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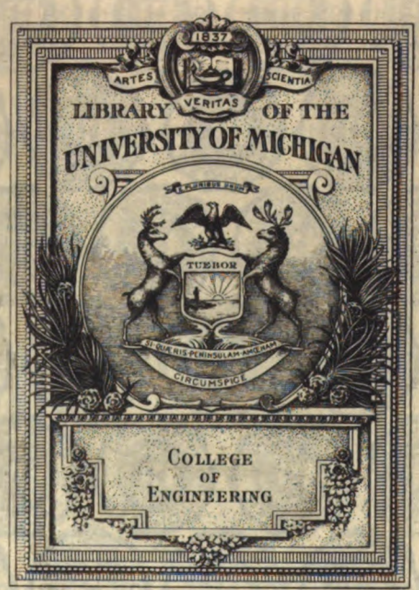


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# THE ELECTRICIAN

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**The Index to Vol. C. of "The Electrician," is included in this issue, and will be found facing page 26.**

# Current Topics.

## Electrical Research.

THE need for further support of the Electrical Research Association was revealed at a recent Conference, as published elsewhere in this issue. Though this Association is one of the most active of the co-operative research organisations in the country, as is borne out by the long list of researches accomplished and in progress, those responsible for directing its operations are concerned with regard to the future. From statements made at the Conference it will be gathered that unless something is done to put the Association on a sounder financial basis, its life of usefulness is likely to be short-lived; further, much more advantageous work could be undertaken were the necessary funds forthcoming. The resolution adopted at the Conference brings into effect an organised effort not only to secure the present scale of expenditure of about £25 000 per annum, but to double it in five years. This ambition is based upon a hope of receiving increased support from the electricity supply industry, for though the bulk of the income of the Association comes from the manufacturing firms, of the 624 supply undertakings in this country, roughly only 25 per cent. support the Association. The claim which the Association makes upon this section of the industry is backed by the benefits which it has already enjoyed as a result of researches in buried cables, nozzles of steam turbines, etc. According to Mr. H. T. TIZARD, the gross annual revenue of the electrical supply industry is in the neighbourhood of £40 000 000, and a contribution of one tenth of 1 per cent. of this sum would be sufficient to provide the Association with the income it requires. The necessity for research is recognised by most, if not all, manufacturers and many of them maintain their own laboratories. There are, however, many researches of a general type which can be better investigated by a central body rather than by individual firms, and, as pointed out at the Conference, while questions relative to production are suitable subjects for work in manufacturer's own laboratories, the problems affecting utilisation are better handled on a co-operative basis. While we believe that the majority of supply engineers are in favour of support of the Association, as was pointed out by Mr. F. W. PURSE, the difficulty lies with the Electricity Committees, which, in most cases, formed of non-technical members, are not inclined to grant sums of money towards maintaining an Association whose results from researches are incorporated in the equipment bought from manufacturers, the improvements, as explained by Mr. D. N. DUNLOP, being thrown in gratis, as it were.

## Radio Apparatus and Supply Mains.

FOLLOWING upon the remarks made on page 727 of our issue of last week, relative to mains-operated equipment for radio purposes, it is interesting to note that regulations in regard to such apparatus have just been issued by the Institution of Electrical Engineers in the form of a supplement to the ninth edition of the Institution's Regulations for the Electrical Equipment of Buildings. These regulations have been prepared by a sub-committee on which the Radio Manufacturers' Association and other interested bodies were represented. That Association has now approved the regulations, and will endeavour to arrange that all radio sets manufactured by its members comply with them. The fact that this question has been settled before the opening of the National Radio Exhibition should tend to make the exhibits at Olympia even more interesting, for whereas hitherto mains-operated apparatus complied only with the requirements of the manufacturer, both design and method of connecting have now been brought into line with other domestic and industrial appliances.

## Overhead Lines and Aircraft.

WE publish elsewhere in this issue a letter from Mr. T. STANHOPE SPRIGG, Editor of "Airways," relative to our remarks upon the objections raised, in the interests of aircraft, to the erection of overhead transmission lines. While we are among the first to admit that the future of air transport is one of enormous possibilities, we nevertheless feel that the progress of electrical development is equally important. Whereas the service offered by the latter is for the masses, by comparison, aviation can only be for a few. Mr. SPRIGG, refers to overhead telephone and telegraph wires as being "equally dangerous to airmen" and, eliminating the possibility of electrocution, this may be so. A point which has been overlooked, however, is that whereas it is a comparative inexpensive undertaking to bury telephone and telegraph wires "in the vicinity of aerodromes," it is another matter when the problem is that of burying transmission lines throughout the country. To expect an industry to accept such a proposal is as unreasonable as to hope that the world of aviation will erect landing stages throughout the country at heights above the much discussed overhead transmission lines

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in order to avoid collision. While on the subject of objections, why should it be assumed that electricity supply undertakings, on the other hand, do not entertain the fear that aircraft may damage by short-circuit the network of their distribution systems? In the days of the early submarine cables, the mercantile navy accepted the new conditions without prejudice, and though it may be argued that the cables "sit" in water deeper than that shown by the Plimsoll marks of the world's ships, where these cables are taken ashore, the position is much the same as in the vicinity of an aerodrome. Airports are much the same as seaports, in that between ports aircraft like ships should continue on a course charted with the "dangers" lurking on that course. In the case of aircraft the danger of overhead lines can only exist when taking off or landing, therefore the chance of mishaps is comparatively remote and not so serious as has been suggested. In a country like the United States, where air transport is at least as much employed as here, overhead lines are in common use, and since American airmen can fly under such conditions, are we to understand that the British pilot is less skilled?

## American Battery Exports.

A POINT of outstanding interest revealed by the figures for exports of electrical equipment shipped from the United States during March last, is the fact that of the approximate $1 000 000 increase over the same month last year, batteries and washing machines accounted for over half of the improvement. When it is remembered that both these articles are manufactured in large quantities in this country, and that our own export figures for the same month showed, in the case of batteries, a decline of £125 when compared with March, 1927, there is reason to assume that even though we may not be actually losing ground, we are certainly not gaining it. American-made batteries are in the main good but expensive, whereas the British-made product has now been developed to compete in price with the Continental battery, while still retaining the British standard for capacity. Our experience of both American- and British-made batteries is that the former is in no way superior to the latter taking them type by type. Of the "heavy duty" class there are several British makes, and, comparing these with well-known similar types of American origin, tests have indicated that the British battery is equal in capacity to the American product, at a price in favour of the British. In view of these facts, manufacturers of British batteries should do all in their power to reduce the potential markets for American batteries by developing their export sales. With few exceptions, battery-making firms in this country confine their output to sales in the home market, whereas opportunities occur in places even as small as Hong Kong, which absorbed American batteries valued at £9 000 during March last, while India and British Malaya accounted for £8 000 and £6 000 respectively. Australia, on the other hand, bought batteries valued at no less than £17 000 during the same month—from the United States.

## Boiler House Efficiency.

IT will be agreed that an enormous amount of research, theorising and experiment have been carried out during the last fifty years in connection with the furnace side of the steam boiler, and, according to Mr. T. ROLAND WOLLASTON, the work has been almost useless. This expression of opinion was given at the Summer Meeting of the Institution of Heating and Ventilating Engineers at Blackpool, and is based on the fact that the compilers have nearly always started from unsound bases, to wit, the orthodox flat-grate thin-fire furnace and the assumption that "convection" played the most important part in transferring heat from fuel to water. In burning coal on such grates they were told that the utilisation of 50 per cent. excess air with, say, 12 per cent. $CO_2$ in the resultant chimney gas constituted excellent practice. Then again it has been the custom to rate boilers on "heating surface" regardless of its location in relation to the fire. One found constantly guarantees of from 5 lb. to 8 lb. evaporation per sq. ft. of heating surface per hour from boilers, but it was obvious that the rate of evaporation from the surface nearest the fire must be many times that of the surface furthest away. Dealing with the relative value of "radiant heat" from the incandescent fuel as compared with "convected heat" the conclusion might be drawn that "radiant" heat is very much more useful than "convected" in water heating and steam raising. Mr. WOOLLASTON looks forward to the tubeless boiler in which, by converting all the heat possible into radiant heat, evaporations of the order of 30 to 50 lb. per sq. ft. of heating surface per hour would be obtained. This, it is suggested, would be obtained by adopting gas producer practice in the design of a producer boiler.

## An Encouraging Prospect.

As was to be expected, Sir HUGO HIRST made some most interesting remarks on Tuesday at the annual general meeting of the General Electric Co., Ltd. His observations concerned not only the satisfactory progress of the company, but they also touched upon the electrical industry as a whole. His pro-British attitude in respect to shareholdings falls in line with the views expressed at the B.E.A.M.A. dinner on Tuesday to the Commission to Australia, of which Sir Hugo is a member. As is already known, a 10 per cent. dividend is to be paid this year, and speaking of this, Sir Hugo pointed out that a recent rise in price of the company's shares was not due to a leakage of information, but to American buying. Since it might cause embarassment, at some future date, if too big a proportion of the shares were found to be in non-British hands, the board propose to watch this movement and if necessary to adopt methods to keep it in check. Such an attitude is typical of the far-sighted policy which has always been associated with the G.E.C., and will, without doubt, be for the betterment of the industry as a whole. As to the industrial outlook generally, Sir Hugo is fully satisfied, having due regard to all the circumstances. The heavy industries are still in deep waters, and the progress made has been in spite of that handicap. The future, however, is, as ever, full of promise. A point of interest raised at the meeting was to the effect that it will take four or five years before the national electricity scheme is likely to influence the company's accounts. Nevertheless, the scheme is even now preparing the way in educating the public in the greater use of electricity and the cheapening of domestic electric appliances. The whole of the chairman's speech, though full of promise for the future, nevertheless, calls upon everyone in the industry to work steadily and thoroughly, in order that, in the words of Sir Hugo, a more favourable balance of trade will be attained.

## The Hampstead Celebrations.

HAMPSTEAD Garden Suburb is to be congratulated upon its coming-of-age celebrations which concluded on Saturday, because, apart from the social events which marked the occasion, electricity played a most important part. One of the outstanding features of the celebrations was a competition in connection with the illuminating of private houses, many of the competitors introducing electric fairy lamps and flood projectors into their schemes. Apart from advertising Hampstead as an ideal residential district, the celebrations of last week will have impressed many a visitor with the hitherto unrealised possibilities offered by electrical illumination. There must be a number of towns with suburbs of a like age to Hampstead, and, in such cases, the promotion of similar celebrations should be encouraged. Electrical contractors making such a suggestion to local traders will, with few exceptions, receive sympathetic hearing in that not only will the suburb be advertised but it will be visited by residents from neighbouring suburbs, with a consequent increase in trade. The publicity value from an electrical point of view needs no explanation, while the electrical business likely to accrue from such a scheme is sure to be considerable.

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# DOMESTIC LIGHTING AS A LOAD FACTOR.*

## Peak Load and Cold Weather—A Feminine Fear—Views on Two-part Tariffs—Electric Cooking and Transformer Kiosks—Load Factor or Total Output?—Water Heating and Broadcasting.

By A. F. BERRY.

THE fact that electric lighting had no rival and was remunerative had stunted the development of other uses of electricity in the home. For heating and cooking electricity had rivals which were much appreciated and well understood, and the charges for which were usually included in the rent or form a small addition to it. In spite of this heavy handicap, electric heating and cooking progress, but not at the rate they should. Broadly speaking, heating and cooking were essential to increase the load factor of electric supply undertakings, which must be low with lighting alone. When general domestic electrification had been developed efficiently the lighting peak load would be negligible. The lighting plant could be used during the " sleeping " hours for securing a supply of hot water, and, during the day, for meeting part of the heating and cooking load. In a house or flat with complete electric services, lighting accounted for only a small fraction of the energy used. Apart from all-night water-heating units, other applications of electricity should use $^{16}/_{18}$ times the energy required for lighting in the winter quarters, and $^{10}/_{12}$ times the amount in the summer quarters of the year.

Lack of appreciation of the great convenience of electricity often made it more costly to the user than was necessary. For instance, it was uneconomical to replace a coal fire by an electric fire in a dining room fireplace. In that room warmth was required mainly under the table. Electricity alone could furnish this, and at a small fraction of the cost of a fire, whether electric or other. Electricity should be so installed that it is available exactly when and where it is required. This was the most economical plan, and conduced to the greatest appreciation of the convenience of electricity. Few engineers would replace a boiler and engine by one large motor when electrifying a works or factory, and in the same way a candelabrum and a coal fire should rarely be replaced by an electrolier and an electric fire. The load-factor of supply could be greatly increased and money saved by developing domestic electrification on more thoughtful lines. A good load factor was the result of incessant use, and such use means that the service was found to be invaluable. The maximum effect of domestic lighting and heating on the load factor would be secured only when appliances in great variety were supplied on easy terms and when a desire for the convenience afforded by electricity had been created in the minds of housewives.

In an example, for which the author was indebted to Mr. W. A. Gillott, it was assumed that the connected load on an all-electric house is 17·85 kW, the average demand being 1·3 kW. The most important feature of such a load was that the peak occurs during the winter on Sundays. The average annual consumption would be 5 450 kWh during the day, while the consumption for water heating at night would be 9 100 kWh, equal approximately to 80 per cent. load factor on the demand. With a house of the size assumed, very little, if any, other form of fuel would be needed, and the cost of electricity would be found to compare favourably with that of other methods. A suitable tariff would be £8 per kW per annum of lighting demand plus ¾d. per kilowatt-hour.

### The Discussion.

Col. R. E. CROMPTON (chairman) said, as London was not a manufacturing town, the only chance for the supply companies to increase their output was in the direction indicated in the paper.

Lt.-Col. W. A. VIGNOLES stated that though it was generally thought that there was no purpose for which electricity could be used which would not have the effect of improving the load factor, there was, however, one exception. Apparently, under certain conditions, there was a danger that electricity used for heating might cause a peak load during a cold snap in the winter, which peak might last only for a few days. If the price of electricity was low enough, however, it would be used continuously throughout the winter for heating purposes, and therefore the peak was not likely to rise as indicated. It could also be said that load factor may be improved by the development of intensity of lighting in shops. The development of late shop-window lighting was also important and had improved load factors very considerably. While heating of houses was confined to the cold period, the heating of water was required all the year round, and its application was likely to be highest in the summer months. In dealing with electric cooking, the speaker stated that his Association had obtained figures from some 200 undertakings showing that there were about 50 000 electric cookers in use in those undertakings. This, though it accounted for many million units in the year, represented only about 1·25 per cent. of the houses in the areas concerned. There was no doubt that cookers were being used more rapidly in newly developed areas where the new houses were being built. With the recent improvement of hot plates, which had been very marked in the last year or two, be believed we could look in the future for a much more rapid development. Finally, development could only be secured by the establishment of two-part tariffs.

### A Load Problem.

Mr. F. W. PURSE said, taking the load as a whole, he did not think the lighting peak-load negligible. With respect to domestic heating, he pointed out that on one housing estate known to him the whole of the lighting and heating was furnished by electricity. One Sunday morning in November, when Sunday cooking was in full progress, something happened to the transformer, and the entire estate was deprived of light and heat. In his own district electric cooking was going ahead very rapidly, but when he had particulars of voltage drops, and when his Mains Department got out estimates for maintaining the pressure, involving a transformer kiosk in every road, it began to make him think. With regard to load factor, if the Commissioners' last return on coal consumption was studied it would be realised that it is not the load factor which specifically affects the cost. There was an undertaking given in that return which had a load factor of 42 per cent., but because its output was only 2 000 000 kWh, its coal consumption was 5·39 lb. per kWh. The undertaking which had the lowest coal consumption per kWh was Manchester, which, with a load factor of 53 per cent. consumed 1·33 lb. per kWh. Next to that, where the load factor was only 24 per cent., the coal consumption was 1·71 lb. per kWh. The reason for this low coal consumption was because the output was as high as 133 million kWh. His contention was that it was not the load factor so much as the size of the undertaking which counted. What we really mean when we speak of increasing the load factor was the increase of the total output. It was the load factor combined with increased size of output, and not the load factor alone, which counted. With regard to the example of 0·4d. per kWh mentioned in the paper, we might have looked forward to that figure under the old control, but he was a little doubtful about it under the Central Board's scheme. Some station engineers were supplied with figures of an approximate cost estimated at 0·25d. per kWh—high tension—plus the fixed charge. If they studied the 1926 Act, they would find that after ascertaining the maximum demand, the more the summer peak was filled up, the greater would be the average maximum demand for which they had to pay. According to the maximum demand system under the Act of 1926, the highest demand registered in any month was taken and carried on to successive months until another higher maximum was reached. If we assumed a unit of 100 for the winter peak, and if the year began on April 1st, the load would probably have dropped down to 70, and would go on dropping down until June to about 50. In that case the average maximum demand to be charged under the Act would be 70 to 80. It would be lower, the smaller the load factor of the undertaking. But if this peak was filled up so that a steady figure through the year was obtained, the average demand on which the undertaking would have to pay would be 100 instead of about 75.

Mr. J. W. MEARES was of the opinion that there was no question that the raising of the load factor and the spread of the capital charges was one of the crucial points in electricity supply. He had lived where there was water power and where the load was highly developed. The load factor was 55 per

* Abstract of a paper on " Domestic Lighting and Heating and Its Influence on Load Factor of Supply," presented by Mr. A. F. Berry to the Institution of Civil Engineers' Engineering Conference.

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cent. and the costs, consequently, on a very small undertaking, were exceedingly low. Power for water heating was obtained at the equivalent of ½d. per kWh. On the question of thermal storage for levelling up the load factor on the tidal power, it was pointed out that there was a time during which power could be generated and a slack time when no power was available. It was conceivable that tidal power might in this way assist electricity supply.

Mr. A. H. DYKES remarked that to develop the cooking load in residential districts there must be a two-part tariff. The author suggested that the domestic day load should be stimulated by a tariff upon the lines of £8 per annum per kW of lighting installed. In other words, he based his standing charge, not on the amount of kilowatts collected for cooking and other purposes, but simply on the lighting load. He had looked into one or two of the stations where the two-part tariff was at work. There was one station which supplied Leatherhead and a widely scattered district, where the mains in some cases had to pass over miles of common, was providing electricity something like eighteen months ago at a price for lighting of 10d. per kWh. When it was decided to offer a two-part tariff it could not be based on the rateable value of the houses, because the rating differed so much in the different districts; therefore it was based merely on what had been the previous consumption for lighting. He took out the number of units each house had had, taking the price at the then rate of 10½d. and decided that the follow-on charge was to be 1½d. That amount was deducted and the difference was made the standing charge. In one small section there were 19 consumers who adopted this tariff. The kilowattage was 16·6 for lighting, 73·5 for cooking, 40 for heating and 21 for other purposes, a total of just over 150 kW, which worked out at 9 kW per house. The consumption by these houses before this tariff was offered amounted to 4 280 kWh, for which the people paid 10d. per kWh. Last year, under this tariff, they consumed per house 2 840 kW, instead of 225 as under the old arrangement, and the figure charged them was £9·2 per kW. If anybody was willing to use electricity reasonably let him adopt the two-part tariff and he would get it at a low figure. The revenue from the houses of which he had spoken was increased by 2·74 times and the number of kWh consumed by 12·5 times. People in small houses were not prepared to pay a fixed bill at the end of the quarter. Therefore in Beckenham and district he charged a fixed sum per week which covered the cost of the wiring, and the fixed charges plus 1d. per kWh. This fixed charge included an average of 23 kWh per week. which sum was collected weekly. At the end of a quarter the meter was read and if the average had been more than 23 kWh per week, the people paid 1d. per kWh for the amount of excess, and if it proved to be less than an average of 23 kWh per week, the housewife got a rebate.

### American Conditions.

Dr. J. W. LIEB pointed cut the different conditions in the United States. In the lower part of California and Florida freezing point was never reached, and the question of household heating was different from what it was in the Eastern States. Originally there were load factors in the United States of 18-20 per cent., but in the Metropolitan areas they had improved 38 and 40 per cent. There was a pronounced improvement in the residential load factors on the system, as a result of broadcasting, due to people listening to the programmes with mains-operated sets. Again, there was a great improvement in the load factor as a result of refrigeration.

Miss HASLETT said though the average woman was ready to find any method which would lighten her household tasks, she had always believed and continued to believe that electricity was expensive, and also she was afraid of it.

### ELECTRIC PUMPS IN GOLD MINES.

Electricity has been successfully employed in pumping out a deep gold mine in South Africa, according to the New Jersey Public Utility Information Committee. An accident to the old pumping equipment flooded the mine to such an extent that it could not be "dewatered" with the equipment previously used, causing the abandonment of the lower levels.

When the rising water threatened the upper levels, it was decided to attempt to pump the mine out by means of electrically-driven pumps. A multi-stage centrifugal pump, direct-connected to a 2 000 H.P. motor, was installed more than 3 000 ft. below ground, and for 23 months the equipment operated continuously, pumping water to the surface at the rate of 75 000 galls. per hour.

# BOOK REVIEWS.

**The Principles of Electric Power Transmission by Alternating Currents.** By H. WADDICOR. (London: Chapman and Hall.) Pp. xix + 399. 21s. net.

During the past fifteen years or so the progress of electric power transmission has been accompanied by the publication of quite a large amount of literature on the subject in the form of papers read before various societies and institutions, and in this book the author has brought together and arranged much of the scattered information in a convenient form for reference. Intended primarily as a text book for the use of students, it is also of direct usefulness to designers and engineers responsible for the transmission of electric power. Many formulæ and phases of the subject required so infrequently as never to be remembered will be found in these pages, logically placed for the student and easily traceable by the busy engineer.

Of the thirteen chapters, three are devoted to useful fundamental principles, three to transmission theory proper, two to overhead lines, one very complete chapter to underground cables, and others to protection and pressure rises.

Throughout the four hundred clearly printed and well illustrated pages the author has very wisely avoided unnecessary digressions into mathematics or physics, with the result that the more theoretical chapters will be read and assimilated with a minimum amount of time and energy by the student attempting to master the principles. Moreover, the practical examples, which are sprinkled throughout the text will prove an encouragement to those readers whose sole object is to solve practical problems for the sake of the results rather than for mental exercise, a distinction not always appreciated by writers on transmission theory.

It might be contended that the subject of underground cables is in itself of sufficient magnitude and importance to justify a textbook to itself rather than one chapter in a book of the kind under review. For the specialist that may be true, but for the more general student Mr. Waddicor has provided an interesting section in which few words are wasted, and few important matters omitted. If we overlook one or two slips such as the unjustified condemnation of chemical wood paper and the statement that the draw-in system is practically always used for city work, we may say that the modern views on underground cables are well presented.

We notice that the author has adopted the growing and commendable practice of adding at the end of each chapter a list of references, so that the serious student may follow up any particular branch of the work. We anticipate that many will find this summary on electrical power transmission not only invaluable in itself, but also a stepping stone to a wider survey of this most important branch of electrical engineering.

P. DUNSHEATH.

## AMERICAN ELECTRICITY SUPPLY.

**ACCORDING to a recent compilation of the United States Geological Survey, an output of 80 205 474 000 kWh was produced by public generating authorities in the United States during 1927. Of that total, water power was responsble for 29 875 008 000 kWh, and the balance, 50 330 466 000 kWh, were produced from fuel. During the period under review 41 886 000 tons of coal, 6 782 000 barrels of fuel oil, and 62 919 000 000 cu. ft. of natural gas were consumed. This consumption is equivalent to 45 910 000 net tons of coal from which there were generated 49 995 000 000 kWh at an average fuel consumption of 1·84 lb. of coal per kWh; for the remainder wood fuel was used. The imports from Canada during 1927 amounted to 1 632 609 000 kWh and the corresponding exports were 4 868 000 kWh. The generator capacity of 25 398 385 kW in 1927, increased in January, 1928, to 27 690 891 kW, only generators of 100 kW or over being included.**

**That the electricity supply companies in the United States are operating at a slightly higher rate than the same time last year was indicated in reports on the March 1928 consumption of electrical energy, received by the "Electrical World" from a large proportion of the companies. The average sale of productive operations during the first quarter of 1928 was about 1 per cent. over that for the same period in 1927, but the March activity was 2·3 per cent. over March last year.**

Windsor T.C. are to instal an electric pumping plant, in place of the old steam plant.

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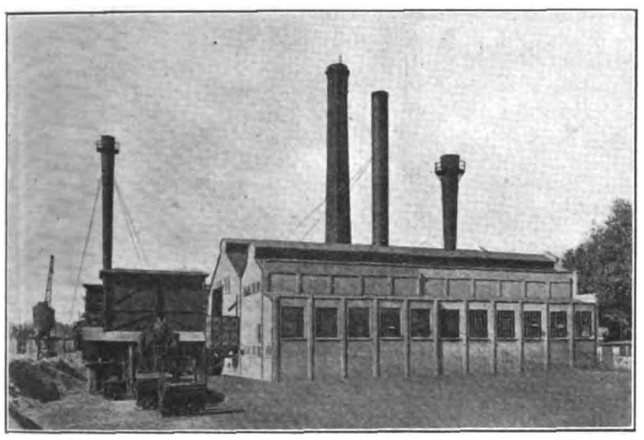
# MAIDSTONE EXTENSIONS.

## Rapid Growth of Domestic Consumption—Additions to Boiler House—New Turbo-Alternator and Switchgear Installed—Plans for the Future.

AFTER years of discussion and alteration of plans, the public supply of electricity in Maidstone was inaugurated in 1901, when the plant consisted of four hand-fired boilers and five d.c. engine-driven generators, of a total capacity of 675 kW. Two hundred and twenty-five consumers were connected up by the opening date, and the supply was practically all for lighting purposes. The plant was only run between the hours of 3 p.m. and 11.30 p.m., a storage battery meeting what little demand there was during the rest of the day and night. The use of electrical energy increased fairly rapidly, and in 1908 the buildings were extended, and a 500 kW steam



**An exterior view of the Maidstone power station.**

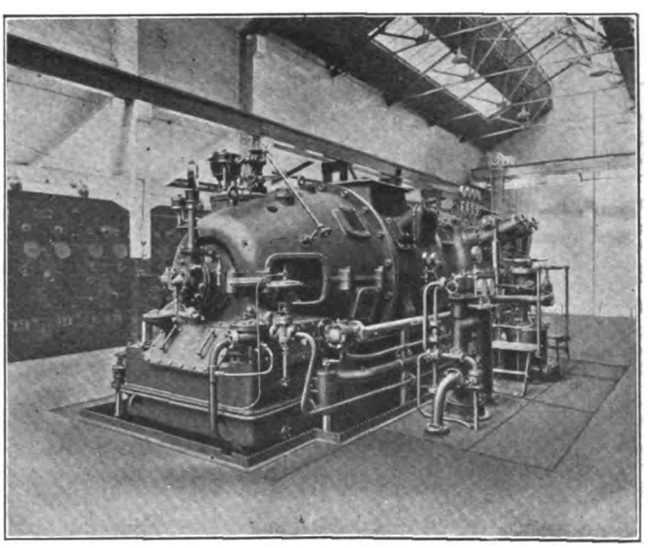
dynamo and an additional boiler were installed; mechanical stokers were fitted to the boilers, and various auxiliaries, making for greater economy, were added. In 1913 additional plant became necessary, and a sixth boiler, together with a steam dynamo of an output of 825 kW, were installed in a further extension of the buildings. Just before the outbreak of war in 1914 it had been decided to replace some of the smaller engine-driven sets by a steam turbine, and the installation of this set was expedited by work rendered necessary by the war. Three of the old 150 kW steam dynamos were taken for "urgent Government requirements," and in their place was installed the first 1 250 kW Brush-Ljungström turbine and a 1 000 kW rotary converter. Later, in 1916, further extensions were put in hand, but it was not until 1918 that these extensions were finished, but a 30 000 lb. capacity water-tube boiler by John Thompson, Ltd., and a 1 500 kW Brush-Ljungström turbine, were practically completed at the time of the Armistice. In 1919 and 1920 the system of generation was changed from d.c. at 500 V to 3-phase 50-period alternating current at 6 000 V, and a further 30 000 lb. John Thompson water-tube boiler, together with a third Brush-Ljungström turbine of 1 500 kW were installed. In 1924 further extensions of plant again became necessary, and it was decided to put up the first instalment of a new generating station built and equipped on modern lines for the economical generation of electrical energy. This extension, consisting of reinforced concrete buildings, coal-handling plant, water-tube boilers, water-softening plant, cooling tower, 3 500 kW Brush-Ljungström turbine, and h.t. switchgear, was completed and put into service in December, 1925. For the twelve months ended March 31st, 1928, the coal burnt per kWh generated was only 1·82 lb., while the thermal efficiency of the station for the whole year was 15·9 per cent.

With the ever-growing uses of electrical energy, especially for domestic purposes, it was soon realised by the Electricity Committee that additional plant would have to be installed, and the official opening ceremony of those extensions took place on Wednesday. These comprise additions to the boiler and turbine houses, consisting of one water-tube boiler of 60 000 lb. per hour capacity, one 7 000 kW turbo-alternator, and extra high-tension switchgear.

The buildings, both boiler and turbine houses, were extended so that a further boiler and a 12 500 kW turbine could be installed at a future date. The plant consists of a 60 000 lb. Stirling boiler, fitted with Green's tri-tube economiser; Diamond soot blowers, and fired by Bennis chain grate stokers with induced draught; a Davidson grit arrester, Mather and Platt pumps, and Bennis ash conveyor and elevator are also fitted; a 7 000 kW Brush-Ljungström turbo-alternator and accessories are included, together with additional e.h.t. switch panels by the General Electric Co., Ltd. An additional cooling tower will be installed at an early date.

With these additions the total capacity of the generating plant amounts to 17 650 kW, of which no less than 16 150 kW is represented by the Brush-Ljungström turbines. The extensions to the plant were designed by the electrical engineer to the Corporation, Mr. E. E. Hoadley, who had the assistance in the details of the work of Mr. D. McBean, who acted as constructional engineer.

The turbo-alternator supplied by the Brush Electrical Engineering Co., Ltd., is of the Brush-Ljungström type, and has an output at the most economical load of 5 600 kW when supplied with steam at a pressure of 200 lb. per sq. in. and a total temperature of 600 deg. F. at the main turbine stop valve, exhausting into a vacuum of 28½ in. (with the barometer at 30 in.). The turbine is direct coupled to two alternators having a combined output of 5 600 kW at 0·8 power factor, 6 600 V, 50 cycles, three-phase. The set has a continuous maximum capacity of 7 000 kW and runs at a speed of 3 000 revs. per min. All the main bearings, as well as the governor and thrust block bearings, are lubricated by means of a continuous supply of oil delivered under pressure by a rotary pump of the valveless type; while, in addition, a separate steam-driven oil pump is provided for use when starting up. Both pumps draw their supply from the main oil tank, and the auxiliary pump is automatically started in the event of the oil pressure falling below a pre-determined value. Fitted to the turbine is a powerful automatic governor which controls the throttle valve, through the medium of a pressure relay system, thus giving sensitive and positive governing. The governor can be adjusted at the turbine by hand operation, and also at the switchboard by means of electric control. The condenser is of the two-flow surface type, capable of dealing with 62 500 lb. of exhaust steam per hour, and maintaining a vacuum of 28½ in. mercury with the barometer at 30 in. and circulating water at a temperature of



**Showing the new 7 000 kW turbo-alternator.**

60 deg. F. Air is extracted from the condenser by means of a Brush-Delas ejector, which is capable of extracting 34·25 lb. of dry air per hour and maintaining the vacuum already mentioned. This ejector is of the two-stage type, the nozzles being in series and the whole combined to form a simple self-contained unit. The condensate is extracted from the condenser by means of a Worthington-Simpson two-stage vertical spindle extraction pump and is delivered through a recorder of the Venturi type to the hotwell. The extraction and lift pumps are mounted on a common bedplate and are driven

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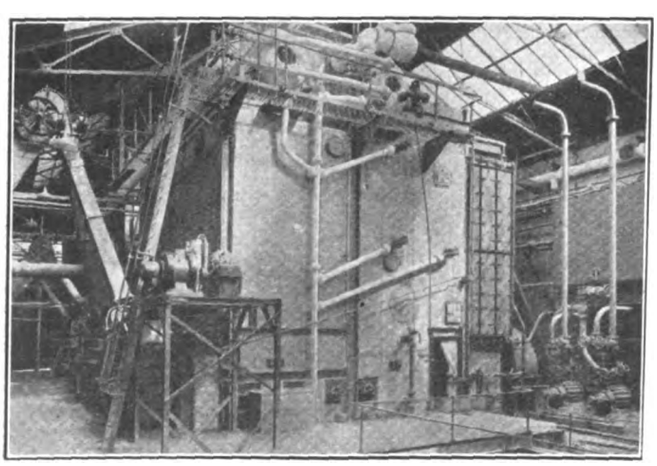
by an 8 B.H.P., 400 V, 50 cycle, three-phase squirrel cage induction motor at 1 440 revs. per min., made by the Brush Electrical Engineering Co., Ltd., this motor being controlled by a floor mounted oil-immersed star-delta starter. The water for condensing purposes is delivered to the condenser by means of a motor-driven centrifugal pump of the "Sunturbo" type, made by J. Stone and Co., Ltd. This pump is capable of delivering continuously the requisite quantity of water for the condenser against a total head ranging from 14 to 40 ft. when running at a speed of 575 revs. per min. The pump is driven by a 65 B.H.P. 400 V, three-phase, 50 cycle induction motor, which is controlled by means of a switch panel arranged for floor mounting. For providing the supply of air necessary for cooling the alternators a centrifugal fan, made by Matthews and Yates, Ltd., is installed. This is capable of delivering 26 000 cu. ft. of air per minute against a pressure of 6½ in. water gauge. The fan is direct driven by a 50 B.H.P. 400 V, 50 cycle, three-phase induction motor with control similar to that used for the circulating pump motor. The air is cleaned by passing through an "A.B.C." oil type air filter, which is provided with spare cells and cleaning tanks.

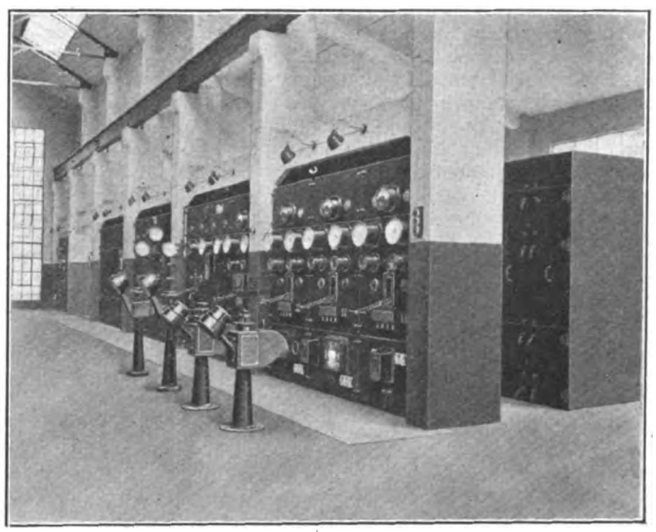
The extensions to the high tension switchgear were carried out by the General Electric Co., Ltd., and the gear employed is installed in cubicles of the steel plate type, being mechanically operated from a slate control board mounted in front of the cubicles. The apparatus is connected to a duplicate set of busbars. The plant and apparatus controlled by this switchgear comprises three alternators, one of 9 000 kVA and two of 2 000 kVA capacity respectively, and three feeders. Two of the feeders are of 500 kW capacity, one supplying power to the works auxiliaries, the other connecting the power station to Foster Street sub-station, while the third feeder is of 1 000 kW capacity. The alternator cubicles are equipped with oil circuit breakers of 100 000 kVA maximum breaking capacity, isolating links, instrument transformers, etc., the employment of the feeder cubicles being approximately the same.

The present extension to the steam-raising equipment, supplied by the Stirling Boiler Co., Ltd., comprises one Stirling patent tri-drum high duty water-tube boiler, with a Stirling patent integral superheater, and a Green's tri-tube economiser. The boiler represents the latest development in vertical boiler construction, incorporating as it does several unique and patented features. The type of boiler here described is one which, among the vertical boilers, is becoming increasingly popular in this country and abroad. This boiler has 9 594 sq. ft. of heating surface, and is normally capable of evaporating 60 000 lb. of water per hour to steam at 225 lb. per sq. in. pressure, superheated to a temperature of 700 deg. F. The feed-water system consists of two patent



**A view of the new Stirling boiler.**

"all-electric" Plurovane high-lift turbine pumps, supplied by Mather and Platt, Ltd. Each of these pumps is capable of delivering 200 gallons of water per minute against a total head from all causes of 275 lb., and is driven by a Mather and Platt open-end bracket squirrel cage rotor induction motor, capable of developing an output of 75 B.H.P. The feed-water is conveyed from the pumps to a main feed range and thence enters the economiser at a temperature of 100 deg. F., and is raised to 225 deg. F. before entering the boiler. Under the latter are two Bennis patent improved smokeless chain grate stokers, with an approximate effective grate area of 306 sq. feet. Each grate is composed of special improved patent serrated half links, and is fitted with a six-speed driving gear. This driving gear is coupled to a 10 H.P. motor, situated on a raised platform, through reduction gears to the main driving shaft, and thence by belt and pulleys to the driving spindle of the



**The newly installed G.E.C. switch board.**

stoker gear-box. The installation includes one "Sirocco" induced draught fan, with a volume capacity of 82 000 cu. ft. per minute of flue gas at a temperature of 450 deg. F., while revolving at 570 revs. per min. and discharging into a 6 ft. 6 in. diameter chimney 100 ft. high. At the base of this chimney is fitted a dust collector. The external services of the boiler tubes are kept free from deposits by an installation of Diamond soot blowers, manufactured by Babcock and Wilcox, Ltd. A complete ash-conveying and elevating plant, supplied by Ed. Bennis and Co., Ltd., has been installed. This comprises a water-sealed trough conveyor, which deals with the ashes from the two existing Vickers boilers, the new Stirling boiler, and for a further boiler which may be installed at a later date. The ashes are conveyed to a bucket elevator, by means of which they are dumped into a 15-ton ash hopper. From the hopper the ashes are dropped by means of a slide into carts and lorries, and removed. The ash conveyor and elevator completes the cycle of operations by means of which the coal is not touched by hand from the time it arrives alongside in a barge until it is taken away as clinker. By means of recording instruments a complete check is maintained of the efficiency of the plant. On the boiler a Bailey meter records the steam flow, the air flow, and the temperature for the gases, while fitted to the stoker is a Lea coal recording meter, giving a continuous record of the coal passing over the stoker. This, together with the Bailey meter, enables the steam to fuel ratio to be determined at any instant.

## ELECTRICITY ORDERS.

Applications for Electricity Supply Orders have been made to the Electricity Commissioners by the following companies or persons. Notices of any objections must be sent to the Commissioners by the dates mentioned:—(1) Burnham and District Electric Supply Co., Ltd., for part of Burnham Urban district (July 7th); (2) Power Development Co., Ltd., for Petworth, Steyning West and Horsham rural districts and parts of Thakeham rural district (July 10th); (3) Messrs. W. H. and Wm. Burton, for parts of Aysgarth and Reeth rural districts (July 17th); (4) Hawes Electric Lighting Co., Ltd., for parts of Aysgarth rural district (July 17th); (5) John C. Bannister and Co., Ltd., for parts of Easingwold rural district (July 18th).

The Minister of Transport proposes to confirm Electric Lighting Orders made on the applications of the following local authorities. Notices of any objections must be sent to the Ministry of Transport by the dates mentioned:—(1) Burnley Corporation, for part of Burnley rural district (July 9th); (2) Ashford Urban District Council, for parts of Ashford rural district (July 7th); (3) Tain Corporation, for the burgh of Tain (July 21st),

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# THE I.E.E. SUMMER MEETING.

## Inspection of Portobello and Hydro-Electric Stations—Visits to Works—An Unexpected "Visitor"—A Shipping Experience.

LAST week we described the opening features of the I.E.E. Summer Meeting in Glasgow, including the visit to the Falls of Clyde hydro-electric scheme on Tuesday.

In describing further the details of the Bonnington and Stonebyres stations, each of the station tunnels terminates in a surge tank constructed throughout in reinforced concrete. This surge tank compensates for the unequal flow due to the inertia of the water column both at times of starting and shutting down the plant. Each tank has a bar screen with its members set 2 in. apart. This affords a final straining of the water before entering the pipe lines. Any material capable of passing through these 2 in. bar screens will also pass through the turbine gates without doing any mechanical injury. The water entry to the pipe lines is controlled by means of sluices, which, in the case of Bonnington, can be either manually or electrically-operated, and in the case of Stonebyres are controlled by Servo motors.

Both power station buildings are constructed with reinforced concrete, in the making of which rock derived from the tunnels and other works was employed. It is interesting to note that the contractors for the civil work used an electrical plant at each station, consisting of two 50 kW 500 V level compound d.c. generators driven by Marshall semi-diesel oil engines. Each station also contained electrically-driven air compressors. From these stations distribution of electrical energy for power, lighting, and compressed air to all the scattered portions of the work was both simple and economical.

Each power station contains two units erected on a single floor. The turbines are of the vertical shaft inward flow reaction type—running 375 revs. per min., and are direct coupled to 25 cycle three-phase 11 000 V alternators. The speed is controlled by an actuator or governor operated from a servo motor worked by oil pressure. In the case of the Bonnington turbines, care had to be taken to safeguard against damage arising from water hammer due to transient pressures. This is effected by means of relief valves on the spiral casings. The water, after yielding up its energy in the turbines, passes through draft tubes formed in the mass concrete foundations. The gate apparatus consists of twenty cast-steel guide-vanes, cast in one piece with the stems. These work in bronze bushes with an external lubricator. The gates are connected by means of cast-iron safety links to a regulating ring and are actuated through main connecting rods from a double piston type Servo motor provided with a clutch gear for manual operation, if and when required.

In the case of the Bonnington plant, the pipe lines are connected to the turbine casing through cylindrical balance valves, which can be operated either manually or electrically, and are specially designed to give easy starting or stopping without setting up water hammer. The switchgear employed has a rupturing capacity of 250 000 kVA, the whole being operated from a control platform in the turbine house. The output from both hydro stations is transmitted over 3 three-phase double circuit transmission lines, operating through balanced protective gear. One of these is a trunk feeder to the station busbars at the company's steam-driven power house at Motherwell. The other two lines are feeder distributors. The drop is compensated by means of booster transformers controlled through Brookhirst regulating gear. The work was carried out to the plans and specifications of Messrs. Buchan and Partners, Edinburgh, who acted as consultants for the scheme. The civil work was executed by Sir William Arrol and Co., Ltd., and the hydro-electric equipment is by the English Electric Co., Ltd.

On Wednesday, a visit was made by motor coach to Portobello and on arriving at the power station, members and visitors were received by the Acting Chief Magistrate, Bailie Hay, in the unavoidable absence through illness of the Lord Provost, Sir Alex Stephens, the convener of the Edinburgh Electricity Committee, Bailie Houston and Mr. E. Seddon, engineer and manager. On reaching the main turbine room members were further greeted by a large electric sign reading "Welcome I.E.E."

The coal used at the Portobello station is principally washed pearls having a calorific value of 10 500 from the Lothian coalfield, most of the collieries being within a radius of about 6 miles.

The coal sidings are situated about 800 ft. from the boiler house. Trucks are passed over a weighbridge on to a rotary tippler of the Mitchell Conveyor Co.'s design, the coal gravitating into a hopper having a capacity of about 50 tons, from which it falls on to a belt conveyor. The conveyor is about 706 ft. long and passes through a tunnel 430 ft. long below two roads and a railway. The main conveyor discharges into

**The official photograph of members and their friends at the meeting. This was taken at the Falls of Clyde.**

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hoppers which feed two gravity bucket elevators by Messrs. Fraser and Chalmers. The eight boilers installed are of the tri-drum type supplied by the Stirling Boiler Co., fitted with superposed economisers. Each boiler is fitted with a mechanical stoker in some cases of Babcock and Wilcox design or in others of the Underfeed Stoker Co. There are five boiler feed pumps, each of 18 000 gallons per hour capacity against a head of 810 feet. Four steam-driven pumps are by G. and J. Weir, Ltd., and one electrically driven pump is by Mather and Platt, Ltd.

## Generating Plant.

The generating plant at present installed comprises three 12 500 kW turbo-alternators, by the British Brown-Boveri and Co., with condensers and auxiliaries by W. H. Allen Sons and Co.; one 12 500 kW turbo-alternator set complete with condenser and auxiliaries, by the Metropolitan-Vickers Electrical Co., Ltd., and one 5 000 kW turbo-alternator with condenser and auxiliaries by C. A. Parsons and Co., Ltd. The condenser cooling water is drawn from the estuary of the Forth through three 57 in. dia. cast iron concrete lined tunnels 500 yds. long. Four pumps each with a capacity of 14 000 gallons per minute against a total head of 50 ft. are installed. Three pumps are by Worthington-Simpson, Ltd., driven by 400 V a.c. Bruce Peebles motors. The remaining pump is by Mirrlees Watson Co., Ltd., driven by a 500 V d.c. motor of the General Electric Co., Ltd.

The system employed is three-phase, 50 cycles, 6 600 V with earthed neutral point through a limiting resistance. The main switchgear is of the concrete cellular construction by the British Thomson-Houston Co., Ltd. The main busbars and oil switches are in duplicate and all switches have a rupturing capacity of 750 000 kVA. Auxiliary busbars feed four 1 000 kVA transformers to obtain a low tension a.c. supply for the station auxiliaries. The station d.c. load is supplied by means of motor generator sets and a standby battery of 1 850 A hours capacity.

Extensions now being made at the station include a duplicate coal handling plant, capable of handling 80 tons per hour, while eight boilers by the Stirling Boiler Co., Ltd., are under construction of the same steaming capacity as those already in use, but with the addition of heaters and grit arresters. The mechanical stokers are by the Underfeed Stoker Co. (L. type, 2 boilers) and Babcock and Wilcox, Ltd. (compartment type, 2 boilers) and improved drop link type, 4 boilers. Five new feed pumps (four steam and one electric) will be supplied by Mather and Platt, Ltd., and one electric by the Harland Engineering Co. Two 31 250 kW turbo-alternators are being constructed by the British Brown-Boveri and Co., Ltd. These are to be fitted with twin condensers and duplicate extraction pumps by W. H. Allen Sons and Co. The pump house is being extended to accommodate three new pumps, with capacities of 30 000 gal. per hr. against a total head of 50 ft., two of which have been ordered from W. H. Allen Sons and Co. The driving motors will be 625 H.P. 6 600 V by Bruce Peebles and Co. The switchgear for the extension is of the remote controlled, ironclad, compound filled type by the Metropolitan-Vickers Electrical Co., Ltd. The rupturing capacity of the main oil circuit breakers is 1 500 000 kVA and the normal full load current carrying capacity of the alternator switches is 3 500 A. The present extensions when complete will bring the plant capacity up to 117 500 kW. At a later date an additional 31 250 kW set will be installed, thus bringing the station to a maximum capacity of 148 750 kW.

When the Central Board is ready to operate the Central Scotland Scheme, Portobello will be required to produce 337 000 000 kWh for the first year and for the second year 378 000 000, which is three times the present output.

Another visit arranged on Wednesday was an inspection of the works of Bruce Peebles and Co., Ltd., while an alternative excursion included Queensferry, the Forth Bridge, and the Hopetoun Deer Park, returning via the Turnhouse Aerodrome and the Zoological Gardens. While passing the latter place, a hitherto absent "visitor" made his appearance, in the shape of an elephant on whose sides were painted the letters M.I.E.E.

Thursday's programme included a trip to Fort William to visit the Lochwater water power scheme of the British Aluminium Co., Ltd., while visitors were also invited to inspect the water power station of the Fort William Electric Lighting Co. at Blarmachfoldach. In the evening the visitors were the guests of the British Aluminium Co., Ltd., and Balfour Beatty and Co., Ltd., at a ball held at the Highland Hotel.

The headquarters on Friday, the last official day of the meeting, were at Oban, visitors being conveyed from Fort William by steamer; the chief items of outstanding interest during the voyage were a small fire which broke out below decks and which was soon extinguished, and the loss of Mr. J. Taylor's hat which was blown over the side. In the course of the afternoon the President made his final address.

For the benefit of members and their friends a number of local works were thrown open for inspection; these included the works of Mavor and Coulson, Ltd., Drysdale and Co., Ltd., Hamilton and Sons, (a Ruths steam accumulator installation), the new Govan Refuse Power Works, and the Harland Engineering Co., Ltd.

## FIFTY YEARS AGO.

### Diverting Demonstrations with a Frog's Heart.

A GLANCE through the pages of THE ELECTRICIAN for July 6th, 1878, reminds us that :—

The Eastern Telegraph Co. started laying a cable from Tenedos to Kemer.

* * *

Results were given of a series of electrical experiments with crystalline selenium.

* * *

The question of telegraphic communications with our South African possessions was receiving attention.

* * *

Prof. Hughes furnished to THE ELECTRICIAN a detailed and categorical denial of the claims made by Mr. Edison to the invention of the microphone and of the allegations of breach of confidence made against him and Mr. Preece.

* * *

A current lecture experiment was to place the heart of a frog on the electrodes of a Dubois Reymond with connections to a sensitive reflecting galvanometer. The rhythm of the pulsations was then observed by the swinging to and fro of the spot of light on a transparent screen.

* * *

Prof. J. G. McKendrick discovered that by placing Hughes's microphone on the disc of the phonograph the latter would transmit the sounds recorded on the tinfoil to a telephone at a distance. Thus, he said, we have a combination of microphone, phonograph and telephone which promises to be of use. He had no doubt that arrangements could be made by which the sound might be reproduced in a dozen different places at once.

I.E.E. members and visitors at the works of Bruce Peebles and Co., Ltd., on Wednesday.

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## I.E.E. SUMMER MEETING SNAPSHOTS.

*IN spite of the inclement weather which attended the Summer Meeting of the Institution of Electrical Engineers, we are able to reproduce a number of snapshots of members and their friends. The dull days were not conducive to the best results from a photographic point of view, but the prints, nevertheless, form a pictorial record of the meeting.* (1) *In merry mood in spite of the rain.* (2) *On the way to Oban.* (3) *The President's happy smile.* (4) *All prepared for the weather.* (5) *Too busy to sit down.* (6) *Some well-known faces.* (7) *The President in serious mood this time.* (8) *More lunches.* (9) *Returning from one of the visits.* (10) *Who is he?* (11), (12) *and* (13) *more well-known personalities.*

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# ELECTRICAL RESEARCH ASSOCIATION.

## Future Finances of the Electrical Research Association Discussed—Supply Industry Invited to Give Further Support—Manufacturers' Appreciation.

A CONFERENCE was held at the Institution of Electrical Engineers on June 8th, to consider the future of the Electrical Research Association at the expiration of the period of Government grant, which is now on a diminishing scale and ceases in 1930. The conference was presided over by Sir Richard Glazebrook, F.R.S., and representatives from all sections of the industry were present.

Sir RICHARD GLAZEBROOK, in opening the conference, said that the Association had in the past been supported to a large extent by manufacturers, and the question arose whether something more might not be done by those who are not manufacturers, but users of electrical apparatus and machinery; whether the advantages that follow from the results of research were not such as to touch the community as a whole, particularly supply companies and associations, and municipal authorities. The papers giving a brief account of the programme of work and results accomplished up to the end of last May showed that interesting and important work was going on. The total expenditure during the past ten years amounted to approximately £138 000, and the benefits had gone, not merely to the manufacturers, but to the users. We were told that cable research had added £1 000 000 to the value of the cables, and that it was saving at present £250 000 every year. Taking again the experiments on turbine nozzles and so on, in the case of a station of 100 000 kVA there was an estimated saving of £6 000 annually, due to the results of research.

### Benefits to Supply Industry.

Mr. H. T. TIZARD stated that the Department of Scientific and Industrial Research had watched with interest the development of the electrical manufacturing industry, and there was reason to know of the efforts to promote research that the manufacturing industry had made. In the case of the supply industries, however, there was a gap which could be better filled. Looking through the list of work done, he was struck by the number of researches undertaken by the Association, and the number of results obtained, which were directly to the benefit of the supply industry. He understood that the supply industry had a revenue of something like £40 000 000 annually, or over; the total subscriptions paid by the supply industry to the Association were between £3 000 and £4 000; that is to say, £1 for every £10 000 of revenue. They had not got unlimited funds; they had got a number of directions in which those funds could be spent. If he confined himself only to electrical research, he mentioned that apart from the support given by the Department to the Association, there was being spent to-day in one form or another, for general research at the National Physical Laboratory on electrical problems, standardisation problems, electrical problems connected with radio research, and more far-reaching scientific researches which may have a big effect on the electrical industry, something like £35 000 each year. In addition, in the last few years the Government had set up a high-tension plant at the National Physical Laboratory, mainly for the benefit of the industry, at a cost of something over £50 000. When the Electrical Research Association recently decided to increase their expenditure, the Department increased quite substantially the block grant that was payable to the Association under the old agreement.

Mr. W. B. WOODHOUSE also spoke, pointing out that as the engineer was not always in control of the finances of the various undertakings, it was necessary to consider the best way in which to put the need for money for research before those people who were able to find it. He believed that if the electrical engineering industry with one voice urged the vital necessity of much greater support of the Association, they would get it. The urgent matter for the industry's good was to get a bigger annual income. In the last ten years £138 000 had been spent, and the most striking results had been produced, but the sum spent was too small. The research on the heating of buried cables had been invaluable; it would be difficult to put down a figure of the value gained. The researches on insulating materials were more and more making clear how much there was to be known. In this connection, as in other matters, if something more was known about any particular section of the industry a little ahead of the rest of the world, it would do us, nationally, a great deal of good, but if we waited until these things were developed by research and invention in other countries, we should not keep our place, and we should pay in the price of foreign products more than the actual cost of research. Insulating oils had been another field of research. Supply engineers who remembered the difficulties and troubles of oil insulated transformers some years ago would appreciate the benefits brought about by the Association. Another valuable section of the Association's work was that on the fundamental problems of dielectrics. This research was leading us into new fields. The Association had conducted a series of researches into overhead lines and materials. As to electrical control apparatus, it was indicated at the last annual meeting of the Association that the research on switchgear was producing most valuable results. The value of the work done to the supply industry, to the manufacturers, and to the country, far outweighed what had been spent. Separate works research departments, though serving a useful purpose, could never obtain the advantage of bringing together experts from the whole of the country to discuss different problems and to help forward their solution.

Mr. LL. B. ATKINSON referred to the results of the research undertaken on steam nozzles. If the results of those researches could be applied—and they would be gradually applied right through the industry—they would result in saving, on present production, £250 000 a year to the supply industry. Passing to the question of switchgear researches, discoveries had been made which uncovered new systems of control. As soon as they were adopted several hundreds of thousands of pounds yearly would be saved to the supply industry and to the manufacturers in that one section alone. That work wanted carrying on, but they had reached the limit of the apparatus at their disposal. Their object was to make switchgear on a moderate and cheap scale which would easily, and with certainty, break off 100 000 kW at a time. That required a 100 000 kW plant to test them on. They had been assisted in the past, but they had got to a stage where, if they were to keep abreast of the times, they must spend money on additional and large plant for testing work. It was considered that during the next five years £100 000 to £200 000 would be spent on such plant alone. There was the question of dielectrics and of insulation. It was estimated that the supply industry and the private users in this country spent every year about £1 000 000 in repairing breakdowns arising from faulty insulation. It was necessary to continue this work on insulation and its properties, in order to cut out at least a quarter of that £1 000 000. That, again, would be £250 000 a year coming into the industry, because we had found out something which was not known before. So far as that particular research was concerned, the committee of the Association who went into it were firmly convinced that an expenditure of £20 000 for the next five years could be profitably spent in arriving at the meaning of insulation.

### A Suggested Method.

Mr. C. P. SPARKS spoke with special reference to the electrical supply industry, and emphasised the services rendered to the supply industry section of co-operative research by the B.E.A.M.A. during the last eight years. According to the latest returns the investment in the electric supply industry was something over £200 000 000, with a gross revenue of some £41 000 000. He suggested that it could afford to put on one side one-tenth of 1 per cent. of its gross revenue for research, subject to one point, namely, that representation on the Council should be proportionate to the amount subscribed by the various interests forming the organisation.

Dr. W. H. ECCLES pointed out that a number of manufacturers had their own research departments, and there was a feeling amongst some of them that they ought not to be asked to contribute also to a general research association. If manufacturers could be convinced that it was in their interest to favour general research, that it was quite separate from their own individual efforts, something in the way of financial support would be forthcoming from them following that conviction. On the other hand, the power industry did not, possibly, volunteer its support more eagerly because it felt

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that it was paying for improved machinery in the price asked by the manufacturers.

Mr. F. W. PURSE stated that the I.M.E.A. fully endorsed the work of the Association. The trouble was how to work up the enthusiasm of members, because the Association have rather been hiding their light under a bushel. Another point was how to get the money from individual councils. Those engaged in municipal work found a set of circumstances which probably did not always strike the manufacturer. In many places the manufacturers were continually hammering at the high rates; they asserted that the rates must come down or they would be unable to pay their way.

### Other Municipal Subscriptions.

The members of the Council said that they would do all possible to help the manufacturers by keeping the rates down, and consequently when it came to a question of £20 for the Research Association, they did not feel that they could afford it. It was not only the Research Association for which they had to find money; there were other claims. The Electrical Development Association received 0·1 per cent. as their contribution, and the British Standards Association also came in for its subscription—these were both voluntary. In addition, local authorities had compulsory payments towards the expenses of the Electricity Commissioners. They also had the Joint Electricity Authority to pay.

Mr. T. P. WILMSHURST said that though the Commissioners had no power to contribute funds by means of annual subscription to the work of the Association they had power under the 1919 Act to contribute towards any special piece of research, and the Commissioners were at the present time conducting certain specialised research through the mediumship of the Research Association into problems connected with 132 000 V lines.

Mr. D. N. DUNLOP stated that the B.E.A.M.A. Council had decided to continue their support of the Research Association on a scale at least comparable with past years, and probably with additional support later. There was an hiatus between the work done by the E.R.A. and the application of the results to the practical problems in the workshop, which had not yet been definitely overcome. Dr. Eccles and Mr. Purse both suggested that the cost of research was included in the price of machinery and apparatus supplied by the manufacturers. That was hardly true. It was not possible to-day to regulate the price of apparatus in this country by the extent of one's contribution to research, either individually or collectively. The price was largely determined by importation and by competitive tenders from abroad. Whatever desire manufacturers might have to put a certain percentage on the price, however small it might be, there were conditions existing, if he were to get business, which made it practically impossible to consider that, unless it were possible to come to some sort of co-operative understanding between purchasers, power companies, and municipal undertakings.

### Collecting Fees.

If some scheme of that sort were adopted, quite apart from the price quoted, and was left out of account in considering foreign tenders in relation to home tenders, then it would be possible for the manufacturers to be the collectors of the funds for research. The B.E.A.M.A. had no objection to being the collector of the funds for the Research Association if, after due reflection, that was the best way of doing it. On the question of dielectrics, insulation, and so on, the supply industry in all its branches was just as interested in the development as the manufacturer. Overhead line construction and cables generally affected the entire industry through all its branches, and therefore it should be considered as work of national importance. The conditions of the industry should improve so that £50 000 a year ought to be ultimately found in one way or another, and the manufacturers were willing to find their fair and reasonable share in order to continue the work of the Association.

Mr. C. C. PATERSON, speaking on behalf of Mr. Fleming, Mr. Everest, and others engaged in research work in connection with private firms in this country, said that they all felt definitely that there were, broadly, two sets of problems in connection with the electrical industry—the problems of production and the problems of utilisation. Private industrial research laboratories were mainly engaged on the problems connected with production, such as the quality of materials, improvements in materials, etc. But there was also the other broad field of research, equally important, which was certainly not their exclusive province, and the burden for which should not fall solely on them. This covered many problems of utilisation, as exemplified by the buried cable research, or switch performance in relation to the circuits broken, and work of that nature. While he was sure that there was no industrial production organisation in this country which was not prepared fully to bear its share of this general research on the utilisation of electrical products, he felt strongly that the burden of this kind of work should be borne equally by the whole industry, and that was the view of those who had been associated with the Electrical Research Association since its inception. There was no clash between the work done by the Industrial Research Laboratory and the work done by a Research Association. Fundamentally, they handled different classes of problems.

Col. K. EDGCUMBE spoke of the feelings towards the E.R.A. of the research department of a small specialist manufacturer. Although having their own research department, they had found the Research Association extraordinarily useful, particularly in the case of components which were obtained from some other manufacturer. It was fairly clear that the purchaser would not expend large sums on doing research work on a product which he bought from someone else. Two cases recently occurred in the instrument industry, and the Instrument makers went to the Research Association, who told them what was wanted, and in both cases the E.R.A. did it for an extremely small sum per head. Doubtless the same thing applied to other branches of the industry.

Mr. J. T. MOULD expressed the view that he would suggest to the Radio Manufacturers' Association that if any money was available it was their duty to help the Electrical Research Association. He also suggested that the British Radio Valve Manufacturers' Association be invited to co-operate.

A resolution to secure and extend the present scale of expenditure of the Association was then put to the meeting and adopted.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Overhead Lines and Aircraft.

[TO THE EDITOR.]

SIR,—With reference to your paragraph "Overhead Lines and Aircraft" in your issue of June 22nd, may I assure you that the last thing the aviator wishes to do is "to take pot-shots" at your insulators. On the contrary, both in his own and your interests, the aviator would prefer that transmission lines were carried underground.

Your remarks as to the "vast spaces through which aeroplanes can roam" and the advantages of their being obliged "to proceed warily at altitudes below 100 ft." is robbed of much of its practical value on account of the fact that aircraft at present are unable to land at an altitude of 100 ft. Overhead telephone and telegraph wires are equally dangerous to airmen when they are in the vicinity of aerodromes as at Lympne, near Hythe, but in many cases, representations to the proper authorities have resulted in their removal.

Your disparaging reference to "the convenience of a few flying men" is disappointing as showing an inadequate appreciation of the great future of air transport; the more surprising in a journal representative of the most progressive and revolutionary discovery of modern times.

One of the pioneers of electrical science derived much benefit, I seem to remember, from the use of a kite (the earliest form of flying-machine) in a thunderstorm. It would be a pity were his successors to prove so antagonistic to their aeronautical contemporaries whose ultimate ambition is the utilisation of electrical energy, broadcast by radio power stations, for the propulsion of their aircraft.—I am, etc.,

T. STANHOPE SPRIGG,
Editor, "Airways."

London,
June 27th.

[Our comment upon the views expressed by Mr. Spriggs will be found on page 1.—ED.]

[Owing to pressure upon our space a number of letters are unavoidably held over.—ED.]

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# AN ELECTRICAL PIONEER.

## Mr. Massingham's Recollections of Early Days of Electricity Supply.

AMONGST our special snapshots at the I.M.E.A. Convention at Bath was a picture showing Mr. H. G. Massingham, the original owner of the Bath electricity undertaking, greeting Mr. J. W. Spark, the present city electrical engineer of that city. Mr. Massingham, as our older readers will remember, played a prominent part in the electricity supply world in its earliest days, and though he is in his 78th year, he is still remarkably active.

Mr. H. G. Massingham, the original owner of Bath electricity undertaking.

In a recent lecture which he gave in aid of a Brighton charity, Mr. Massingham gave some of his electrical recollections, portions of which we reproduce below in his own words.

"I was responsible for the introduction of electricity into Bath, into Exeter and into Taunton, besides assisting in several other places in the West of England. The last-named town, Taunton, has the reputation of having been the first town in the United Kingdom to have been permanently and successfully illuminated by electricity. Owing to this, a large number of deputations from all parts of the United Kingdom visited Taunton, including a large and important one from the Corporation of the City of London, the chairman of which was Sir Frank Green, afterwards Lord Mayor.

"This deputation was accompanied by its legal adviser, and also its consulting electrical engineer, the late Sir William Preece. They spent two days at Taunton examining the electricity supply works, and the public and private lighting of the town, also the various uses to which electricity was already being applied, even at that early stage of its development; for this was before there was a single public electric light lamp, of any kind whatever, in the whole of London.

"I remember also two deputations visiting Taunton, one from Bath and the other from Bristol, for which a special train was chartered, starting from Bath. The deputation from this city consisted of the Mayor and Corporation and their officials, and a few of the leading citizens who were not members of the local authority. We were joined at Bristol by the deputation from that city, consisting also of the Mayor and Corporation and their officials, and again a limited number of the leading citizens. The deputation from Bristol was also accompanied by their technical adviser, the late Sir William Preece, who was at that time advising the Bristol Corporation, and continued to do so right down to the time of the successful introduction of electricity into Bristol.

"The late Sir William Preece and myself were comparatively near neighbours at one time, as he was living in Bristol at the same time that I was living in Bath, and he was naturally very much interested in what I was doing, and glad to take advantage of any opportunity to acquire practical experience, as in those early days of the industry there were no teachers —none from whom we could learn—we had to experiment and find out for ourselves, and learn as best we could from each other's failures and successes.

"Taunton also has the distinction of having been the first town in the United Kingdom to hold an electrical exhibition, which was opened by the late Field-Marshal Sir Lintorn Simmons, who was at that time Governor of Malta or Gibraltar, and brave man though he was, he felt very nervous when I took him for a run on the River Tone, in a very small electrically-propelled boat, one of the first to be built in this country.

"At this exhibition the numerous uses to which electricity would probably be put in the future were fully explained and practically demonstrated as far as was possible, and it appealed to a larger public than Taunton alone could supply, owing to the facilities for visiting it from the surrounding towns, including the cities of Bath, Bristol and Exeter, given by the Great Western Railway Co., and it proved of great educational value in giving 'light, more light,' to the public in those early days, to illuminate their darkness with respect to the then new science of electricity, and dispel many of their prejudices and preconceived opinions of what was possible.

"When I visited the electrical engineering section of the British Empire Exhibition at Wembley, I could not help being forcibly reminded that the birth of that magnificent electrical display was in the West of England many years before, in the same way that in the ordinary process of evolution, the original steam engine of Stephenson's shown at the Exhibition gave birth to the magnificent specimens shown in the same section by the various railway companies as their latest and most up-to-date developments.

"About the year 1888 I remember a visit of the British Association to Bath, the chairman of which was the late Sir Frederick Bramwell, who was at that time President of the Institution of Civil Engineers. The outstanding feature of the meetings of the British Association in Bath was a lecture given by the late Prof. Ayrton on the various uses to which electricity could be applied, and for which I supplied the electrical energy and various appliances to enable him to illustrate his lecture, and in which the late Lord Kelvin, who was an early worker in the field of electricity, and inventor of several electrical and other scientific instruments, took a keen interest, expecially in the practical demonstration of electric welding, which was then publicly shown for the first time in this country.

"At the Kelvin centenary meetings, Lord Balfour, who described himself as 'one of the diminishing band who knew Lord Kelvin,' said that 'Lord Kelvin proved himself a leader of rare originality, unfailing industry and enthusiasm for the cause of science which had never been surpassed,' a statement which I heartily endorse, as another of the 'diminishing band who knew Lord Kelvin' long before he was honoured with that title for his valuable services to science in this country.

"A few years before the introduction of electricity into Bristol, I remember being appealed to by the citizens of Bristol to light their Cathedral by means of electricity for an important musical festival, at which, I think, Clara Butt made her debut, and when, for the first time in the history of the cathedral, the ceiling and other beautiful portions of the interior were sufficiently well lighted to enable excellent photographs of it to be taken. I have a vivid recollection of this, owing to the bitter opposition and severe criticism, and strong condemnation on the part of some religious people, who at that time thought it sacrilegious to introduce electricity into a place of worship, and a desecration of the building, the Bristol Cathedral being the first in the United Kingdom to be so treated."

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# LIGHTING ENGINEERS.

## Details of the Sheffield Conference.

PROGRESS is being rapidly made with the details for the forthcoming Public Lighting Conference at Sheffield from July 9th to 12th. As the date draws near, attention is being focussed on the trial street lighting there, that is being carried out by the President Designate (Mr. J. F. Colquhoun, lighting engineer, Sheffield), to demonstrate in a practical form the much discussed, and not over well understood, "Standard Specification for Street Lighting," prepared by the British Engineering Standards Association last year, and which was the subject of a paper at the meeting of the Association at Brighton, by Mr. Robert Watson of Doncaster, and Capt. Jolley and Mr. Waldram jointly. We are informed by Capt. W. J. Liberty (secretary of the Association) that no less than eight miles of streets are being experimentally lighted and will be inspected at night not only by members and delegates, but by various scientific bodies interested in the question. At midnight motor transport will be provided to convey representatives over the route. The British Engineering Standards Association are holding a plenary meeting of the Street Lighting Section No. 39/5, at the Association's headquarters at 11 p.m. at the Grand Hotel, on the Thursday, after which conveyances will be provided to take the members out to view the demonstration, whilst officials of the National Physical Laboratory have arranged for an all-night test, in conjunction with the members of the Lighting Association, with a view to getting accurate results on the spot, and data for use after the conference to enable them to draw conclusions from the demonstration.

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# NEWS IN BRIEF.

## Electrical Plant for Poor-Law Institutions—Truro Municipal Buildings Lighting—Wireless for Hospitals—North-West England Electricity Scheme—Electrical Development Association's Factory Lighting Campaign.

FUNDS are being raised for an electrical installation in the Church at Tetney.

An assistant professor of physics is required at the Military College of Science, Woolwich.

Barnsley Watch Committee propose that gas meter testing be carried out by the Electricity Department.

The Commissioners of His Majesty's Works, etc., recently invited tenders for the erection of a wireless station at the North Foreland.

Kendal Board of Guardians have received sanction to instal electrical plant at the Milnthorpe Institution. Tenders for the plant are to be obtained.

A telephone service between Santiago (Chili) Buenos Ayres (Argentina) and Montevideo (Uruguay), operated by the Chili Telephone Co., was commenced recently.

Truro Corporation have asked the City Surveyor to obtain prices from three local firms for the electric lighting of the whole of the municipal buildings, including the town clock.

Dr. and Mrs. S. Z. de Ferranti have invited two parties of 27 members of the Manchester Branch of the Electrical Association for Women to visit their all-electric house at Deganwy, near Conway.

Eston Electricity Committee have decided that before any further rental wiring is installed, each case be inquired into in order to ascertain what the probable consumption of electricity will be.

Barnsley Corporation Hospitals Committee recommend that an estimate of the cost of providing wireless sets at Kendray and Lundwood hospitals be obtained, and that the advice of the Borough Electrical Engineer be sought.

Hastings Electricity Committee recommend that the charges for hire purchase of electrical apparatus in the extended area be the same as those inside the borough, but that the charges for the hire of such apparatus be 25 per cent. above the charges inside the borough.

Oxford Town Planning Committee, reporting on the proposal for the use of the old Church Institute, in George Street, St. Clement's, as a modern electric laundry, states that it is undesirable to establish an industry of this character in a residential and congested area.

Any authorised undertakers or other persons interested in, and desiring to make representations upon, the North-West England and North Wales Electricity scheme must send such representations, by registered letter, to the Secretary to the Central Electricity Board by July 27th.

The import duty, under the Portuguese customs tariff, in respect of boards or panels for the control, distribution, observation and measurement of electrical energy, including the necessary fittings therefor, is 10 per cent. *ad valorem* under the minimum tariff and 20 per cent. under the maximum tariff.

Barnsley Electricity Committee have considered the report of the Director of Education on the awards made by the Education Committee on the essays of school children in connection with the recent electrical exhibition, and recommend that the total prize money of £10 10s., be paid to the Education Committee for distribution.

The E.D.A. have decided to carry out an intensive campaign to secure better lighting in factories and workshops throughout the kingdom. A preliminary outline of the scheme and a handbook describing the scheme will be published shortly. The basis of the campaign will be postal communications to the executives of factories and workshops.

Allegations that electricity had been deliberately generated to show a high load factor were vigorously denied at a meeting of the West Derby (Liverpool) Guardians last week. The charge engineer at Mill Road infirmary, dealing with points raised by Mr. J. Scott (consulting engineer), said there had been no unnecessary generation of energy.

The accounts of the Auckland (New Zealand) Power Board for the year ended March 31st, 1927, show revenue £516 755, and surplus £63 556. The load added during the year was 20 984 kW, of which supplies to stoves and for water heating accounted for 13 236 kW. Domestic supplies amounted to 29·14 per cent. of the total output. Electricity sold was 66 207 786 kW, compared with 50 528 290 in the previous year.

Electric light is to be adopted at the Bugle (Cornwall) Working Men's Institute.

Hackney (London) Electricity Committee seek sanction to borrow £5 000 for the free wired prepayment scheme.

A telephone service between all parts of Great Britain and the principal places in the Sarre Territory has been opened.

Stourbridge Board of Guardians have decided to adopt electric lighting at the Institution, with 700 lights, at a cost of about £1 575.

A telephone service between Great Britain and certain towns in Mexico was commenced last Sunday. The charge is £12 for three minutes.

Southwark (London) Borough Council are about to renew the electric wiring at the Central, Borough Road and Southwark Bridge Road libraries, at a cost of £270.

Edinburgh Provost's Committee has remitted to the Magistrates' Committee the question of extending the system of automatic electric signals for regulation of street traffic.

Plymouth Electricity Committee have agreed to the proposals to loan electric cookers to the Education Department, for use in cookery schools, and also to appoint a lady demonstrator.

Swansea Electricity Committee have decided to establish a works fitting shop on land adjoining the generating station at the Strand, and to furnish the necessary tools, at an estimated cost of £700.

Hull Mental Hospital Committee have decided to instal an electric light cable for the villa for male patients and the first assistant medical officer's house. The City Architect is to obtain tenders.

Early in the last financial year Exeter Corporation adopted a regular hiring scheme for domestic electric cookers. About 100 cookers have been supplied to consumers on these terms, in addition to others privately owned.

The tower light at the Aberdeen north pier, the jetty and all the navigation lights have now been converted from gas to electricity, and an electric motor has taken the place of the gas engine which formerly operated the fog bell.

The question of the urgency for the provision of suitable premises for showroom purposes in Ilford was again raised at the last meeting of the Electricity Committee. The Chairman and the Town Clerk were asked to make further inquiries.

The fifth summer meeting of the Whitworth Society was held on June 28th, during the similar meeting of the Institution of Mechanical Engineers at Southampton. The membership roll now comprises over 500 names, and Mr. Thos. Sugden was elected president at the annual dinner.

The income of the Hull Municipal Telephone Department for the year ended March last was £117 225, the royalty tax paid was £11 371, making £140 070 since the beginning of the service, the gross profit was £39 183, and the net profit, after making a contribution to the relief of rates, £11 204.

About a dozen stations on the L. and N.E. Railway are to be equipped with plants for charging the batteries of the all-electric restaurant cars in use on the "Flying Scotsman" and on other trains which are to be similarly equipped. These plants will be in addition to those already in use at King's Cross (London), Leeds and Edinburgh.

Chief Constable J. Crawley (Newcastle-on-Tyne) states that 32 towns in Great Britain have now adopted his system of police telephone boxes, and that the system has resulted in considerable economies and has assisted considerably in the detection of crime. Chief Constable Crawley sailed recently for the United States, for the purpose of reading a paper before the International Police Conference at Colorado Springs.

Coun. J. Boothman, chairman of Clitheroe Electricity Committee, who has returned home after an investigation of industrial conditions in Italy, states that the tremendous use of electrical energy in the development of industrial Italy is a feature which greatly impressed him. In Milan electricity costs are the equivalent of ½d. per kWh, or a third of the average cost in this country. Great stretches of railway in Northern Italy are being supplied with electric power from Government stations. All this is helping Italy to manufacture for export, where previously she had to import.

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# IMPERIAL DEVELOPMENT.

## B.E.A.M.A. Dinner to British Mission to Australia.

THE Rt. Hon. L. S. Amery, M.P., Secretary for Dominion Affairs and the Colonies, attended a dinner on Tuesday of the British Electrical and Allied Manufacturers' Association, at the Connaught Rooms, London, when Sir Hugo Hirst and Sir Arthur Duckham, as members of the Australian Trade Mission, were also special guests. Colonel R. K. Morcom, chairman of the Council, presided.

Mr. AMERY, proposing "Imperial Development," said the problem at the present time was how to convert our unlimited potential resources into realised wealth. The secret of America's success in production and power consumption was co-operation and concentration of purpose. In America a great brain and mind power had been concentrated on economic development. In our Empire we had great resources and quality, and number of population, but we needed, nevertheless, concentration of purpose. In his recent tour of the Empire he had been impressed by the limited development of resources because of the need of a wider co-operative market. The one thing that seemed to be lacking was just that wider scope. If they could find a means whereby they could combine to create a wider home market the field would be of immense dimensions. We were, however, developing the power of thinking imperially. Mr. Bruce had recently set up an Australian Development and Migration Commission, and had urged that a Commission from the United Kingdom should visit his country in order to get into contact with the Australian Commission, to sow the seeds of new ideas, and to bring back to the Mother Country similar ideas for development.

### Australian Progress.

Sir GRANVILLE RYRIE, High Commissioner for the Commonwealth of Australia, supported the toast, and said he had noted Mr. Amery's praise of America. He doubted, however, whether Australia would be far behind the United States in economic development when she had had the same length of existence. Taking America at an age of development comparable with that of Australia, the latter country was considerably younger in years than was the United States at that stage.

Sir ARTHUR DUCKHAM, replying, said that in regard to the Mission to Australia it was too early to talk with advantage about its work. The members had first to learn and appreciate Australian thought, Australian conditions, and Australian aspirations—undoubtedly they would come back as exponents of Australian development and inter-Empire trade. In such development lay the future prosperity of the British people. Australia was ripe, and they might be able to advance helpful proposals. In their preliminary work they had received informally representatives of various trades which exported to Australia. They had heard a good deal about the limitations imposed by Australian tariffs but very little of the benefits arising from Australian preference for British goods. Perhaps after the return of the Commission the outlook in that direction would be less a matter for imagination. Australia was an essentially British country and its possibilities for trade development within the Empire were considerable.

Sir HUGO HIRST also responded to the toast, and expressed the opinion that the sound judgment of the business men forming the Commission would do much to bring about a satisfactory issue. He realised that it was his duty to the community and to the country to regard even his own business in a national sense. During the war the business mind was applied to national affairs, and the present Commission was also made up of business men. The electrical industry and Australia had much in common in that, with the present standard of quality of both, there was a bigger need for judgment than for anything else—judgment as to policy and the best lines upon which to base all future development in an imperial sense.

Mr. HERBERT G. WILLIAMS, M.P., proposed the "Chairman and Council," and Col. R. K. MORCOM suitably responded.

Among those present were Lord Inchcape, Sir Charles A. Parsons, Sir Philip Dawson, Engineer Vice-Admiral R. W. Skelton, Sir Ernest Clark, Sir Philip Nash, Sir Stephen Demetricadi, Sir John M. Gatti, Messrs. E. Garcke, C. H. Merz, Evan Williams, Charles P. Sparks, W. L. Hichens, and many other well-known personalities.

# LEGAL INTELLIGENCE.

## English Electric Co. and Crompton-Parkinson in Transformer Photograph Dispute.

MR. Justice Romer in the Chancery Division on Tuesday had before him a motion by the English Electric Co., Ltd., against Crompton-Parkinson, Ltd., for an injunction restraining alleged infringement of the copyright in three photographs of an electrical transformer of the plaintiff's manufacture known as the "Standard Specification Core Type Transformer."

Mr. Kenneth Swann, for the plaintiffs, said they had had the photographs made of the transformer for the purpose of using them in their trade literature and advertisements.

Mr. Trevor Watson, for the defendants, said he had not put in any evidence, as he thought he should probably be able to settle the matter. It was only a question of getting the necessary authority, and he suggested a week's adjournment.

Mr. Swann said the plaintiff's alleged that the defendants had used the photograph for advertisements in the trade journals in such a way as to describe the transformer as their product.

Mr. Watson said he did not want this motion to be used to get further publicity for the plaintiffs.

Mr. Swann said a considerable amount of publicity had been given to the defendants, to the detriment of the plaintiffs. Already statements had been circulated in the trade giving a wrong impression that this machinery was the defendant's product, and that these photographs were photographs of the defendants' machinery.

Mr. Watson said the defendants offered an undertaking on June 6th, which gave the plaintiffs everything to which they were entitled. This motion, he said, had been brought on purely for publicity purposes. He asked for a week's adjournment, and he would give an undertaking in the terms of the notice of motion.

This was assented to.

A motion by the British Thomson-Houston Co., Ltd., against W. Bett, of St. George's Square, Regent's Park, in default of appearance, came before Mr. Justice Tomlin in the Chancery Division on June 26th.

Mr. Tookey, for the company, said the motion was for an injunction restraining infringement of the company's leading-in wire and gasfilled lamp patents.

His Lordship: I see you are asking for delivery up and an inquiry as to damages, but you are joint owners with the Marconi company of one of the patents. Are you entitled to recover damages for your own use of the patent?

Mr. Tookey: Yes. It has been decided that a tenant-in-common can take proceedings individually.

His Lordship: Does the infringer have to pay damages to the other owner as well?

Mr. Tookey: Oh no. It will be proved at the inquiry as to who was damaged. Marconi's use this patent for wireless and the plaintiffs use it for electric lamps. If they are entitled equally the plaintiffs will only get half.

His Lordship granted a perpetual injunction with costs, and directed delivery up or destruction of all infringing articles and an inquiry as to damages.

### AYLESBURY CIVIC WEEK.

This week Aylesbury is *en fête*; a Trade and Industrial Exhibition was opened by Lord Burnham on Saturday, and was visited by the Duke of York on Monday. The Electricity Department is taking an active part in the week's affairs; the uses of electricity are very much in evidence at the Exhibition, in connection with the home, with agriculture, and with small industries. An inquiry office is open at which the electrical engineer and manager, Mr. W. A. Turnbull, and his staff are in attendance, and practical demonstrations are being given; a six-roomed model electric house is on view, as well as a free cinematograph and numerous side shows. Tuesday was "Women's Day" and visiting members of the Electrical Association for Women were addressed by Coun. Mrs. Hammer. Wednesday was the "Agricultural Day," and Mr. Francis, of the E.D.A., lectured on "Electricity and Agriculture," with the aid of the cinematograph. To-day (Friday) the Overhead Lines Association and kindred engineering societies are holding a conference, and the film which aroused so much interest at the joint meeting of the American and British Institutions of Electrical Engineers last February—"Voices Across the Atlantic"—is to be shown. See page 21.

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# BUSINESS ITEMS.

THE address of Julius Sax and Co., Ltd., is now West Lodge, 27, Lower Mall, Hammersmith, London, W.6.

R. I. and Varley, Ltd., have opened new showrooms at Kingsway House, London.

The Manchester branch of Siemens Electric Lamps and Supplies, Ltd., has removed to 10 and 12, Cateaton Street.

Walter Parkins and Co. announce that their address has been changed to Goldthorn Hill, Dudley Road, Wolverhampton.

Curry's, Ltd., radio engineers, of London, have opened a new branch business at 42, High Street, Scunthorpe, Lincs, with Mr. A. F. Dean as manager. The firm have also opened premises at 32, Southchurch Road, Southend-on-Sea.

Nottingham Electricity Department, in co-operation with the Nottingham branch of the General Electric Co., Ltd., are making an exhibit of electrical products on a stand at the Royal Agricultural Show, to be held at Nottingham from July 10th to 14th.

With reference to our note in the June 15th issue, page 684, concerning the summer outing of the Students' Section of the I.E.E., Philips Lamps, Ltd., point out that a casual glance at this paragraph may convey the impression that their works are situated at Cologne; their works are, of course, at Eindhoven.

Ceag, Ltd., have produced a combined electric and flame lamp for miners, which they claim affords greater illumination than the ordinary flame lamp with the warning given by the latter in the presence of firedamp or other dangerous gas. To detect the presence of gas the top of the lamp is turned, extinguishing the electric light, and the pressure of a knob causes a small oil flame to be electrically ignited.

Recent orders received by Eco Power, Ltd., for Foster steaming economisers include the Shropshire, Worcestershire and Staffordshire Power Co., one with a heating surface of 3 024 sq. ft.; Leeds Corporation, five, each with a heating surface of 6 480 sq. ft.; Bedford Corporation, one, with a heating surface 5 184 sq. ft.; Hull Corporation, five, each with a heating surface of 5 610 sq. ft.; and one with a heating surface of 7 200 sq. ft. for an existing boiler.

The Brown Boveri Organisation has received an order for a single shaft turbo-alternator set, having an output of 85 000 kW., for the Zschornewitz power station, Berlin. The most economical output will be 75 000 kW and the speed 1 500 revs. per min. The generated pressure will be 13 000 V, and the set will be designed for a power factor of 0·75. The steam turbine will be of the three-cylinder pattern, similar to the two installed at the Ferrybridge power station and those in hand for the Edinburgh Corporation. The order for this set includes the complete condensing plant, which consists of two condensers and auxiliaries.

The new University College, Nottingham, which was formally opened by the King on June 11th, is equipped, for inter-departmental communication, with a private automatic telephone exchange. The switchboard installed is one of a series developed by Ericsson Telephones, Ltd., for small private installations. The initial equipment of 32 lines and five links or connecting circuits, can be increased to 44 lines and seven links and by means of an additional panel an ultimate capacity of 89 lines and 14 links is given. The links consist of a set of relays arranged in unit form on the jack and plug principle. The equipment operates from a low-capacity central battery of 24 V and the charging panel, for convenience in this case, is lined up with the switchboard unit.

Recent orders secured by the Cambridge Instrument Co., Ltd., include: For the Moredon power station, Swindon, four 12-point electrical distance thermometer outfits, four combined $CO_2$ and CO indicating and recording outfits, eight dial draught gauges, twelve index thermometers (mercury-in steel type), and 22 steel armoured thermometers; for the Barking power station, ten 12-point thermo-electric pyrometer indicating outfits, for steam, gas, water and air temperatures; for the Buenos Aires Western Railway, twelve index thermometers (mercury-in-steel type), combined temperature and pressure recorder, nine dial draught gauges, fitted with 13 in. dials; for Manufactures des Glaces and Produits Chimiques de St. Gobain, Pisé (Italy), two 18-point thermo-electric pyrometer indicating outfits; for an Argentine power station, two 12-point thermo-electric pyrometer indicating outfits; for the Shanghai power station, four 4-point electrical distance thermometer recording outfits, for measuring steam, flue gas, air and water temperatures in the boiler house.

# PERSONAL.

MR. Dane Sinclair, chairman and managing director of British Insulated Cables, Ltd., feeling it advisable to reduce his activities, has relinquished the post of managing director, and Mr. G. H. Nisbett has been appointed to that office in his stead. Shortly after 1890 Mr. Nisbett joined the City of London Co. as chief electrical engineer and, during his services with that company, designed and laid down what was the first l.t. alternating distributor system in this country, and probably in the world. Another innovation for which he was responsible was the first use of lead covered cables for underground distribution on a scale of any appreciable magnitude. In 1894 he joined the British Insulated Wire Co. (now British Insulated Cables) as chief engineer. In 1902 he became chief engineer and manager. In 1924 he was appointed director and engineer. Mr. Nisbett was the first to design a system of lead covered cables for house wiring purposes. He was probably the first to use the conduit system for the wiring of buildings, in 1889, employing for the purpose rubber insulated cables drawn into "compo" piping with wooden draw boxes, the whole being buried in the plaster of the walls. He was the originator of the free wiring system, being the promoter (with others) of the National Electric Free Wiring Co.

**Mr. G. H. Nisbett, who has been appointed managing director of British Insulated Cables Ltd.**

Plymouth Electricity Committee have appointed Mr. F. Hayes, at present chief assistant, as deputy engineer and station superintendent at the salary of £600 per annum; Mr. F. G. Jones, mains superintendent Plymouth area, as mains engineer for the whole area and Mr. J. A. Goodall, chief assistant, Newport Street as consumers' engineer for the whole area.

Mr. S. H. Hodgkin, managing director of the Pulsometer Engineering Co., Reading, has been elected vice-president of the Reading Chamber of Commerce.

Estate of the gross value of £169 488, with net personalty of £150 332, was left by the late Mr. Percy St. Clair Matthey, chairman of Johnson, Matthey and Co., who died, aged 64 years.

Stirling Town Council have increased the salary of the electrical engineer, Mr. William R. Murray, by £75 a year.

Mr. S. T. Allen has been appointed Central England Engineer under the Central Electricity Board, and has resigned his office of chief engineer and manager to the West Midlands Joint Electricity Authority.

Croydon Tramways Committee report that Mr. T. B. Goodyer, tramways manager, desires to be relieved of his present duties. Mr. Goodyer has been in the service of the Corporation for 22 years, having previously been in the service of the company who leased the undertaking prior to the undertaking being taken over by the Corporation in 1906. He is now 62 years of age. The Committee recommend that his services be retained in a consulting capacity at a salary of £500 per annum. It is also recommended that Mr. G. V. Stanely, the present engineering assistant, be appointed acting manager at a salary of £550 per annum, being an increase of £50 on his present salary.

## Obituary.

SIR DAVID YULE, on July 3rd, in his 70th year. Sir David was a director of Vickers, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and Electric Holdings, Ltd.

## THE JOHN BENN HOSTEL BALLOT.

The Boys Ballot, the tickets for which are now ready, has become quite the event of the moment, and the demand for books is very encouraging. All who hope to win a saloon motor car, a "Reville" cloak, a trip to Madeira, or one of the 350 other valuable prizes offered should take an early opportunity of sending for their tickets, which are 1s. each, or 10s. for a book of 11. The help of ticket sellers in works and offices and amongst personal friends will be greatly appreciated. Tickets, posters, and complete list of prizes from the Ballot Organiser, c/o Sir Ernest Benn, Bt., Bouverie House, Fleet Street, London, E.C.4.

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# THE SOCIAL SIDE.

ABOUT 70 members of the Sheffield Illumination Society and friends travelled to Edwinstowe on June 23rd for their annual excursion. Cricket was the order of the day, and Sherwood Forest proved a very suitable place both for this and other games.

**Fun at the sports of the Johnson and Phillips Athletic Club.**

The Johnson and Phillips Athletic Club sports were held at Kidbrooke on June 23rd. The programme of contests followed the usual lines, and the array of prizes, the gift of the directors and management, provoked some keen struggles. The directors present were Mr. J. Macgregor (chairman and managing director of Johnson and Phillips, Ltd.), Mr. H. J. Sheppard and Sir Philip Dawson, M.P., and the prizes were presented by Lady Dawson, who was thanked by Mr. W. Burge, chairman of the club. Music was provided throughout the afternoon by Callender's Cable Works Band, while another (involuntary) act of hospitality was the yielding of the palm in the invitation relay race to a team from Siemens Bros. and Co., Ltd.

The staff of the Bective Electrical Co., Ltd., spent the early part of the afternoon of June 23rd in a cruise aboard the yacht "Ceto" R.Y.S., on the occasion of their annual outing. Later, various amusements were enjoyed at "Dorincourt," Kingston Vale, where the Marquis and Marchioness of Headfort entertained the company and their friends. The programme included side shows such as "Crown and Anchor," "Hopscotch," "Tip-it," etc., while tennis and golf claimed more serious attention. Lord Bective surrendered the Earl Fitzwilliam Tennis Challenge Cup to Secretary Andrews, who also won the costume race. Mr. Arthur T. Hulance, Lord Bective's co-director, won the Golf prize. With one exception every member of the party had won a prize; the exception being the organiser—Lord Bective.

The Bristol Electric Club's competition for the "Langdon" Cup was held on January 22nd on the course of the Knowle Golf Club. The competition was against Bogey, and with one exception, "Colonel" Bogey was the winner against every card returned. The following were the leading scores:

| | | | |
|---|---|---|---|
| A. J. Skinner .. .. | Receives | 11 | Result all Square. |
| W. J. F. Dutson .. .. | ,, | 17 | One Down. |
| R. H. Orchard .. .. | ,, | 11 | Two Down. |
| S. B. Haslam .. .. | ,, | 3 | Three Down. |
| T. Davidson .. .. | ,, | 14 | Three Down |
| H. Coope .. .. .. | ,, | 15 | Five Down. |
| A. J. Nicoll .. .. .. | ,, | 17 | Eight Down. |

Mr. A. J. Skinner wins the "Langdon" Cup, which he holds for one year, and will receive a replica. He also wins two-thirds of the sweep; Mr. Dutson receives one-third of the sweep. It is contemplated holding further competitions, of which due notice will be forthcoming later.

The Hospital Fund Committee of the employees of British Insulated Cables Ltd., Prescot, Lancashire, has had under consideration the provision of a Rest Home, as part of an after-care scheme for sickness and accident cases. A number of photographs of the beautiful house and estate decided upon was published in THE ELECTRICIAN recently, and the Rest Home was opened on June 19th by the chairman of the company, Mr. Dane Sinclair. The home has, in consequence of the generosity of the directors, been opened free of debt, and there is now only the liability for running expenses to be met out of the funds of the Hospital Committee. These expenses will be met partly by voluntary weekly contributions from the employees who subscribe to the Hospital Fund and partly by payments received from visitors who wish to spend a holiday at the home. Preference is, of course, given to convalescent cases, who can stay at the home free of expense, visitors being accepted when there is surplus accommodation. The aim of the Committee is to run the home not on the lines of an Institution but rather to preserve the atmosphere of a private house. (See page 21.)

The official opening of the Sports Ground of Pirelli-General Cable Works Social and Sports Club took place on June 23rd. The ground, consisting of approximately 23 acres, provides four grass tennis courts, four hard courts, two football pitches, a Rugby pitch, hockey and cricket grounds and bowling green, a nine hole golf course and a kiddies' playground. A pavilion with accommodation for dancing and social events is also available, besides dressing rooms and parking space. Owing to illness, Mr. G. A. Pirelli, who was to have performed the ceremony, was unable to be present, and the function was performed by Mr. G. Martinez, director and general manager of the Firm. Mr. A. E. Greenhill, officiated as chairman. The ceremony over, various competitions commenced, including a cricket match between Eastleigh and Southampton Works, which resulted in a win for the Southampton team by 88 runs to 65, children's races, an open-air whist drive, a golf stroke competition, a target bowls competition, a mixed doubles tennis tournament, ladies and gents' obstacles races, etc. Later in the evening prizes were presented to the winners by Mr. Martinez. The Club Orchestra played selections during the afternoon, and at night provided a programme for dancing.

The annual outing of Henley's Social Club took place on June 9th, when the venue was Berkhamsted. The morning was left free to tour the town and district, lunch was taken at the King's Arms Hotel, and the afternoon was devoted to sports. The winners of the various events, to whom prizes were presented by Mrs. W. F. Bishop, the wife of the assistant general manager of this company, were: 100 YARDS FLAT (LADIES).—1st, Miss Wade; 2nd, Miss Madgett; 3rd, Miss Aulsebrook. (GENTS).—1st, Mr. Clarke; 2nd, Mr. Crafford; 3rd, Mr. Camfield. THREE-LEGGED RACE.—1st, Miss Shipton and Mr. Crafford; 2nd, Miss Cavendish and Mr. Barker. WHEEL-BARROW RACE.—1st, Miss Brett and Mr. Brewer; 2nd, Miss Cavendish and Mr. Barker. EGG AND SPOON RACE (LADIES).—1st, Miss Madgett; 2nd, Miss Hatton. (GENTS).—1st, Mr. Barker; 2nd, Mr. Shankland. CHARIOT RACE.—1st, Misses Thurgood, Wade and Aulsebrook, and Mr. Galley; 2nd, Misses Cavendish, Madgett and Hatton, and Mr. Barker. HOPPING RACE.—1st, Miss Seath; 2nd, Miss Wade.

The annual sports and garden fete, held under the auspices of the Social Association connected with Elliott Brothers (London), Ltd., was well attended, over 1 400 being present

**A close finish at the Elliot Brothers, Ltd., annual sports meeting.**

at the Old Dunstonian's Ground, Beckenham Hill, in fine weather. Amongst those present were Sir G. K. B. Elphinstone and Lady Elphinstone, Mr. and Mrs. L. W. Smith, Mr. and Mrs. R. O. Smith, Mr. and Mrs. A. W. Atkyns. The entries for the sports surpassed all previous years, and in consequence the events were keenly contested. In addition, the Motor Cycle Section gave some excellent displays of skilful riding, and caused great amusement with a "Pram Race," in which ordinary prams, with a passenger, were towed around the track by solo machines. The children were also well catered for, a delightful programme having been arranged by Miss Karlowa. Numerous side-shows added considerably to the gaiety of the afternoon, as also did the various competitions. The Lewisham Borough Silver Band rendered a popular programme of music during the afternoon. At the conclusion of the programme the prizes (which with a few exceptions were kindly given by Messrs. Elliott Brothers) were presented to the successful competitors by Mrs. L. W. Smith, who during the course of the proceedings was presented with a bouquet by Miss Ellen Pierce, daughter of the chairman of the Association.

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# IN PARLIAMENT.

## Railway Companies' Road Transport Bills passed by Committee.

THE hearing of evidence and arguments in regard to the railway companies' Bills for authority to carry on road transport work, without the existing restrictions, was concluded by a joint select committee of the House of Lords and the House of Commons last week.

Mr. Tyldesley Jones opening the opposition to the Bills (in connection with the powers sought to carry goods) on behalf of the National Road Transport Employers' Federation; said the revenues of the railway companies, were derived from railway and non-railway sources, and he had had tables prepared which showed that the big drop was in non-railway revenues. The railway companies told the Committee that they could not kill their competitors on the road, but he would remind the Committee that the Balfour-Browne report did not think that was impossible, and that report was signed by Mr. Arthur Watson, then general manager of the L. and N.W. Railway, and Sir Thomas Williams, a former general manager of that railway.

Sir Lynden Macassey, addressing the committee on behalf of the Commercial Motor Users' Association, said there was no evidence by traders in support of the Bills.

The National Traction Owners' Association and the Motor Hire Purchase Association, respectively, also opposed the Bills.

Mr. W. H. Gaunt, of J. H. Lyons and Co., and Mr. James Bradnum, vice-president of the National Federation of Fruit and Potato Salesmen, criticised the railway companies' methods of dealing with goods traffic.

Mr. Cripps, addressing the Committee on behalf of the Federation of British Industries and others, said there was no evidence that a single trader would benefit by railway companies' road traffic.

Mr. Macmillan, replying to the opposition, submitted that the promoters had established that it was expedient that they should be empowered to provide transport services by road, and apply their funds for that purpose. The real problem to be dealt with was that of accommodating two facts: first, that a large amount of traffic in passengers and goods had been, and must be, diverted to the road; secondly, that the railway companies must continue to exist for the conveyance of traffic which could not otherwise be conveyed.

### The Committee's Decision.

Lord Chelmsford, chairman of the Committee, announced the Committee's decision, which, in effect, is as follows: The Committee find the preamble of the Metropolitan Co.'s Bill not proved. The Committee find that the preamble of the other six railway companies' Bills proved, subject to the following conditions:—(1) So much of the London traffic area as is within the administrative County of London shall be excluded from the operation of the Bill; (2) protection shall be given to statutory tramway, trolley, and omnibus undertakings of municipal authorities within their own municipal boundaries. This protection will extend to the Middlesex County Council and any urban district council, but not to private statutory tramways and omnibus undertakings. The Committee understand from the promoters that they are prepared to insert a clause empowering the Minister of Transport to institute an inquiry when he is of opinion that the powers conferred by these Bills have been used contrary to the public interest and to report to Parliament. The Committee understand also from the promoters that they are prepared to insert provisions relating to: (1) Publication of fares in omnibuses; (2) power to local authorities to make representations; and (3) notification of experimental services to the Minister of Transport. The Committee will make a report recommending the Minister of Transport to promote a public Bill governing the conditions in which the traffic should be carried on throughout the country and for bringing the powers of the licensing authorities into conformity with modern traffic requirements, and giving the power to impose conditions as to fares and to take into account the adequacy of existing services and the congestion of streets and roads. The Committee are impressed with the need for amending the chaotic state of the law, and regard this legislation as of the utmost urgency, but they do not, however, consider that the passing of these Bills should await such general legislation.

The Committee have considered the clauses during the present week. With regard to the prohibition applying to London, the Committee decided that it should read "the company shall not . . . work or use within the administrative county of London any road vehicle for the conveyance of passengers." In the clause to the effect that in the event of a local authority giving an adequate tramway or omnibus service, the railway company shall not run a competitive service within the local area, provision was made that the adequacy of the existing service shall be settled by the Minister of Transport.

### Replies to Questions.

The following are points from answers to questions in the House of Commons:

Since the passing of the Electricity (Supply) Act, 1922, 21 applications, affecting 19 undertakings, have been made to the Minister of Transport by local authorities for a revision of the maximum prices charged for electricity. In 13 cases he has made Orders fixing reduced maximum prices, in five cases applications were in abeyance, pending local negotiations, and in the remaining case an inquiry is pending.

Further extensions of the transatlantic telephone system in Canada are contemplated. It is already available to all parts of the United States. No further reduction of charges is contemplated at present.

The approximate revenue of the Post Office telegraph undertaking for the financial year 1927-28 was £6 100 000, including £1 235 000 in respect of wireless receiving licences, and the telephone revenue was about £18 650 000.

The Rugby telegraph transmitter is employed for about eight hours a day, spread over the whole day, and the telephone transmitter is used from 11.30 a.m. to 2 a.m. The speed of transmission is limited to the rate at which reception is possible, and is about 20 words a minute. The station is capable of transmitting at over 80 words a minute. The telephone transmitter carries speech from Great Britain and from several countries on the Continent of Europe to the United States, Canada and Cuba.

The Canadian and American transatlantic telephone services are worked over the same radio channel. So far a this end is concerned, the services are self-supporting.

Two of the four Imperial beam wireless services have been in operation less than a year. While the assistant Postmaster-General (Viscount Wolmer) is able to say that an official estimate of the yield of the beam services to the British Exchequer during the current year would be much less than £500 000, he doubts whether it would be in the public interest at present to attempt an exact forecast.

The average daily number of words transmitted by the Rugby wireless transmitter to ships at sea is 455 in private messages and 2 506 in news messages. The daily average number of messages sent by the Rugby telephone transmitter since January 1st, 1928, is 24.

Certain representations have been received by the Ministry of Transport with regard to the Bournemouth and Poole Electricity Supply Co.'s charges. No official requests have been received for an inquiry.

Technical officers of the Post Office have witnessed four demonstrations of television—three in this country and one in the U.S.A. The company most active in the matter in this country has not yet fulfilled its promise to give Post Office officers a further demonstration.

British Post Office officials have visited the United States to study telephone conditions. The Postmaster-General does not think it desirable at present to send a Telephone Commission.

During the three months ended March 31 last, the cost to the British Government of working the transatlantic telephone service was £15 864.

### Greenock and Port Glasgow Tramways.

Consideration of this Bill, to substitute buses for tramways, was concluded by a House of Commons Committee last week.

After speeches by counsel for Greenock, Port Glasgow and Gourock Corporations and the Scottish Motor Traders' Association, and the hearing of the evidence of representatives of the opposing local authorities and certain omnibus owners who apprehended that the granting of the powers asked for in the Bill would place them at a disadvantage, the Chairman announced that the Committee found the preamble to the Bill proved, but they would require some additional clauses or alterations to clauses. They wanted a penalty provided for the discontinuance of the new service. They also wanted a clause inserted to protect any legal rights which Greenock might have arising from the terms of their lease with the company. If the Bill did not already provide for the maintenance of reduced workmen's fares they would want a clause inserted to that effect.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

CLYDEBANK CORPORATION.—Electric lighting work in connection with erection of 300 to 350 houses of two, three, and four apartments, at Parkhall housing estate, Clydebank. Schedules, etc., from the Town Clerk.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., July 6th.—Supply of (*a*) mechanical, and (*b*) electrical engineering labour in the Manchester district, for three years. Forms of tender, etc., from Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1.

MORLEY CORPORATION.—Electrical work of 32 houses to be erected on the Bradford and Wakefield Road site, Morley. Specifications from Borough Engineer; deposit £2 2s.

EAST HAM CORPORATION, July 6th.—Reconstruction of tramway and highway in Plashet Grove, East Ham. Specifications from Borough Engineer; deposit £2 2s.

TAIN CORPORATION, July 6th.—Underground mains, overhead mains, street lighting and meters. Only manufacturers are invited to supply the material. Specification, etc., from A. Hugh Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

NEATH RURAL DISTRICT COUNCIL, July 7th.—Supply of sundries in connection with Dulais Valley electric lighting scheme (item 3); and electric cables, etc., in connection with the Council's general electricity scheme (item 8). Tender forms for item 3 from Mr. D. M. Davies, engineer, Council Offices, Orchard Street, Neath, and for item 8 from Mr. G. H. Thomson, electrical engineer, Charlesville Place, Neath.

SWINDON CORPORATION, July 7th.—Supply and erection of steam exhaust, water and other pipe work, valves, tanks, evaporators, etc. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 2s.

KILMARNOCK CORPORATION, July 9th.—Electric light installation in 24 houses. Particulars from Mr. Robert Armour, 38, Bank Street, Kilmarnock.

STOCKTON-ON-TEES CORPORATION, July 9th.—Supply of paper insulated cables. Specifications from Mr. S. G. Marston, Electricity Works, Stockton-on-Tees.

ANTRIM LIGHT AND POWER CO., LTD., July 10th.—Supply and erection of overhead line for the supply of electricity in the town of Antrim and district; and supply and erection of a switchboard. Specifications, etc., from the Secretary at the company's offices, Antrim.

MANCHESTER CORPORATION, July 10th.—Cast iron bases and finals for tramway poles, copper bonds, etc. Specifications from Tramways Manager.

BELFAST CORPORATION, July 11th.—Electrical installation in Templemore Avenue, Ormean Avenue, Falls Road and Peter's Hill Public Baths. Specifications from City Electrical engineer; deposit £1 1s. each.

NEW MILL URBAN DISTRICT COUNCIL, July 11th (extended from June 29th).—Extension of overhead supply mains to Hade Edge, Snowgate Head and Melthamhouse. Specification from the Engineer or from the Clerk to the Council, Council Offices, New Mill, near Huddersfield.

COOKSTOWN (IRELAND) RURAL DISTRICT COUNCIL, July 12th.—Lighting Stewartstown for one, three or five years. Particulars from Clerk, Boardroom, Cookstown.

LONDON AND HOME COUNTIES JOINT ELECTRICITY AUTHORITY, July 12th.—Manufacture, laying, etc., of a transmission line, consisting of duplicate e.h.t. and telephone cables, from Kingston-on-Thames generating station to the Hersham sub-station of Walton-on-Thames U.D.C. Specification (W.M.1), etc., from the Authority's Offices, 5, Millbank, London, S.W.; deposit £2 2s.

SPENBOROUGH EDUCATION COMMITTEE, July 12th.—Electric light installations at Hightown Council School, Hightown C.E. School and Littletown Council School. Specifications from Director of Education, Bradford Road, Cleckheaton.

BARNSTAPLE CORPORATION, July 13th.—(*a*) One 100 kW Diesel oil engine, with d.c. generator etc.; (*b*) one storage battery of 240 cells, 75 Ah at one hour discharge rate, including removal of existing battery; (*c*) low pressure switchgear; (*d*) about 14 miles of low pressure, three core, lead covered and armoured cables, with boxes, pillars, etc., and removal of existing cables. Specifications, etc. from Preece, Cardew and Rider, 8, Queen Anne's Gate, London, S.W.1; deposit £2 for each section.

DUNDEE CORPORATION, July 13th.—Supply of l.t., paper insulated, lead covered and double steel tape armoured cable, all to B.E.S. specification for working pressure up to 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

STIRLING CORPORATION, July 13th.—Electrical work in connection with erection of 36 houses at Raplock Road, Stirling. Specifications, etc., from Mr. A. H. Goudie, burgh engineer; deposit £1.

LLANDILO URBAN DISTRICT COUNCIL, July 14th.—One 75 kW crude-oil engine driven generating set, with accessories; one 10-ton oil storage tank; and one control panel, including connection of cable. Further particulars from the engineer, Mr. T. Bowen.

BELFAST EDUCATION COMMITTEE, July 16th.—Experimental electric lighting set, for mechanical engineering department in the Municipal College of Technology, Belfast. Specifications, etc., can be obtained at the General Office, at the college.

ISLE OF WIGHT EDUCATION COMMITTEE, July 16th.—Electric light installation at secondary school, Newport. Particulars from county surveyor, Mr. S. R. Cocks, St. Thomas Street, Ryde.

SHOEBURYNESS URBAN DISTRICT COUNCIL, July 16th.—Underground mains, switchgear, transformers, and meters. Specification, etc., from Messrs. A. Hugh Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

HARROGATE CORPORATION, July 17th.—Supply and erection of two 50 000 lb. boilers, with pipe work and accessories. Specification, etc., from Mr. N. McLean, borough electrical engineer, 33, Swan Road, Harrogate.

WEST RIDING EDUCATION COMMITTEE, July 17th.—Electric light and bell installation at Silkstone New School. Specification from Education Department, County Hall, Wakefield.

NEWRY URBAN DISTRICT COUNCIL, July 21st.—Two 100 B.H.P. and one 150 B.H.P. heavy oil engines, each direct coupled to l.t. three-phase alternator (contract No. 2); l.t. switchboard for three-phase 4-wire system (contract No. 3); 5-ton overhead crane (contract No. 4); and underground and overhead distributing mains and services, and street lighting installation (contract No. 5). Specifications from Town Clerk; deposit £2 2s. for each.

HODDESDON URBAN DISTRICT COUNCIL, July 23rd.—Lighting of street lamps, from September 1st, 1928, to March 31st, 1929. Particulars from Council Offices, Hoddesdon.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 33 000 V overhead transmission line between Brighton and Worthing. Specification (No. S.E.E.-S.L.1) from Mr. J. R. Brooke, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

BULUWAYO MUNICIPALITY, July 6th.—Supply of electric cooking ranges and storage type water heaters. (Reference B.X. 4 484.)

KNYSNA MUNICIPALITY (CAPE PROVINCE), July 6th.—Supply, erection, etc., of electric lighting and power system. (Reference B.X. 4 493.)

MAYNOOTH (CO. KILDARE) COLLEGE CHURCH, July 7th.—Overhauling and enlarging electric action organ. Specifications from the Rev. J. R. Maguire, at the college.

DUBLIN BOROUGH COMMISSIONERS, July 9th.—Supply of electric wiring accessories. Specification from City Electrical Engineer; deposit £1 1s.

SYDNEY CITY COUNCIL, July 9th.—Supply of 33 000 V cable and 660 V pilot cable. (Reference B.X. 4 530.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 10th.—Supply of 50 kW switchgear and steel work, for Arapuni power scheme. (Reference B.X. 4 410.)

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DUNEDIN (N.Z.) CORPORATION, July 11th.—Supply of step down transformers and switchgear. (Reference B.X. 4 535.)

VICTORIAN RAILWAY COMMISSION, July 11th.—Supply of telephone cable. (Reference B.X. 4 543.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 12th.—Supply of 120 kVA transformers and switchgear, for Johannesburg. (Reference B.X. 4 479.)

MONTEVIDEO ELECTRICITY WORKS, July 13th.—Supply of 12 three-phase 33 000 V 50 cycle oil cooled transformers. (Reference B.X. 4 461.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 17th.—Two 12-ton, four 4-ton and seven 4-ton battery locomotives; two 150 kW motor generators and switchgear; overhead line and equipment. (Reference A. 6 317.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 17th.—Switchboard cable. (Reference B.X. 4 431.)

POSTMASTER-GENRAL'S DEPARTMENT, MELBOURNE, July 17th.—Automatic telephone switchboards. (Reference B.X. 4 480.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, July 18th.—Six water-tube boilers and accessories, for Ultimo power house. Specification (£2) from Electrical Engineer, 61, Hunter Street, Sydney.

SYDNEY CITY COUNCIL, July 18th.—Supply of paper insulated 660 V cables. (Reference B.X. 4 319.)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, July 18th.—Supply and erection of 13 transformer stations, with switchgear and transformers (10 000/380–220 V), in the county of Dublin. Specifications, etc., from the Secretary, 60–62, Upper Mount Street, Dublin; deposit £5.

ARGENTINE NATIONAL SANITATION DEPARTMENT, July 19th.—Supply of machinery and materials for seven automatic pumping stations for dealing with sewage in the Belgrano, Saavedra, Hipódrome, Malcolm, Alvear, Penitenciaria and Cildánez districts, each plant consisting of three electric pumping sets, a three-phase static transformer, control switchboard, etc.; and 17 automatic pumping installations for the sewage of the Boca and Barracas district. (Reference A.X. 6 389.*)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 19th.—Incandescent lamps. (Reference B.X. 4 487.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 19th.—Supply of transformers, converters and d.c. and a.c. switchgear (Reference B.X. 4 485.)

INVERCARGILL (N.Z.) TRAMWAYS DEPARTMENT, July 23rd.—Induction voltage regulator. (Reference B.X. 4 473.)

CAPE TOWN MUNICIPALITY, July 25th.—Supply of a.c. electricity meters. (Reference B.X. 4 527.)

VICTORIAN RAILWAY COMMISSION, July 25th.—Supply of electric train stops.

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply and delivery at East London of two 25-ton, six 10-ton, and two 2-ton electrically-driven overhead travelling cranes. (Reference A.X. 6 347.*)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply of crude oil engine, generator, and switchboard. (Reference A.X. 6 405.*)

DUNEDIN CORPORATION, July 30th.—Supply of 6 tons of hard drawn electrolytic copper trolley wire. (Reference A.X. 6 477.)

UITENHAGE MUNICIPALITY, SOUTH AFRICA, July 30th.—Supply and delivery of h.t. and l. t. switchgear, h.t. and l.t. cable, motors, fans, meters, transformers, kiosks, feeder pillars, and line material. (Reference B.X. 4 517.)

ECUADOR GOVERNMENT, July 31st.—Supply of two electrically-operated portal cranes, of 5 and 10 metric tons capacity, respectively, for Guayaquil. (Reference A.X. 6 387.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Supply of armoured telephone cable. (Reference B.X. 4 518.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Electrically driven concrete mixing plant. (Reference A.X. 6 441.*)

VICTORIAN ELECTRICITY COMMISSION, August 6th.—Supply of three-phase, 60 cycles, interconnected star, oil insulated, self-cooled, outdoor type neutral earthing compensator, (Reference B.X. 4 519.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 7th.—Supply of 50 kVA transformers and 2 100 V, three-phase, 50 cycles, truck type switchgear. (Reference B.X. 4 526.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 9th.—Supply of six electrically-driven overhead travelling cranes. (Reference A.X. 6 409.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4 505.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kV switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B.X. 4z477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

BULUWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain grate, turbo-alternator, spray cooling equipment and circulating waterpiping and three-panel switchboard, with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

VICTORIAN ELECTRICITY COMMISSION, August 20th.—Supply of 66 000 V transformers and spares. (Reference B.X. 4 541.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21.) Specifications etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, E.C.; deposit £1 1s.

## Tenders Accepted.

BURY GUARDIANS.—Barrow and Co., Ltd., installation of refrigerating plant, £223.

BRADFORD CORPORATION.—J. Carter, electric light installation at firemen's residences at central station, £185.

WEYMOUTH CORPORATION.—Johnson and Phillips, Ltd., Supply and laying of cables to Radipole Spa estate.

METROPOLITAN ASYLUMS BOARD.—Metro-Vick Supplies, Ltd., part contract for supply of electrical accessories for 12 months.

BATTERSEA (LONDON) BOROUGH COUNCIL.—Synchronome Co., Ltd., installation of synchronised clocks at central library, £73 10s. 6d.

SWINDON CORPORATION.—Standard Telephones and Cables, Ltd., supply and laying of a h.t. feeder, l.t. pilot, and other cables, £28 848 18s. 6d.

WARE URBAN DISTRICT COUNCIL.—North Metropolitan Electric Power Supply Co., electric motor, for Stanstead sewage pumping station, £147 8s. 6d.

## METAL AND CHEMICAL PRICES.

TUESDAY, July 3rd.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £66 0 0 | — | 5s. |
| Electro Wirebars | ,, | £69 0 0 | — | — |
| H.C. Wires, basis | per lb. | 9¾d. | — | — |
| Sheet | ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0¼d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8¼d. | — | — |
| Sheet ,, | ,, | 9⅝d. | — | — |
| Wire ,, | ,, | 9¾d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 10 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £22 0 0 | — | — |
| Foreign or Colonial | ,, | £20 10 0 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £212 0 0 | 17s. 6d. | — |
| Wire, basis | per lb. | 2s. 9d. | — | ¼d. |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £25 7 6 | — | 5s. |
| *Mercury* | per bottle | £21 10 0 | — | 10s. |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2¼d.
,, Roll, ,, £10 15 0

*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0

*Copper Sulphate*—Ton £25 to £25 10 0

*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3¼d.

*Rubber*—Para fine, 11¼d.; plantation 1st latex, 9¼d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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# ELECTRICITY SUPPLY.

## Proposed Extensions at Bermondsey—Additional Plant for Ribble Power Station—New 30 000 kW Turbo-Alternator for West Ham—Llanfairfechan's Consumers—Anniversary of Shipley's Electricity Supply—Bulk Supply for South Shields.

THE Electricity Commissioners have approved of a loan of £10 000 for the Lurgan T.C. electricity undertaking.

The borough surveyor of Colchester is to report as to cost of conversion of the oil lamps in various parts of the borough to electric lighting.

Dundee Works Committee have now approved of the Central Electricity Board's proposal to erect towers in Kingsway for h.t. transmission lines.

The Electricity Commissioners have sanctioned the borrowing by Bermondsey (London) B.C. of £59 000 for a new electricity station at Neckinger.

The Electricity Commissioners have approved Preston Corporation's proposal to increase the capacity of the Ribble power station from 50 000 to 60 000 kW.

The Wessex Electricity Co. having taken over the Hungerford Electricity Supply Co., a meeting is to be arranged with Hungerford P.C. in regard to street lighting.

Towcester R.D.C. have granted an application by the Northampton Electric Light Co. for permission to erect an overhead h.t. line from Towcester to Buckingham.

Newport Pagnell R.D.C. have decided to continue their opposition to the proposal of the Northampton Electric Light and Power Co. to erect overhead cables along the main street at Olney.

Penzance Lighting Committee have instructed the town clerk to open negotiations with the Penzance and District Electric Supply Co., with a view to a reduction of the maximum prices charged.

Newry U.D.C. have authorised the clerk to invite tenders (under five heads) for the carrying out of the electric-lighting scheme for the town, erection of generating station, switchboard, mains, etc.

The Commissioners have formally consented to the extension of the West Ham generating station. The new plant will consist of a 30 000 kW two-phase, 50 cycle turbo alternator and two boilers.

Fulham (London) Electricity Committee recommend the acquisition of such land for extensions at the power station as will permit of the plant being developed ultimately to a capacity of 250 000 kW.

The Torquay and Paignton Gas Co., and the Paignton Electric Light and Power Co. have been invited by Paignton U.D.C. to submit tenders for the lighting of public lamps in the district for a period of 7 years.

Brighton Electricity Committee have adopted a scheme for extending the circulating water system, in order to deal with the new 15 625 kW turbo-alternator at the Southwick power station. The estimated cost is £2 000.

Kensington (London) B.C. have granted permission to the Notting Hill Electric Lighting Co., and the Brompton and Kensington Electricity Supply Co. to lay mains, on the condition that wherever possible the cables are laid in the footways.

Progress has been made with the electricity scheme in East Lothian. The cables have now been laid from North Berwick sub-station to East Linton by the Lothians Electric Power Co., and the supply of current will be available within a few months.

Bangor electricity department have commenced work on the scheme which will ultimately result in a change of the system of supply from a.c. to d.c. The policy of encouraging the use of electricity in off-peak hours by offering reduced rates during those periods continues to bear fruit.

The Metropolitan Electric Supply Co., Ltd., give notice of intention to apply to London County Council for consent to an alteration of their pressures and system to 230 V single phase and 400 V three-phase, 50 cycles. Notices of any objections must be sent to the Clerk of the Council before August 2nd.

The Power Development Co. have informed Steyning West R.D.C. of their intention to apply for an Order to supply electricity to the parishes of Ashurst, Botolphs, Coombes, Edburton, Henfield, Old Shoreham, Shermanbury and Woodmancote. The council think it desirable that, as far as possible, cables be laid underground.

Ramsey (Isle of Man) Commissioners have received a letter from the Government Secretary, giving details of the Governor's proposals which suggest the establishment of two electric power houses, one at Castletown for the supply of that town, Port Erin, Port St. Mary, and Ballasalla, and one at Ramsey for the supply of that town, Peel, Kirk Michael, etc.

Bangor (Ireland) Borough Council have declined to support Crompton and Co.'s proposal to apply for an Order to supply electricity in the town. A meeting of the council is to be held to discuss the question of applying for an Order. Estimates prepared by Mr. J. E. Sayers are in favour of establishing a municipal generating station rather than taking a supply from Belfast.

The Local Government Board have reported to Tynwald in favour of Douglas Council's application for a new site for a generating station, extension of plant, etc.—The General Electric Co. have asked the terms upon which the Corporation would supply electricity in bulk at the Ramsey Boundary. The Electricity Committee have decided to ask whether the Lieutenant-Governor is prepared to make grants for transmission lines to Ramsey and other districts.

The Electricity Commissioners have refused the application of Darlington Corporation for permission to supply electricity to 12 additional houses, adjoining the borough boundary, in the Cleveland and Durham County Electric Power Co.'s area of supply. The company recently stated that they would be able to supply the consumers concerned during the coming winter, but they would have to pay a higher price than that which would be charged by the Corporation, unless they adopted the residential tariff.

Llanfairfechan U.D.C.'s electricity supply was switched on last week. The council are taking supply from the North Wales Power Co., and are distributing on the three-phase four-wire system. About 250 consumers have been connected, and it is anticipated that within the next 12 months this number will be nearly doubled. The street lighting is to be entirely converted to electricity. The cables were supplied by British Insulated Cables Ltd., and the switchgear and transformers by the English Electric Co., Ltd.

The first anniversary of the inauguration of Shipley's 33 000 V supply from the Yorkshire Electric Power Co. in place of that formerly generated at the council's electricity works, was celebrated on June 30th. A debit balance at the beginning of the year of £5 439 resulting from the coal dispute has been converted into a profit of £10 068, with the result that, from July 1st the long promised reduction in the price of electricity will be an accomplished fact.—The Electricity Committee have obtained sanction to borrow £4 532 for the installation of a 1 000 kW rotary converter.

South Shields Electricity Committee have decided to accept the offer of the County of Durham Electric Power Co. to give a bulk supply at the following rates:—For the first 50 000 kWh per quarter, 0.7d. per kWh; above 50 000 and up to 100 000 per quarter 0.7d. per kWh, less 10 per cent.; above 100 000 and up to 200 000 per quarter, 0.7d., less 20 per cent.; above 200 000 and up to 400 000, 0.7d., less 25 per cent.; above 400 000, 0.7d., less 30 per cent.; the kW demand charge to remain as in the existing agreement, at £4 10s. per kW of demand per annum. The coal clause basis will be reduced from 30s. to 15s. per ton.

Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry last week into the applications of Torquay Corporation and the Teignmouth Electricity Co. for Orders authorising extensions of their areas of supply. Mr. Harold Beveridge, for Torquay Corporation, said their average price was the lowest, or nearly the lowest, in the country. All surplus derived from the undertaking was applied to reduction of charges or capital work. Mr. H. F. G. Woods, borough electrical engineer of Torquay, said he probably told the authorities in the proposed area that the present prices in the Torquay rural area, compared with the Teignmouth Co.'s prices, were 5½ times less. Mr. R. J. Sutcliffe, for the Teignmouth Co., said they would introduce, on October 1st, throughout their area, the same tariff as Torquay were charging in their outside area. They had arranged with the Co-operative Wholesale Society to give them a bulk supply of 600 000 kWh per annum. Mr. Frank Christy, chairman and managing director of the Teignmouth Co., said his company could supply at a less cost than Torquay Corporation.

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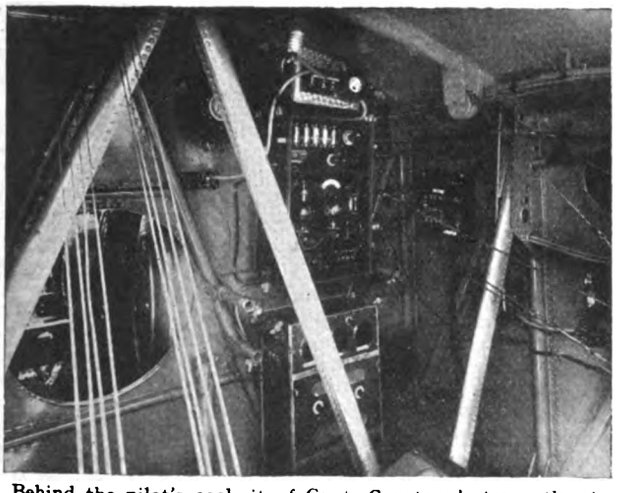
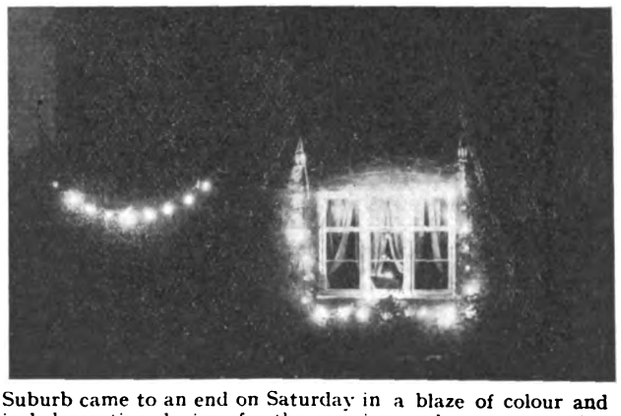
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

An exhibition, including a wide range of electrical appliances, staged at the Cubitt Factory, was visited by the Duke of York on Monday, in connection with the Civic Week at Aylesbury. Mr. W. A. Turnbull, the engineer and manager of the electricity works, in co-operation with the General Electric Co., is showing (right) domestic and industrial appliances. An "all-electric home" is arranged adjacent to this stand, while a special stand (left) is assigned to a display of "Magnet" household appliances. Perhaps one of the most striking displays is an example of modern window lighting by the Illuminating Engineering Department of the G.E.C. (centre). (See page 14.)



Behind the pilot's cockpit of Capt. Courtney's transatlantic 'plane, showing the Marconi direction finding, transmitting and receiving equipment, installed ready for immediate use. The "Southern Cross" also carried wireless, owing much to its present day efficiency.

The Rest Home of the Hospital Fund Committee of the employees of British Insulated Cables Ltd., reposing in its valley of trees. Readers will remember, that the home was opened two weeks ago by Mr. Dane Sinclair, chairman of the company, free of debt. (See page 16.)



Last week's coming-of-age celebrations of the Hampstead Garden Suburb came to an end on Saturday in a blaze of colour and light. Many of the houses were illuminated by external electrical decorative devices for the occasion, and some conception of the effects produced can be gathered from the two houses shown in the photographs above. Many dwellings included flood-lighting in their schemes, and revealed considerable ingenuity. To the hundreds of visitors who went to the suburb during the week, Saturday's display was quite a novelty, and of good publicity value from the electrical point of view. It is suggested that contractors should promote similar schemes wherever possible, for, if nothing else, such displays of electrical illumination will educate the public into appreciating the opportunities which electricity offers in this direction. Further, the sales of lamps, wire, etc., are likely to be extensive.

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# COMPANY NEWS.

## Telegraph Descriptions Show Improvement—Manufacturing Holdings Variable—Electric Traction Shares Harden—Electricity Supply Improve—Annual General Meeting of the G.E.C.—Reports and New Companies.

CABLE telegraph descriptions have been in favour this week. Eastern ordinary stock with a rise of nearly 20 points is quoted over 240, at which it stood a couple of months ago. The £10 shares of the Eastern Extension Company have advanced 2½ to 24¼. Marconi shares are also better. In the manufacturing group Ever Ready sub-divided shares show a small advance on last week's equivalent. Johnson and Phillips are a weak spot, with a fall of 3s. 9d. Elsewhere, Metropolitan Electric Supply ordinary shares have improved 3s. 9d., and District Railway stock is 3 points up.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 37/- | 36/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/-* | 23/- | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48/9 | 45/- | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6* | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 26/3 | 26/3 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½* | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/- | 27/- | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 31/6 | 31/6 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6* | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6 | 34/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124½* | 127½ | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 125* | 125 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. | 82 | 82 | 103 | 50½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 70½ | 70½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 76 | 76 | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 80 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 73½ | 73½ | 89 | 05 |
| 4 | Lon. Un. Trams. 1st Deb. .. | 60½* | 61½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 60* | 71 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 65½ | 65½ | 102.17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 68½ | 68 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72* | 73 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 70 | 73 | 69½ | 12½ |
| 4½ | ,, ,, 4% 1st Pref. .. | 82½ | 82½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146.12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62* | 63 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/- | 25/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams. Ord. .. | 7/6 | 7/6 | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61* | 62 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/1½ | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 24/- | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. .. | 105 | 104½ | 109⅜ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 85/- | 85/- | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9* | 23/1½ | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 25/-* | 25/7½ | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/7 | 18/- | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. .. | 25/- | 25/- | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 8/1½ | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 11/3 | 11/3 | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/7½ | 20/7½ | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/10½ | 26/7½ | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 10/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 7½ | General Elec. Ord. .. .. | 39/6 | 38/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 115/- | 115/- | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 43/9 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 22/6* | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 32/6 | 32/6 | 37/- | 13/1 |
| 8 | ,, ,, 8 C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 30/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25½ | 25½ | 50/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½ | 58½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 80½* | 81½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 243 | 225 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 64½ | 64½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24½ | 21½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 39 | 39½ | 42.12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 44½ | 42½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 67/6 | 66/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 48/- | 47/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24½ | 21½ | 23 | 11/3/6 |

(*a*) 1s. 7.5d. per share. (*b*) £8 8s. 6.66d. per cent. (*c*) 1s. 6.949d. per share. (*d*) 1s. 8.706d. per share. (*e*) 1s. 9.3d. (*f*) 1s. 9.12d. (*g*) 1s. 7.223d. ‡Including 1s. bonus. * Ex dividend.

NOTTING HILL ELECTRIC LIGHTING CO., LTD.—Intm. div. of 5s. p. sh. on dfd. shs. is announced.

DICKSON AND MANN, LTD.—Debit blce. £383 carried fwd., a decrease of £1 550, being net pft. for past year.

CORK ELECTRIC SUPPLY CO., LTD.—Intm. div., 1s. p. sh., or 10 p.c. p.a. on ord. shs., agst. 7½d. p. sh. (6 p.c. p.a.) last year.

TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD.—Intm. div., 2½ p.c., tax free (same as last year), payable July 12.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Intm. div. on acct. of year endg. Dec. 31, 1928, of 9d. p. sh., less tax, on ord. shs. will be payable on July 21.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Intm. div. of 5s. p. sh., tax free, for the three months ended March 31, 1928, will be payable on July 14.

TRACTION AND GENERAL INVESTMENT TRUST.—Intm. divs of 2½ p.c. actual on pref. stk., 6 p.c. actual on ord. stk. (agst. 4 p.c.) and 1s. 11d. p. sh. on new shs., less tax, will be payable on July 31.

GREENWOOD AND BATLEY, LTD.—Pft. for year ended March 31, 1928, £30 511, agst. £30 175. To deprectiatn., £6 000. Fin. div. 2½ p.c., makg. 5 p.c. for year (same as previous year). Fwd. £13 459, agst. £13 395.

KIDDERMINSTER AND DISTRICT ELECTRIC LIGHTING CO., LTD.—Net rev. for 1927, £9 993, agst. £7 545, plus £465 brt. in. After provisn. for exes. and int., £1 500 for renewals, and £990 for res., div. on ord. shars. is 5 p.c., agst. 2½ p.c. Fwd. £505.

ELECTRIC AND GENERAL INVESTMENT CO., LTD.—During year ended May 31, 1928, gross pft. was £10 691. After deductg. gen. charges, int. on deb. stk., cost of income certs. purchased and pref. div., blce. is £3 225, plus amt. brt. in, makg. £47 474, wh. is carried fwd.

ENGLISH ELECTRIC CO. OF CANADA.—Net pft. for 1927, $178 577, agst. $163 157. It is proposed to replace existing 20 000 $100 par pfd. and 30 000 no par value common shs. by 50 000 Class A and 50 000 Class B no par value stk. Pfd. shhldrs. receive two shs. of A and half a sh. of B for each existg. sh., and the common receive a sh. for sh. allotment of B.

NORTH WALES POWER CO., LTD.—Pft. for 1927, £47 572, After paymt. of deb. int., blce., including £25 051 brt. in. is £31 455. To special int. res. £25 051, to special renewals fd., £5 000, blce. £1 404, to special int. res. Sales of electrical energy show increase of 26 p.c. Power house at Maentwrog is ready for operation and awaitg. completn. of h.t. transmission lines, which should be in commission during July.

PETTERS, LTD.—Net pft. for year ended March 31, 1928, £25 634, plus £24 811 brt. in. After paymt. of pref. div. for half year ended Sept. 30, 1927, blce. is £44 445. Int. on fundg. certs. to July, 1928, £1 670; pref. div. at rate of 7½ p.c. p.a., less tax, to March 31, 1928, £6 000; to fundg. cert. redemptn. fd., £830; div. on ord. shs. at rate of 6 p.c. p.a., less tax, for year, £5 400; to res. £5 000; fwd. £25 545. Result of year's tradg., havg. regard to prevailing conditns. in engineering industry, has been satisfactory.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Gross earngs., includg. subsidiary companies, for 1927, $38 319 989, agst. $38 602 891; net earngs. $22 054 624, agst $21 700 727. After provisn. for int., sinkg. fd., depreciatn. and other charges of subsidiaries, blce. is $12 058, agst. $11 905 856. Addg. miscellaneous int., and deductg. gen. exes. and gen. amortisation ($300 000) net rev. is $11 947 669, agst. $11 745 397. Four qtrly divs. each of 1½ p.c. have been paid on pref. and ord. shs. To gen. res., $4 000 000; fwd. $8 893 907, agst. $7 892 004.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—Gross receipts for 1927, £4 658 618, agst. £4 495 401. Net receipts, after paymt. of workg. exes., £1 011 640, and increase of £20 434, plus £30 840 int., etc. After provisn. for annuity to City of Buenos Ayres Tramways Co., deb. stk. int. and sinkg. fds. and sinkg. fd. for redemptn. of pref. and ord. shs., blce. was £374 400, agst. £364 164. After paying div. on 5½ p.c. 1st pref. shs., and 6 p.c. cum. 2nd pref. shs., £61 215 is carried fwd., agst. £45 815. A

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decision has not yet bn. arrived at by the Municipal Council regarding revision of tariffs.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Pft. for year ended March 31, 1928, £342 291, deductg. directors' and auditors' fees, deb. int. and depreciatn. of bldgs., machinery, etc., leaves £283 074, or £786 277, after addg. amt. brt. fwd. less directors' bonus of £3 000. Income tax, transfer to res. (£50 000), div. on pref. shs. to Dec. 31, 1927, and intm. div. on ord. shs. absorbed £139 596, leavg. £646 681. Fin. div. on ord. shs. 2s. 6d. p. sh., less tax, makg. 4s. for year, plus 1s. p. sh. bonus, less tax. Fwd. £532 931. Works have been fairly well employed during year, and small increase of pft. is result of increased cap. expenditure by which works productn. has been increased.

## Company Meetings.

GREENWOOD AND BATLEY, LTD.—Col. O. C. Armstrong, presiding at the meeting on Monday, said in regard to the present state of trade and the prospects and possible period of its recovery, the situation as he saw it was that in the engineering industry there had been no real improvement. The placing of orders of any importance was sporadic and, speaking generally, trade was still bad. Further, there were at present no signs or indications which justified the expectation of that steady and continuous improvement necessary to fill their works and bring them back to prosperity. They had, so far, been fortunate in being able to maintain their favourable balance at practically the same figure for several years. It was not a high level, nevertheless it had enabled them to continue a steady distribution of dividends over the long series of bad years which they had been called on to face. The reserves and surplus of the profit and loss account totalled £198 000. The cash balance, £120 662, was adequate to meet all their needs for some time to come. In spite of bad trade they might congratulate themselves. The report was adopted and a dividend of 3½ per cent. on the preference shares, making 7 per cent. for the year, and a final dividend of 2½ per cent. on the ordinary shares, making 5 per cent. for the year, both less tax, were approved.

NORTH WALES POWER CO., LTD.—Mr. Kenneth M. Clark, presiding at the meeting last week, said the past year's profit amounted to £47 571. Construction work had been actively pushed forward, and 87 additional miles of transmission line had been completed, making a total of 340 miles in service. The principal lines completed were those extending the supply to Oswestry, inter-connecting Wrexham and Legacy sub-station with Hawarden sub-station, and making a supply available to the Mold Urban District Council. The lines duplicating the service to Rhyl Urban District Council and giving a supply to Prestatyn Urban District Council were also completed. The 66 000 V line between Legacy and Crewe would shortly be brought into commission. The construction of the main 66 000 V line between their new station at Maentwrog and the Legacy sub-station at Wrexham should be completed next month. At the Maentwrog generating station they expected to be generating electricity almost immediately. Due to their association with Electricity Distribution of North Wales and District, Ltd., they were providing bulk supplies to a further 40 towns and villages, and undoubtedly this number would be augmented in the near future. With the completion of the Trawsfynydd dams and the Maentwrog station, it was estimated that in 1929 they would be able to generate 75 per cent. of the electricity required, leaving the balance to be purchased from other sources. The sale of units of electricity was 26 per cent. over that of the previous year. Their consulting engineers, Sir Douglas Fox and Partners, had reported that the further development which would become necessary at Trawsfynydd and Maentwrog to meet the increasing demand for electricity could only be effected by extending the company's water-shed and increasing the storage capacity. The directors had decided to negotiate for the further capital required to enable the company to proceed with this work. In collaboration with the North Wales and South Cheshire Joint Electricity Authority, a scheme for the development of rural areas had been submitted to the Commissioners. The report and accounts were adopted.

DUBILIER CONDENSER CO. (1925), LTD.—Sir Arthur L. Dickinson, presiding at the meeting on Tuesday, said the company's business had increased, although it was still below their working capacity. The electrical and wireless industries had shown substantial progress, with prospect of continuance. Competition, both from abroad and at home, had placed on the market products purporting to give the same results as the company's products and at a lower cost. The public were gradually learning that such inferior products were more costly in the long run. The trading profit was £61 410, compared with just under £38 000 in the preceding year, and the net profit, after deducting tax, was £28 413, against £12 260. Mr. W. H. Goodman, managing director, said conditions in the radio industry were more settled than they had been for some time, and the Radio Manufacturers' Association, being now really representative of the industry, could deal effectively with matters such as the application of the Merchandise Marks Act, to imported goods and other problems vitally affecting the whole industry. As an instance of the competition from abroad, he would give one typical case. A well-known British company gave them the prices quoted by a foreign competitor, and said they could have the business at those prices. He refused the business, and pointed out that it would surely be worth while to give a fractional increase in prices if only to get British goods, which they could show at the Radio Exhibition, where everything must be "All-British." They were told quite frankly that apparatus shown at the Exhibition would have British parts, but that similar apparatus sold to the public would have foreign parts owing to the difference in cost. The new components for broadcast receivers put on the market by them last season were well received. They were preparing to put on the market a combined radio receiver and gramophone which was easily transportable. The report and accounts were adopted, and the dividend of 5 per cent., less tax, on the ordinary shares was approved.

GENERAL ELECTRIC CO., LTD.—Sir Hugo Hirst presided at the meeting on Tuesday, and, after dealing briefly with the figures given in the directors' report (abstracted in our last issue), said the coal mining industry had not even yet sufficiently recovered from the effect of the coal strike to be able to indulge in the capital expenditure which the electrical industry had long been anticipating, and the railway companies had practically made no expenditure. The only real improvement could be recorded in the shipbuilding industry, and they hoped in the coming years to reap the benefits of this. In spite of this sluggishness in the heavy industries, they had been able to do an increased business, which he ascribed to the peace in industry which they enjoyed during last year. The building trade, which provided a large outlet for their products, had enjoyed prosperity throughout the year. He had a feeling that this peace in industry would now have a real chance for the next few years, in spite of the endeavours of a few extremists to wreck it. The working of the Electricity Act had not, as yet, influenced their accounts, yet psychologically it had been of great use. It had helped to educate the public in the greater use of electricity, a variety of new demands had been created, and gradual reductions in the price of current had encouraged a demand for appliances.

### Equipment for Ships.

For years they had given attention to the equipment of ships, and during the last year the "Bermuda," a liner built in the yards of Workman Clark and Co., was electrically equipped throughout with apparatus of G.E.C. manufacture. They had previously equipped an all-electrically manipulated ship for the Admiralty. During the year they had obtained from the Underground Railway an order for 920 traction motors and control equipment for 63 motor coaches and 107 tractor cars, amounting to three-quarters of a million, and they had a contract for the new power station at Birmingham for over half a million, which included two turbo-alternators, each of 30 000 kW, in addition to all the switchgear, transformers and motor generators. The development of Bakelite accessories produced at their Witton insulation works had brought fresh life into their accessories business. The co-ordination of the electricity supply of the country through the Electricity Commissioners' scheme of overhead transmission had brought into the realm of ordinary engineering in the home country problems in very high voltage technique which they had up to now only met in connection with installations abroad. The high voltage testing plant for transmission equipment and control gear which they had in course of installation was planned for a million volts and would suffice to meet everything that could be anticipated in the direction of further increase of voltages for several years to come. In conjunction with the engineers of the Marconi Co. they had been applying the results of their research and experience of

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several years past to improve in size and reliability the large transmitting and rectifying valves upon the efficiency of which depended so much of the wireless broadcasting and signalling services of this and other countries. In these, as in the smaller broadcast receiving valves, their researches of to-day were preparing for still further advances and developments. Sir Hugo Hirst also referred to the work done by the company in the supply of reliable automatic telephone installations, and the handling of transmission problems in connection with long distance loaded telephone cables, and to his impending visit to Australia as a member of the mission which is to study the improvement of business relations between Australia and the home country and how to increase the productivity and prosperity of each. He interpreted his selection as a compliment to the company. He concluded by moving the adoption of the report and approval of the dividend of 10 per cent. per annum recommended therein. The resolutions were carried unanimously.

## New Companies.

JOHN AND SENINGTON, LTD.—Cap., £3 500. Dealers in wireless and electrical apparatus, etc. Reg. office: 1A, Severn Road, Cardiff.

CELIA LTD.—Cap., £1 001. Electricians, electrical engineers and manufacturers, etc. A first director: H. Wheatley, 1, Appian Way, Dublin.

CUTHBERTSON AND CO., LTD.—Cap., £2 000. Electrical and mechanical engineers, etc. Reg. office: 217, West George Street, Glasgow, C.2.

MAGNESITE PRODUCTS, LTD.—Cap., £3 000. Makers of and dealers in calcined magnesite, electrical insulation material, etc. Solicitor: J. E. M. Crowther, Abingdon Street, S.W.1.

NORTH EAST ELECTRIC CO., LTD.—Cap., £5 000. Manufacturers and repairers of and dealers in electric motors and dynamos, etc. Reg. office: 19, Edge Street, London, W.8.

QUADRUPLE VALVE CO., LTD.—Cap., £2 000. Manufacturers of and dealers in wireless valves and apparatus, wireless sets and equipment, etc. Solicitor: J. E. M. Crowther, Abingdon Street, London, S.W.1.

CAMPBELL AND ADDISON, LTD.—Cap., £30 000. To acquire business of wireless telegraphy, telephony, and electric light, heat and power suppliers and engineers, carried on by Campbell Farrar and Chas. A. McKeand at 40, Howland Street, Tottenham Court Road, London, W.1, together with certain patents and trade marks. Solicitors: Farrar Porter and Co., 2, Wardrobe Place, London, E.C.4.

VIDAL ENGINEERING CO., LTD.—Cap., £20 000. To adopt agreement with A. S. Kettelwell, to develop and turn to account the business formerly carried on by him at Thornton Road, Croydon, as the Vidal Engineering Co., and to carry on the business of mechanical and electrical engineers, patentees and manufacturers of electric tools, etc. Reg. office: Vidal Engineering Works, Thornton Road, Croydon.

BAIRD INTERNATIONAL TELEVISION, LTD.—Cap., £700 000. To test, exploit, exercise, develop, manufacture, improve, exhibit work, let out on hire and generally turn to account and trade with inventions relating to a system of transmitting views, portraits and scenes by telegraphy or wireless telegraphy, and to adopt two agreements with Television, Ltd. Reg. office: 133, Long Acre, London, W.C.2. (Public Company).

STANFIELD RADIO CO., LTD.—Cap., £10 000. Manufacturers and repairers of and dealers in wireless, telegraphic and telephonic apparatus, valves, instruments, and equipment, electrical, magnetic and radio active instruments and apparatus, etc., to adopt an agreement with the Stratford Auto and Wireless Co., Ltd., J. W. M. S. H. Menzies and others. Solicitors: Herbert Smith and Co., 62, London Wall, London, E.C.

C. C. FIRES, LTD.—Cap., £3 000. To acquire from I. Turner a sole and exclusive license for the manufacture and sale of "improvements relating to gas or electric heating apparatus," the subject of letters patent No. 278 115 granted to him on July 17th, 1926, to carry on the business of manufacturers of and dealers in gas and electric heating apparatus, etc. Solicitors: Wetherfield, Baines and Baines, 6, New Burlington Street, London, W.

"M.P.A." WIRELESS, LTD.—Cap., £100 000. To acquire from the Motorists Purchasing Association, the business of manufacturers of and dealers in wireless apparatus and appliances, to adopt an agreement with M.P.A., Ltd., as agents for the said company, and to carry on the said business and that of manufacturers of and dealers in electrical and telegraphic apparatus, appliances, etc. Reg. office: 62, Conduit Street, London, W.1. (Public Company.)

# CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.

## Satisfactory Year's Work—The Government's Electricity Scheme—Expansion of Local Supply Undertakings—The Heating and Cooking Load.

THE thirty-second ordinary general meeting of Callender's Cable and Construction Co., Ltd., was held on June 28th at River Plate House, Finsbury Circus, London, E.C., Sir J. Fortescue Flannery, Bart., M.Inst.C.E. (chairman of the company) presiding.

The Chairman, moving the adoption of the directors' report and accounts, said: I think you will agree with me that the result of last year's working was in all respects satisfactory, and I am sure it is so, especially bearing in mind that 1927 was a year of waiting for the development of the great scheme of electrical distribution throughout the country which the Government has had in hand for some time past. The uncertainty as to the general details of their scheme has prevented many of the important electrical undertakings from proceeding with their own plans of development and extension. Permission could be obtained with difficulty for few except purely local extensions, and much of the linking up of existing generating stations from which great advantages are confidently expected in the future, could not be carried out last year. In spite of the delays, we have been able to secure many important contracts in various parts of the country.

Your directors have decided to recommend the same rate of dividend as last year, viz., 15 per cent., and to carry forward £474 165 8s. 7d., being some £97 000 more than was carried forward a year ago.

We can see that the extensions following on the Government's scheme will, in the near future, lead to developments in every section of the electricity supply industry, and your directors feel that it is necessary to make timely arrangement for being able to deal with any contingency that may arise. They have, therefore, decided to ask your authority for the necessary powers to increase the ordinary capital of the company by £500 000.

Sir T. O. Callender, J.P. (deputy chairman and managing director), in seconding the motion, said, in regard to the closer working arrangement with other companies, which was signed at the time of the last general meeting, they had taken a very early opportunity of bringing all their various members together in one meeting and round one table, and they had started to get going the team work which had existed during the year under review. They had already carried out an immense amount of joint investigation on the subject of electrical distribution.

Sir Fortescue Flannery had mentioned the holding up of orders on account of the Government's scheme; it had been very annoying at times to find work that they had confidently anticipated, and for which they had made arrangements, hung up, with no definite idea as to when it would be carried out. But they could not expect those in charge of undertakings to take risks until they knew what the Government intended to do. The company was sending out a tender that day for the immense scheme in the South-Eastern area of England for the overhead distribution grid, the cost of which would run into some millions of money. It would probably be divided up, and he could only hope that that company would receive an adequate proportion of the contracts, in view of the work which they had already done. A couple of years ago the various electrical undertakers who supplied electricity confined themselves to a small area round about the central generating station, with no idea of going beyond the purely municipal boundaries, and sometimes not even so far as that. During the last two years, however, steps had been taken to enlarge their boundaries, and now in nearly all parts of the country one found outside the suburbs, alike of the large and small towns, places being adequately supplied with electricity. All that meant a certain amount of work, but it was nothing to what would be required in the more or less near future. A further development which had taken place was in regard to current for cooking and heating. It had come to stay, and he could see the time coming when many of the mains which they laid down a few years ago, and which were now becoming inadequate for any such large supply would have to be pulled up and replaced by mains of two or three or four times the capacity. Therefore, there was plenty of work in front of them.

The report and accounts were unanimously adopted, and at a subsequent extraordinary general meeting the proposed increase of capital was approved.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ANGERS AND CO., 10, Hatton Garden, Liverpool, electrical engineers. £14 1s. 9d. May 11th.

ATKINS AND POWELL, 1 Thomas Avenue, Windsor, electrical engineers. £10 11s. 10d. May 16th.

BAMKIN, Mr. G. F., 16, Bath Street, Nottingham, electrical engineer. £17 9s. 5d. May 22nd.

BIGGS, G., AND SON, 5, Clayponds Lane, Brentford, electrical engineers. £14 11s. 4d. May 18th.

BLAND, Stanley Ernest (trading as CROWN ELECTRICAL CO.), 82A, Queen Street, Cheapside, E.C., electrician. £31 3s. 3d. May 10th.

BYRAN, Mr. A. H., Queen Street, Arcade, Cardiff, electrical factor. £15 8s. 5d. May 31st.

CROSS AND CO., 32, Church Street, Baldock, wireless dealers. £10 17s. 11d. May 10th.

GATESHILL, Mr. H., 73, Charlotte Street, Hull, radio dealer. £10 11s. 7d. May 11th.

GUDGEON, Mr. R., 23, Colebrook Avenue, Southampton, electrical engineer. £29 0s. 8d. May 1st.

HAYDON, H. W. (trading as RADIA ELECTRIC CO.), 16, Worcester Street, Gloucester, electrical engineer. £10 19s. 10d. May 24th.

HERTZ RADIO CORPORATION, LTD., 71, Bromsgrove Street, Birmingham, wireless dealers. £10 13s. 2d. May 24th.

HURST, Mr. T. R., 1A, Glasshouse Lane, Mexborough, electrical wireless engineer. £11 5s. 10d. May 17th.

HUTCHINGS, Harry, 60, Brook Street, Chorlton-on-Medlock, wireless dealer. £20 15s. 10d. May 17th.

LAY, Oliver Cecil, 20, High Street, Wandsworth, radio accumulator specialist. £22 7s. 2d. May 1st.

MUNN, C. F., AND CO., 44, Praed Street, Paddington, electrical engineers. £19 1s. 4d. May 17th.

NORTH LONDON MAGNETIC AND IGNITION CO., 181, Albion Road, Stoke Newington, magneto repairers. £14 12s. 5d. May 2nd.

PORTABLE WIRELESS, LTD., Triumph House, Regent Street, W., wireless dealers. £47 8s. 10d. May 22nd.

REDDITCH RADIO CO., Market Place, Redditch, wireless electrical engineers. £12 18s. 1d. May 14th.

ROWLANDS, S. J., AND SON (a firm), 2, Knowles Street, Stockton-on-Tees, electricians. £17 5s. May 14th.

SHILCOCK, G., AND SON, 38, Regent Street, Rugby, electricians. £15 2s. 9d. May 26th.

## Deeds of Arrangement.

HILLER, Julius, and HILLER, Emanuel, trading as HILLER BROS., 52, Whitechapel Road, E., electrical engineers. Dated June 25th, filed July 2nd. Trustee, E. H. Hawkins, 4, Charterhouse Square, E.C. I.A. Liabilities unsecured, £957; assets, less secured claims, £149.

IRISH, Leslie William, and REEVES, Robert George, trading at 101, Grimsby Road, Cleethorpes, as IRISH AND REEVES, electrical engineers. Dated June 20th, filed July 2nd. Trustee, A. G. Pearson, 1, Town Hall Street, Grimsby, C.A. Liabilities unsecured, £2,163; assets, less secured claims, £747.

## Mortgages.

[NOTE—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ARTIC FUSE AND ELECTRICAL MANUFACTURING CO., LTD., Birtley.—Registered June 11th, mortgage, securing all moneys due or to become due to Bank; charged on land and buildings at Elizabethville, Birtley. *Nil. December 31st, 1927.

BARNETT (C.), LTD., London, E., wireless accessory dealers.—Registered June 15th, £200 debenture, to C. Barnett, 77, Whyteville Road, Forest Gate; general charge.

CHRISTIE AND HODGSON, LTD., Sheffield, manufacturers of photographic and electrical apparatus, etc.—Registered June 13th, £150 debentures part of £1 500; general charge. *£680. July 30th, 1927.

EDWARDS (ROWLAND) AND CO., LTD., London, W.C., electrical engineers.—Registered June 15th, £500 debenture, to P. E. Bousfield, Yorke, Hadlow Road, Tonbridge; general charge. *£600. May 29th, 1928.

ROYCE, LTD., Manchester, manufacturing electricians.—Registered June 8th, £5 000 debentures, to F. H. Royce, Elmstead, West Wittering, director; general charge. *£24 803 6s. 1d. July 15th, 1927.

WHITE (E. S.) AND CO., LTD., Warrington, electrical engineers.—Registered June 1st, £2 000 debentures, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land at Warrington, also general charge. *Nil. August 25th, 1927.

## Satisfactions.

ATTAIX, LTD., Southampton, manufacturers of electrical appliances. Satisfactions registered June 2nd, all moneys, etc., registered November 16th, 1926 and £1 000 registered May 9th, 1927.

CHURCH STRETTON ELECTRIC SUPPLY CO., LTD., London, S.W.—Satisfactions registered May 25th, £4 000 registered February 24th, 1914 and March 15th, 1917 and £1 800 registered December 3rd, 1923; also registered June 1st, £550, balance of amount registered February 19th, 1921.

COLNE VALLEY ELECTRIC SUPPLY CO., LTD., London, E.C.—Satisfaction registered June 8th, £2 237, part of amount registered July 17th, 1925 and November 25th, 1926.

WORCESTER ELECTRIC TRACTION CO., LTD.—Satisfaction registered June 18th, £10,000 registered April 1st, 1911.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

BESSACARR (DONCASTER) ELECTRICITY SOCIETY, LTD., Inistore, Bawtry Road, Bessacarr, Doncaster (registered under the Industrial and Provident Societies Act, 1893), dissolved by instrument, June 22nd.

HANDCROSS ELECTRICITY CO., LTD.—By special resolution, May 25th, confirmed June 18th. A. R. Thompson, The Market Hall, Redhill, Surrey, A.C.A., appointed as liquidator.

RUTHS STEAM ACCUMULATORS, LTD. By special resolution May 30th, confirmed June 20th, A. J. T. Taylor, of Africa House, Kingsway, London, W.C. 2, engineer, appointed as liquidator, Meeting of creditors at Africa House, on Thursday, July 5th, at 12.30 p.m. This notice is purely formal. All creditors will be paid in full.

### Bankruptcy Information.

BANKS, George Baldwin, 16, Market Place, Redditch, Worcester, trading as The REDDITCH RADIO CO., radio engineer. First meeting, July 9th, 11.30 a.m., Official Receiver's Office, 191, Corporation Street, Birmingham. Public examination, July 25th, 2.30 p.m., Court House, Corporation Street, Birmingham.

HILL, Clement Sanderson, trading as SANDERSON HILL AND CO., Waltham Chambers, Waltham Street, Kingston-upon-Hull, electrical factor. Receiving order, June 20th. Debtor's petition.

LACEY, Walter Thomas, 10, George Street, Bath, electrical engineer and contractor. First meeting, July 11th, 11.30 a.m., Official Receiver's offices, 26, Baldwin Street, Bristol. Public examination, July 23rd, 2.30 p.m., County Court offices, Bath.

RIDLEY, John Donald, trading as the EASTERN COUNTIES ELECTRICAL CONSTRUCTION CO., 41, Butter Market, Ipswich, Suffolk, electrical engineer. Receiving order, June 26, creditor's petition.

### Notices of Dividends.

HORSFALL, William Miles, electrical engineer, 7, Redcross Street, Liverpool. Fourth dividend, 5½d. per £, payable July 4th, Official Receiver's Office, Government Buildings, Victoria Street, Liverpool.

PENTY, Percy Walter, trading as SACKVILLE ELECTRICAL CO., 38, Mannville Terrace, Morley Street, Bradford, electrical contractor. First and final dividend, 5s. 2d. per £, payable July 5th, Official Receiver's office, 12, Duke Street, Bradford.

PRATT, Horace Alfred, Essex House, Lee Road, Dovercourt, Essex, electrical engineer. First and final dividend, 2s. 1d. per £, payable July 5th, 9, Arcade Street, Ipswich.

### Partnerships Dissolved.

A. AND F. GARNETT AND CO (A. J. GARNETT and A. E. JOINER), 29, New Kent Road, by mutual consent, June 26th, 1928. The business will be carried on by A. J. Garnett alone. Debts discharged by A. J. Garnett and all debts owing to the firm should be paid to him.

G. HANCHETT BARRATT AND CO (Gordon HANCHETT and Charles Herbert BARRATT), electrical engineers and makers of electrical machinery, Lower Gold Street, Pendleton, Salford, by mutual consent, April 27th, 1928. Debts received and paid by C. H. Barratt, who will continue the business under the style of Charles H. Barratt, successor to G. Hanchett, Barratt and Co.

HANCHETT, BARRATT AND CURRIE (Gordon HANCHETT, Charles Herbert BARRATT, and George CURRIE), electrical contractors, Lower Gold Street, Pendleton, Salford, by mutual consent as from April 27th, 1928, so far as regards C. H. Barratt. Debts received and paid by G. Hanchett and G. Currie, who will continue the business at 5, Street, Manchester, under the style of Currie and Hanchett.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Paten Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### May 31st.

16 078 Felten and Guilleaume Carlswerk Akt. Ges. Coil junction boxes for submarine cables. (1/6/27, Germany.)
15 919 Forges et Ateliers de Constructions Electriques de Jeumont. Compensated asynchronous motors. (1/7/27, France.)
15 910 H. M. Genese and W. Peto. Electric cells.
15 868, 15 869 P. H. Hull and Imperial Chemical Industries, Ltd. Effecting chemical reactions in gases by electrical discharges.
15 947 C. Lorenz Akt. Ges. Means for maintaining constant frequency in oscillation generators. (24/6/27, Germany.)
15 893 Metropolitan-Vickers Electrical Co., Ltd. Internal combustion engine electric generator power units. (31/5/27, U.S.)
15 905 J. Neale. Signalling means for railways, etc.
15 906 J. Neale. Light-sensitive cells.
15 907 J. Neale. Selenium bridge or cell.
15 931 E. Reisz. Circuit arrangements. (10/11/27, Germany.)
15 932 Siemens-Schuckertwerke Akt. Ges. Fuse bases. (17/2/28, Germany.)
15 964 H. C. H. Smyth. Electromagnetic apparatus.
15 886 Standard Telephones and Cables, Ltd. (Western Electric Co.). Signalling systems.
15 887 Standard Telephones and Cables, Ltd. (Western Electric Co.). Telephone systems.
15 967 Westinghouse Brake and Saxby Signal Co., Ltd. Electric rectifiers. (25/8/27, U.S.)
15 930 G. M. Wright. Picture, etc., telegraph transmitters.

### June 1st.

16 058, 16 059 Acieries de Gennevilliers and P. E. Bunet. Induction furnaces, (2/6/27, France.)
16 104 Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. Telephone systems.
16 042 British Thomson-Houston Co., Ltd. Means for indicating synchronism. (6/6/27, U.S.)
16 043 British Thomson-Houston Co., Ltd., L. Griffiths and C. J. Morton. Ignition devices.
16 009 Ganz-Fele Villamossagi Reszvenytarsasag. Apparatus for regulating voltage in a.c. distribution systems.
16 095 I.G. Farbenindustrie Akt. Ges. Manufacture of lead electrodes for accumulators. (1/6/27, Germany.)
16 067 H. Kindermann. Switches for electric motors.
15 995 F. W. Lanchester. Microphones.
16 089 Metropolitan-Vickers Electrical Co., Ltd. Fault indicators for overhead transmission lines.
16 106 N.I.A. Lighting, Ltd., and D. P. Wheeldon. Supporting electric light fittings, etc.
16 019 J. M. Ortega. Aerial conductors for radio communication.
16 060 E. Parville et Cie. Accumulators. (14/6/27, France.)
16 105 J. E. Pollak (Associated Telephone and Telegraph Co.). Television apparatus.
16 056 Westinghouse Brake and Saxby Signal Co., Ltd. Traffic signalling systems.

### June 2nd.

16 132 J. E. Allen. Controlling electric motors, etc.
16 172 J. L. Baird. and Television, Ltd. Television apparatus, etc.
16 162 British Electrical and Allied Industries Research Association, E. B. Wedmore and W. R. Whitney. Circuit breakers.
16 163 H. Coates. Electric protective systems.
16 158 S. C. Davey and J. Stone and Co., Ltd. Electric heaters.
16 179 W. T. Henley's Telegraph Works Co., Ltd., and E. E. Judge. Covering electric cables.
16 129 F. E. Randle. Electrically controlled level gauge for petrol tanks.
16 185 S. C. Smith. Process of winning nickel electrolytically.
16 148 Westinghouse Electric and Manufacturing Co. Photoelectric cells. (8/6/27, U.S.)

### June 5th.

16 272 Akt. Ges. der Maschinenfabrieken Escher, Wyss et Cie. Relay for regulating apparatus. (12/7/27, Switzerland.)
16 361 Aladdin Industries, Ltd. Lamp fixtures. (21/1/28, U.S.)
16 304 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale and R. Taylor. Telephone systems.
16 344 J. L. Baird, and Television, Ltd. Television apparatus, etc.
16 311 O. Becker, and Porzellanfabrik P. Rosenthal and Co. Akt Ges. Insulators.
16 268 G. A. Betulander. Automatic telephone systems.
16 283 British Thomson-Houston Co., Ltd. Apparatus for producing or recording electric impulses. (6/6/27, U.S.)
16 300 C. R. Burch, F. W. Capper, N. R. Davis and Metropolitan-Vickers Electrical Co., Ltd. Induction furnaces.
16 278 S. O. Cowper-Coles. Electrolyte treatment of metallic bodies.
16 198 G. H. and H. F. Collins and H. Forrest. Connectors for electric circuits.
16 324 C. L. Dann. Electric motors, etc.
16 297 P. Dunsheath. Electric conductors.
16 206 Electroflo Meters Co., Ltd. (Republic Flow Meters Co.) Means for control of temperature.
16 239 English Electric Co., Ltd., and G. Tilstone. Relay switches, etc.
16 314 Felten and Guilleaume Carlswerk Akt. Ges. Method of storing insulating oils, etc. (3/6/27, Germany.)
16 315 Felten and Guilleaume Carlswerk Akt. Ges. Treating substances for impregnation of cables. (30/3/28, Germany.)
16 302 Forges et Ateliers de Constructions Electriques de Jeumont. Asynchronous electric cascade generators. (18/6/27, France.)
16 341 G. W. Hale and Radio Instruments, Ltd. Electric amplifying systems.
16 327 F. W. Hall. Telephone systems.
12 297 W. T. Henley's Telegraph Works Co., Ltd., and F. S. Phillips. Electric conductors.
16 282 International General Electric Co., Inc. Earth fault protective devices for a.c. generators. (4/6/27, Germany.)
16 284 International General Electric Co., Inc. Mercury jet pumps. (7/6/27, Germany.)
16 331 B. Kellermann. Electrical distant observation systems.
16 320 J. M. Large. Storage batteries. (7/6/27, France.)
16 244 V. A. Miller and H. W. Vasey. Electrical indication system for motor vehicles.
16 312 Porzellanfabrik P. Rosenthal and Co. Akt. Ges. and K. W. Schmidt. Electric insulators.
16 205 V. Stobie. Electric heating of fluids.
16 209 G. Wilkinson. Electric storage heating.

### June 6th.

16 475 Akt. Ges. Brown, Boverie et Cie. Mercury vapour rectifiers. (20/6/27).
16 485 J. L. Baird. and Television, Ltd. Television apparatus, etc.
16 393 G. G. Blake. Utilising balancing effects of two opposing electromotive forces.
16 405 British Insulated Cables Ltd., and W. C. Handley. Closing electric circuits, etc.
16 448 British Thomson-Houston Co., Ltd. Indicating instruments. (13/6/27, U.S.)
16 449 British Thomson-Houston Co., Ltd. Vapour electric rectifiers. (16/6/26, U.S.)
16 391 D. M. Browne and G. Trevor. Electrically illuminated signal for office doors, etc.
16 489 G. T. Church. Electric heating apparatus.
16 445 A. Della Riccia. Equipment for direct electric traction.
16 441 E. Dunand. Electric lampshade fittings.
16 421 A. B. Gibbins. Earth inductor location finding apparatus.
16 418 W. Kunze and Radiofrequenz Ges. Multiple valve for frequency changing receiver. (18/12/26, Germany).
16 450 Landis and Gyr. Soc. Anon. Induction measuring instruments. (16/5/28, Switzerland).
16 431 G. Marr. Electric switches.
16 392 W. K. V. Phillips. Apparatus for conversion of electrical impulses into sound etc.
16 419 Standard Telephones and Cables, Ltd. (Western Electric Co.). Wave signalling systems.
16 392 R. C. Wood. Apparatus for conversion of electrical impulses into sound, etc.

### June 7th.

16 583 Bergmann Electricitats-Werke Akt.-Ges. Alternating current motors. (11/6/27, Germany.)
16 572, 16 573 British Thomson-Houston Co., Ltd. Emergency governing mechanism for turbines, etc. (24/6/27, U.S.)
16 574 British Thomson-Houston Co., Ltd. Methods of assembling electrical apparatus. (1/7/27, U.S.)
16 575 British Thomson-Houston Co., Ltd., and R. Dumas. Transformer radiators.
16 579 A. F. Bulgin and J. Silverston. Means for suspension of batteries.
16 509 G. A. Burnham. Circuit interrupting systems.
16 619 H. M. Clarke. Electromagnetic instruments of moving coil type.
16 576 Drake and Gorham, Ltd. Circuit controlling devices.
16 616 Ges. fur Oberbauforschung. Electromagnetic brake shoes for railways. (10/6/27, Germany.)
16 576 A. F. Harmer. Circuit controlling devices.
16 557 P. Knoss. Wireless receiving apparatus.
16 599 Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Vacuum electric tubes.
16 582 C. G. and W. W. Nobbs. Electric heating apparatus.
16 561 B. Peebles and Co., Ltd., and J. W. Rodger. Insulating pressure clamps for electrical apparatus.
16 618 S. M. Rutnagur. Electric traction for railways.
16 525 P. Salter. Headphones.
16 534 W. O. Simmons. Electrical earthing apron.
16 571 W. E. Taylor. Electric lamps.

### June 8th.

16 712 Akt.-Ges Brown, Boveri et Cie. Mercury vapour rectifier. (11/6/27, Germany.)
16 724 Associated Telephone and Telegraph Co. Train control systems. (17/8/27, U.S.)
16 663 E. Berkeley. Electric heating appliances.
16 717 J. R. Blum. Electrical heating apparatus for the body. (9/6/27, Germany.)
16 739 British Electrical and Allied Industries Research Association, E. B. Wedmore and W. B. Whitney. Circuit breakers.
16 675 British Thomson-Houston Co., Ltd. Sound reproducing apparatus. (5/7/27, U.S.)
16 676 British Thomson-Houston Co., Ltd. Driving kinematograph films (5/7/27, U.S.)
16 677 British Thomson-Houston Co., Ltd., F. A. Fossey, C. J. Morton and T. H. Woodfield. Ignition devices.
16 669 A. F. Bulgin. Electric battery case.
16 631 S. Chapman. Electrical testing apparatus.
16 098 W. P. Digby and R. B. Fairthorne. Heat radiation systems of oil insulated transformers.
16 697 Dubilier Condenser Co. (1925), Ltd. Coil winders.
16 741 Electrical Research Products, Inc. Signalling systems. (11/6/27, U.S.)
16 727 C. Epuer. Production of electric discharges. (23/8/27, Germany.)
16 745 J. E. Griffiths. Antiseptic pad for telephones.
16 628 E. A. Hailwood. Insulators for electrical apparatus.
16 635 W. Hughes and E. B. and O. B. King. Wireless telegraphy.
16 731 M. Jacob. Switching devices. (30/8/27, France.)

## Coming Events.

### Friday, July 6th (To-day).

Overhead Lines Association.—Visit to the Trades and Industrial Exhibition, Bicester Road, Aylesbury. 3 *p.m.*

### Saturday, July 7th.

Physical Society.—Visit to the new H. H. Wills Physical Laboratory, Bristol.
Association of Mining Electrical Engineers (South Wales Branch).—Visit to the generating station of the South Wales Electrical Power Distribution Co., Upper Boat. 3.45 *p.m.*

### Monday, July 9th.

Association of Public Lighting Engineers.—Sheffield. Fifth annual conference.
Electrical Contractors' Association (Hastings Sub-Branch).—Ordinary meeting.
Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 7 *p.m.*

### Tuesday, July 10th.

Institution of Electrical Engineers (South Midland Centre).—Local summer meeting. Visit to D. P. Battery Co., Bakewell; Haddon Hall and Matlock. Lunch at Royal Hotel, Matlock Bath. Assemble, Birmingham (Grand Hotel) 8.50 *a.m.*
Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.
Electrical Contractors' Association (Leicester Branch).—Corridor Chambers. Ordinary meeting. 2.30 *p.m.*
Electrical Association for Women.—Visit to Ashtead Potteries, Leatherhead, Surrey; also visit to the Frederick Milner Home, 1.15 *p.m.*; invitation to tea from Mrs. M. B. Jackson at Leatherhead. 4.30 *p.m.*

### Wednesday, July 11th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—5, South Street. Ordinary meeting.
Batti-Wallahs' Society.—Hotel Cecil, Strand, London. Luncheon, followed by an address by Major-Gen. Sir Philip A. M. Nash, K.C.M.G., C.B. 1 *p.m.*
Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting, 5.30 *p.m.*

### Thursday, July 12th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.
Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Electricity and the Public.

So many electrical conferences are held, only to remain a pleasant memory of sociable times spent with business acquaintances in delightful surroundings, that it is worth while to remark upon one which, while by no means lacking in social amenities, has provided the electrical trade as a whole with something to think about and something constructive to do. The conference to which we refer is, of course, that of the Electrical Contractors' Association, held at Cheltenham during the latter part of last week; and though many of the points raised were primarily of interest to contractors, there were several which merit the careful attention of all branches of the industry. In the first place, there came a strong plea from Mr. W. R. RAWLINGS for the adoption of a policy of public enlightenment regarding the possible dangers resulting from the general use of three-phase current at a pressure of 230 V. The folly of lulling consumers into a sense of false security is obvious, and Mr. RAWLINGS very rightly holds that the industry is in duty bound to do everything in its power to protect the public against serious electrical accidents. The present time, when great changes are being made in the national system of electricity supply, seems opportune for undertaking the educational work needed to give people a proper understanding of the risks they may be running every day in their homes, but we do not think that any big publicity campaign is either necessary or desirable. Through the Electrical Association for Women, the Women's Institutes, and other social organisations for men and women, and also for boys and girls, many thousands of the people concerned could be taught without being frightened. For the rest, contractors themselves can easily impart the necessary information individually to their customers. Manufacturers, too, can help by paying greater attention to the provision of suitable earthing means on domestic appliances. Mr. RAWLINGS's plea for the compulsory adoption of a universal three-pin standard plug and connections has been advanced before, and the advantages which its adoption would secure are so obvious that it is hard to understand why the change has not been made.

## Trading without Tears.

THE other important matter raised at the E.C.A. Conference was the continued overlapping and duplication of effort which is so largely to blame for the very modest return which generally rewards heavy capital outlay in an industry which appears to the outsider as a gold mine. Electrical manufacturers, wholesalers, and retailers alike feel that they are the victims in some way of unfair trading methods, but it seems reasonable to assume that the establishment of complete confidence in the fixity of terms from the manufacturer down to the consumer is practically all that is needed to reduce the cost and retail prices of electrical goods, and establish a basis of reasonable profit. It is not necessary to agree with every detail of the E.C.A. Trading Policy to appreciate that the frank formulation and promulgation of the trading system desired by one section of the trade is at least a step towards the realisation of a better system all round. As a basis for constructive work on the part of all interests concerned, the document referred to might very well be the first study of the joint-committee which Mr. MARRYAT suggested would be a preliminary and necessary evil. Such a committee would find it difficult to introduce any great measure of reform, but the possible resultant benefits make the effort well worth while.

## An Electrical Czar.

ONE of the most useful jobs the joint electrical trade committee could do would be to consider the suggestion, first put forward in these columns, but presented to the Cheltenham Conference by Mr. T. R. MARTIN, that the industry should appoint a sort of super-general manager who would possess absolute power to settle sectional trading disputes, to devise the best means for welding the trade together under a mutually satisfactory trading system, and generally to direct the whole industry on properly co-ordinated lines. Such a man would require to be well paid, and the suggested salary of £10 000 a year would not be an excessive price to pay for the large benefits that might be expected to accrue. The plan has been tried—we believe with success—in America, and after making full allowance for the differences in conditions in the two countries, we see no reason why it should not be effective here. At present, when in negotiations, we are asked to make a sacrifice which would favour the other party, many of us ask rather petulantly: "Why should we give way to *him?*" Given some dictator in whose impartiality we could place implicit confidence, we would often willingly make the very concessions that our vanity alone prevents us from making under the present



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scheme of things. The first task of the electrical dictator —or Czar, as the American equivalent is called—would be to reorganise our trade association system. Most of the existing organisations would doubtless be continued, but they would function in the future as satellites of an Electrical Development Association remodelled somewhat on the lines of the National Electric Light Association of America, and possessed of full power to carry through any development or reform that the industry's general manager might dictate. Obviously there will be opposition to this revolutionary proposal, but if the evils of which Mr. MARRYAT put forward no exaggerated account are to be remedied, heroic measures must be adopted. We shall be glad to have our readers' views on this matter.

### Factory and Workshop Lighting.

FROM a perusal of further advance particulars which are just to hand of the forthcoming Factory and Workshop Lighting Campaign, in which the E.L.M.A. Lighting Service Bureau is again co-operating with the E.D.A., we have no hesitation in recommending readers to play a prominent part in this well-planned effort to sell better lighting in factories and workshops. The machinery of the campaign is commendably simple, and once more the E.D.A. Circles up and down the country will be strong local campaign centres. The number of bare lamps, obsolete lighting equipment and wiring installations which handicap British production is enormous, and even in places where little fault is to be found with the installations there is in a majority of cases ample scope for improvement by increasing illumination intensities. It will therefore be appreciated that the field is wide, and as the campaign is confined to three months, individual effort will have to be sufficiently intensive to satisfy even those who criticised the previous campaigns on the score of undue length.

### Wide-awake Competition.

READERS will remember that some few weeks ago we pointed out in these columns the necessity for supply undertakings to meet their competitors in the gas world, particularly with respect to houses on the new building estates in and around London. During the week we have yet again experienced a little of the effort which gas companies put into their organisation with a view to adding a consumer to their books. The case in question is where a new house is ready to be connected to both services, and in both the connection is effected, so far as the consumer is concerned, by filling up one form for each. In the case of the gas company the form was accompanied by full details of the service, price per therm, and some dozens of leaflets illustrating fires, cookers, geysers, lamp standards, etc.; a letter was also enclosed asking whether it would better suit the applicant if the company's representative called to discuss the matter. The electricity supply undertaking, on the other hand, sent a form which contained more details about industrial motors than anything else, and did not even give the price for current. The questions asked were of a semi-technical nature, and no illustrated or other literature accompanied the form. Though fully appreciating that the majority of electricity supply undertakings have showrooms equal to and generally much better than those of the gas companies, it seems to us that whereas the latter make every effort to create the impression of personal attention, even though they may not give so good a service, some electricity undertakings, on the other hand, are leaving too much to chance. Where the occupier of the new house has already used electricity the circumstances do not hold so much danger, but in other circumstances where the conversion of a gas consumer to electricity is in the balance, the chances of success are remote. This absence of counter-attack is also likely to have a considerable influence upon the electrical contractor, for the loss of electricity supply consumers also means the loss of potential business, for once a member of the public has installed himself in a house which he has had to buy he is not likely quickly to change his dwelling, nor will he be easily convinced to discard his gas fire for electric heating apparatus when the decorations, etc., have to be maintained out of his own pocket. If he is "sold" on the electrical proposition before occupying the house, the sale is effected when enthusiasm is at its highest and the desire to possess most prominent. Once let that enthusiasm wane, and the customer is much harder to get.

### Wireless and Aviation.

THE part played by wireless in aviation was once again demonstrated by the "Southern Cross" which flew without mishap from San Francisco to Sydney, New South Wales. Wireless has long been regarded as indispensable on commercial air routes, and experienced pilots are agreed that wireless should also be carried on long distance pioneer flights over sea routes and undeveloped country. These flights can only be justified if they are successful, and by their success add something to knowledge and achievement in aerial development. How narrow may be the line between success and failure is shown by Capt. KINGSFORD-SMITH'S experience during the first stage of his journey. He arrived at Honolulu with his petrol supply almost exhausted. Had he been delayed, as well he might have been but for the assistance he received from his wireless installation, he might never have reached land. From the time the "Southern Cross" left the Californian coast it was in touch with ship and shore wireless stations. A diary of the flight was contained in the wireless messages sent out by the aeroplane and picked up by ships and land stations. They were also "picked up" in Sydney, at one time more than 6 000 miles away. Useful as the service of wireless was in this connection, it proved of even greater value to the flyers when they thought they had lost their way and asked for bearings. As a result, the aeroplane received its position from the U.S.S. "Richmond," and soon after was able to state that land was in sight. As further evidence of the appreciation of wireless by airmen, Capt. COURTNEY, who is prepared to take off for a transatlantic flight, has fitted his machine with d. f. telephonic and telegraphic equipment. This branch of electrical engineering has developed so rapidly, as fast almost as aviation itself, that it is difficult to remember the many stages through which it has passed. Nevertheless, thirty years ago, wireless communication was but an experiment, twenty years ago it was a novelty, while ten years ago its utility became as common as all those other electrical developments with which we are so familiar.

### Swedish Hydro-electric Progress.

THE total development of Sweden's water power through Swedish power stations now amounts to about 1 500 000 H.P., and the total production of electrical energy generated by water power in 1927 amounted to 4·35 billions of kilowatt-hours, according to statements made at the recent annual meeting, in Stockholm, of the Swedish Water-power Association. Several of the leading Swedish power plants have enlarged their capacity, and a number of new power units—including that of the Hammarsforsens Kraftaktiebolag (the Hammarsfors Power Co.), belonging to the international holding and finance concern of Kreuger and Toll—have recently been completed. Although it is claimed that nearly 50 per cent. of Sweden's farming area is electrified, and her leading industries and important railway lines are also electrified, only a small part of the total water power resources has, so far, been exploited. These, according to a recent estimate by the head of the Government Water Fall Board, amount to 6¾ million turbine H.P. during nine months of the year, and a further ten million H.P. during six months of the year. A national system of high-tension transmission lines covering the entire country is gradually being constructed, whereby the power of the great falls in the north of Sweden will be transmitted and distributed to the central and southern parts.

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# THE E.C.A. CONFERENCE

## Big Attendance at Cheltenham Meetings—Earthing and the Public—Electrical Developments and Retail Sales—Trading without Tears

SPAS and their medicinal waters now seem indispensable comcomitants to electrical conferences, so for a second time the Electrical Contractors' Association chose a famous health resort for its annual Conference during the latter half of last week, and, but for certain difficulties in arranging accommodation for over 400 delegates in a town already crowded with other visitors, the choice was a very happy one. The weather was, on the whole, good, and for a meeting place the Association was fortunate to be allotted one of the most attractive of all the provincial town halls. There was a big attendance of members, and representatives of supply undertakings, manufacturers, and wholesalers.

The Conference opened officially on Wednesday, July 4th, with a Council meeting at which Mr. W. H. Walton was elected President for 1928-9, and Mr. H. Willoughby Ellis, Vice-President. New members of Council elected were Messrs. R. Grierson, H. C. Hazel, A. E. Pendock, and C. Whiting. Mr. W. A. Shaw, the retiring President, was presented by the Council with a silver salver.

When the Registration Office opened on Wednesday there was already a large number of members present, and by the time the President and Mrs. Shaw held their reception at the Town Hall there was nearly a complete muster of the delegates.

Thursday's proceedings started with the annual general meeting and a cordial address of welcome by the Mayor of Cheltenham. Mr. Shaw then read his Presidential Address and the taking of the official photograph brought the morning's session to a close. In the afternoon Mr. W. R. Rawlings read his paper on "Earthing as a Safeguard to the Public," in which he entered a strong plea for the proper education of the public regarding the dangers of playing the fool with 250 V a.c. As his expected denunciation as a scaremonger did not eventuate, Mr. J. Orringe then dealt with "Electrical Development with Special Reference to Retail Sales." It was disappointing that so interesting and provocative a paper did not give rise to a longer discussion, but experience of conference psychology suggests that something inevitably suffers when the attempt is made to get more than one paper discussed in one sitting. The day closed with a smoking concert in the Town Hall.

On Friday Mr. H. Marryat's paper on "Trading without Tears" was followed by an interesting discussion, and, after thanks had been returned to the Corporation of Cheltenham for their hospitality, Mr. W. H. Walton was installed as the new President.

In the afternoon the skies miraculously held up for the garden party and tea in the grounds of the Pittville Gardens, and following a short organ recital on the fine new organ in the Town Hall, the Conference was brought to a brilliant close by a ball and supper.

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# THE PRESIDENTIAL ADDRESS.

## Improved Sectional Relationships—Compulsory Wiring Code Advocated—West Ham's Example—Fostering the Principle of Indentured Apprenticeship.

IN his Presidential Address delivered on Thursday morning, following the welcome by the Mayor of Cheltenham, Mr. W. A. Shaw pointed out that while the first E.C.A. Conference at Brighton was entered upon with some feelings of hesitation, it proved an immediate and huge success. The proceedings at Scarborough demonstrated that the success of the first Conference was by no means due to its novelty. Scarborough proved that an annual conference filled a definite place, and supplied a human need in such a scattered organisation, and the splendid gathering at Cheltenham had set a seal of final approval upon the whole idea of these reunions.

Observations during the course of visits to E.C.A. branches and sections all over the country during the past year had shown that electrical contractors were standing more closely together to-day than ever before, and important results of this united determination to work together for the general good of the trade were likely to be seen in the near future. The general relations existing between E.C.A. members and their local supply engineers had improved out of all recognition, and Mr. Shaw was convinced that very substantial benefits had already been achieved by this " revolution of outlook " alone.

Considerable work, however, remained to be done, and there was need for some one to make it his business to get all sections to co-operate together more effectively than they appeared to do at the present moment. Various committees were meeting: but *results* were required. Wholehearted co-operation between all sections of the industry was urgently needed to put the industry on a proper footing.

*Mr. W. A. Shaw, President of the E.C.A.*

[*Specially drawn for " The Electrician " by " Spider."*]

Apart from the better regulation of trading conditions within the electrical industry, there was no more serious problem confronting us than the shoddy workers and workmanship to be found in the electrical installation trade.

" What," he asked, " are we doing to stamp out the shoddy work and shoddy workers that exist in our midst ?."

The problems involved were large and difficult, but for these reasons it was all the more necessary that they should be faced immediately. The National Register of Electrical Installation Contractors was formed in order to deal broadly with the existing situation, and it would be agreed that a good deal of success had been achieved by the Register as a direct consequence of the recognition it had received from a considerable number of electricity supply engineers. There was room, however, for considerable development under this heading—a fact that was recognised very frankly by Mr. F. W. Purse in his Presidential Address at the recent I.M.E.A. Convention in Bath.

" In my opinion," Mr. Shaw continued, " very definite steps must be taken to protect the legitimate electrical contractor against those untrained and incompetent competitors who surround us on all sides, and I do seriously suggest that everybody engaged in the industry, no matter in what section, should carefully consider more determined methods of urging forward the central objects of the National Register. Here and now, for example, I would like to express my firm belief in the need for compulsory wiring rules in this country.

" I think all sections of the industry should unite together with a view to obtaining a compulsory code of wiring rules, providing a standard below which no work would be permitted to be connected to the public mains. Such a scheme would carry with it full authority to electricity supply departments to inspect installation work in progress, and to refuse connection to any work below the given standard. I throw out the suggestion for what it is worth, but I am convinced that if the two immediately interested sections of the industry made suitable representations to the Electricity Commissioners there would, I think, be a distinct possibility of wiring rules being made nationally compulsory, without waiting for local authorities to be put to the worry and expense of individually applying for powers."

There was no need to discuss the national inconsistency which demanded the electrical protection of the worker in his factory and left him exposed to every electrical risk in his own home. Thanks, however, to Mr. F. W. Purse's admirable example in West Ham, we were substantially nearer to general compulsory wiring regulations in this country than we were even twelve months ago. The example provided by West Ham, and sundry other places, where the wiring regulations of the Institution of Electrical Engineers had been made compulsory, represented a very substantial beginning to a movement that was bound to develop with considerable rapidity in the near future.

Finally, on the subject of shoddy workmanship, Mr. Shaw directed attention to the unceasing effort of the Electrical Contractors' Association to raise the status of the trade by fostering in every way the principle of indentured apprenticeship. Electrical contractors in business to-day were morally bound to do everything in their power to attract the best type of boy to installation work, and to provide for his thorough education in the theory and practice of the craft. Only by developing the principle of indentured apprenticeship could they save the trade from falling into the hands of such half-trained workers as were created by war conditions. The employer was more than blind to his own interests who failed to support the Association's indentured apprenticeship scheme to the very utmost of his ability.

Mr. Shaw wished to emphasise, as strongly as possible, how immensely their members were indebted to those trade spirited electrical contractors who played a really active part in their organisation. From personal observation all over the country, he found that the voluntary efforts of the Branch and Section officers were beyond praise or price: while the amount of time and attention devoted to E.C.A. affairs by many of the principal members in London was practically beyond belief.

As a provincial president, he did not undervalue the services rendered to the Association by provincial members of Council who travelled to London from the ends of the country. However, London was the centre of government, trade and general negotiations, and provincial members were greatly indebted to the leading Association spirits in London for the way in which, year after year, they bore the heat and burden of extra routine and emergency affairs.

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# THE ANNUAL MEETING.

## A Record Increase in Membership—The National Register and the Public—Interest in Indenturing of Apprentices—Negotiations with Supply Authorities.

AT the annual meeting which opened the business sessions of the Conference on Thursday, Mr. W. A. Shaw presented the annual report, which showed a record increase in membership. The total membership of the allied associations now amounted to 1 100. During the past year members had been enrolled from districts where the Association was not previously represented, and there was every indication of more substantial progress being made in this direction in the future.

Particularly since the passing of the Electricity Supply Act of 1926, there had been a manifest necessity for increased electrical organisation in all localities throughout the country, and this, in itself, was creating a more lively interest in Association affairs. The E.C.A. organisation now consisted of 28 main branches, and 25 sub-branches. During the past year sub-branches had been inaugurated at Chesterfield, Eastbourne, Hastings, and Torquay, and arrangements were now in progress for similar sub-branches to be organised in other districts.

Continuing, Mr. Shaw said the Council had, during the past year, considered the desirability, or otherwise, of supply companies—as distinct from municipalities—being enrolled as members. There were many arguments for and against, but on the whole he thought it would be generally recognised that the inclusion of supply companies operating wiring departments as members of the Association must be to the Association's advantage.

The question of compulsory registration of electrical contractors had been very much to the forefront in the electrical Press during the last few months, and Mr. Shaw suggested that practical progress would be made by devoting special attention to advertising the Register, and what it stands for, *to the public*, and by advocating the adoption of a national code of compulsory wiring regulations. What had we done, for example, to bring the principle of registration, namely, the execution of good work, to the notice of the public? What had we done to give the public even a hint that any real difference exists between the reputable electrical contractor and his shoddy counterpart?

Discussing the possibility of guaranteeing the public a square deal in connection with private installation work, Mr. Shaw said that at the present moment neither the Register nor the E.C.A. was truly effective so far as the public is concerned, because neither body provided the public with any tangible guarantee of sound work on the part of its members. It was of no great consequence to the public to know that a registered contractor might be struck off the roll if he carried out defective work. Was it impossible to develop this idea of a definite guarantee being associated with the E.C.A. membership?

Apart, however, from registration, the Council felt the need to educate the public concerning the necessity for good workmanship; and, with this in view, a pamphlet was being prepared and would be issued to members, for distribution to the public. The whole object of the pamphlet was to impress on the public the need to secure sound work carried out by members of the E.C.A.; and, simultaneously with the publication of this pamphlet, electrical signs would be available to the membership as a means of demarcation between members of the Association and those outside.

The question of indenturing apprentices had been very much to the front during the past year. Mr. Collinson had been nominated by the Northern Section, and Mr. H. Willoughby-Ellis by the Southern Section to visit the various branches in their respective sections, and address members on the desirability of all lads who are taken into the industry being indentured.

Negotiations with supply authorities had been carried out in a large number of districts throughout the country, and in the majority of cases had culminated in satisfactory schemes for assisted wiring. In very few cases were these schemes carried out by the supply authority direct, most of the work being let out to electrical contractors. These negotiations, however, were again hampered by the presence of a multitude of so-called "contractors" with no obligations to the trade, and whose only object in life appeared to be to obtain work at any price, regardless of the consequences to themselves or anybody else. The Association certainly appreciated the difficulties of supply authorities who were compelled to consider obviously impossible quotations—quotations that did not cover the cost of sound material and labour, let alone provide any margin for establishment charges and overheads.

After referring briefly to the activities of the Statutory Committee set up by the Government to advise on the working of the "Agreed Clause" of the 1926 Act, Mr. Shaw said that very useful results were likely to accrue from the more informal "Committee D," which owed its existence to the Statutory Committee. The informal committee had for its terms of reference the possibility of inaugurating a fair trading policy for general use in the industry.

The Association had cause for congratulation upon the strong position of the Association as revealed in the balance sheet. They must always be in a position to have money available to protect the interests of their membership. Limited funds would limit their activities. In the past they had had to incur heavy expenses to maintain principles which had been most dear to them, and it would be a great pity if they ever had to face the position where their interests had to be sacrificed due to lack of funds.

This reproduction of the official photograph taken at the E.C.A. Conference at Cheltenham is given in two sections, the top being the left-hand side of the group. This year, in contrast with last, fine weather attended the ordeal.

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# EARTHING AS A PUBLIC SAFEGUARD.

## Unappreciated Electrical Dangers—Views on the "Hush-Hush" Policy Regarding Accidents—Universal Three-Pin Plugs Advocated—Security and Other Advantages of the Concentric Wiring System.

IN a paper on the above subject, read on Thursday, Mr. W. R. Rawlings quoted some of the main recommendations put forward in an I.E.E. paper read in July, 1919. From these it was clear that a single 14 wire was not considered safe for all cases. Since that date a considerable amount of investigation had taken place in order to safeguard the public from shock and damage by fire.

The Wiring Rules Committee of the Institution, for example, had drawn up regulations in support of the recommendations, and it was evident that substantial lack of care was taken to protect the public against electrical accidents. The regulations of the Institution were ignored, and publication of the facts concerning the danger which exists was deliberately withheld. Owing to engineering developments, one seldom found a room in the modern house, shop or business premises without an earth close to every electrical outlet. It was, therefore, necessary that precautions which were unnecessary in the past should now be adopted, and the E.C.A. should make every effort to bring about the enforcement of Regulations to protect the public against serious electrical accidents.

Mr. W. R. Rawlings.

The public at the moment did not appreciate the electrical dangers that were lurking near them; nor would they, if they appreciated electrical possibilities, allow inexperienced persons to interfere in any way with their electrical installation.

Fortunately, members of the public could protect themselves by employing E.C.A. contractors, or by seeing to it that every electrical person employed by them was a "registered contractor." He felt sure the time was not far distant when it would be illegal for any unqualified person to instal electrical work.

There were many sad cases due to faulty work and electrical ignorance. Unfortunately, however, there was a difficulty in obtaining particulars of accidents, more particularly since it had been the settled policy of the industry to suppress, as far as possible, all such information. There was only one source from which true information could be obtained, namely, Mr. Scott Ram's official Home Office reports. Unfortunately, however, the information was limited to factories.

Perusal of Mr. Scott Ram's reports showed that in 1924, in factories alone, there were 443 accidents and 27 fatalities. In 1925, 414 accidents (24 fatal) and in 1926, 338 accidents and 17 fatalities. These figures indicated that the system of inspection, and the various prosecutions which took place, had had the effect of reducing electrical dangers in factories and workshops.

### Protected by a Pious Hope.

At the present time the only protection given to the householder and shopkeeper was the pious hope that the I.E.E. Wiring Regulations would be carried out, for there was no one who could enforce anything, not even the Fire Offices.

According to Mr. Scott Ram, although the number of reported accidents from d.c. was double that from a.c., they were far less serious from the point of view of danger to life. Only 12 per cent. involved shock, and of these 2½ per cent. were fatal. On the other hand, although the number of accidents from a.c. was only half that from d.c., the proportion of shock accidents was much greater, namely, 60 per cent., whilst of these 25 per cent. were fatal.

This went to show that, in changing over as we were doing to-day from d.c. circuits to a.c., the danger of loss of life was almost sure to be increased unless some very strict regulations were enforced to safeguard the public.

Mr. Rawlings thought it would be agreed that the time had come when all plugs should be of the earthing type. At present to save a few shillings, plugs of the two-pin type were fitted in the main portion of the house and three-pin plugs in those places where—in the opinion of the person installing the wires—they became necessary. He held that there should be no exception, and that universal three-pin standard plugs and connections should be compulsory. Not only would this give an important safeguard to the public, but plugs, etc., would be cheaper; interchangeability of the plugs would be secured; and, being polarised, the flex leaving the plug could be at any desired angle, giving increased life to the flexible cord.

Earthing, when adopted, must be properly done. A large number of fires had arisen from a faulty earth wire, or from one that was too small for the duty it was called upon to perform.

At the moment, it was fashionable to shroud apparatus such as holders, switches, plugs, etc., in insulating material, but even this method would not afford the protection necessary to safeguard the public against all the troubles referred to. It was obvious that even if the framework of a motor starter or fittings could all be protected by an insulating varnish or the like, there was still the risk of the live conductor being accidentally handled and a contact made through the body to damp concrete or metal work within the building. It was difficult in a modern house to arrange for 6 ft. gaps to exist between electrical work and some structure or piece of apparatus connected to earth. It might be that, in the near future, more care will be taken to insulate most of the things in a building.

### Serious Complications Foreshadowed.

Mr. Rawlings foreshadowed some serious complications when more than one phase becomes general in a building. Extensions might be made by somebody without the requisite knowledge, or without being informed as to the exact position with regard to the supply. Indeed, a trained wireman had nothing whatever to guide him when examining the fuses in basements.

It was well known that there was no surety that an earth connection would remain intact. Recently in his own house, he found that the earth wire was broken off the ordinary domestic iron, but no one was the wiser until the live flexible also broke down and rendered the iron useless. The failure of a wire supplying current was made immediately apparent; and unless there was some system whereby the failure of the actual earth connection was made equally evident, then earthing became a menace and a false security.

There was, however, one method of wiring which, in the author's opinion, would safeguard the public, as in the event of the earthing connection becoming broken, the supply was cut off automatically. He referred to the concentric system of wiring, with the outer neutral uninsulated. If a complete concentric system was maintained there must be absolute security.

Mr. A. H. Dykes, the well-known consulting engineer, who had a very large experience of earthed concentric systems, informed the author that when advising installations in connection with hospitals, mental asylums and public buildings he always adopted the concentric system as the safest and the best. Mr. Dykes added: "The danger from the point of view of shock, and also of fire, of the two wire insulated system arises when a comparatively small leak occurs on the two opposite poles at places on the installation widely separated from each other." The result of such a leak was well known; electrolysis was set up, and finally a breakdown ocurred, with fire possibilities, and other dangers.

On the other hand, as Mr. Dykes pointed out, in the case of a concentric system with the outer earthed, before the current could leak from the inner or live conductor on to any gas or water pipe, it must first leak on to the earthed outer sheathing, thus in almost every case causing an immediate short circuit and the cutting off of the current by blowing the fuse. It was obvious, also, that the high pressure conductor, being in every way surrounded by the earthed conductor, which was at earth potential, no shock could be received by anyone touching the concentric conductor.

It had been said that the earth current would be detrimental, but he learnt from Mr. Dykes that the Post Office, who took up this matter with him some years back, withdrew all their opposition after having made some careful tests. In these cases the house service was given through fuses on the live

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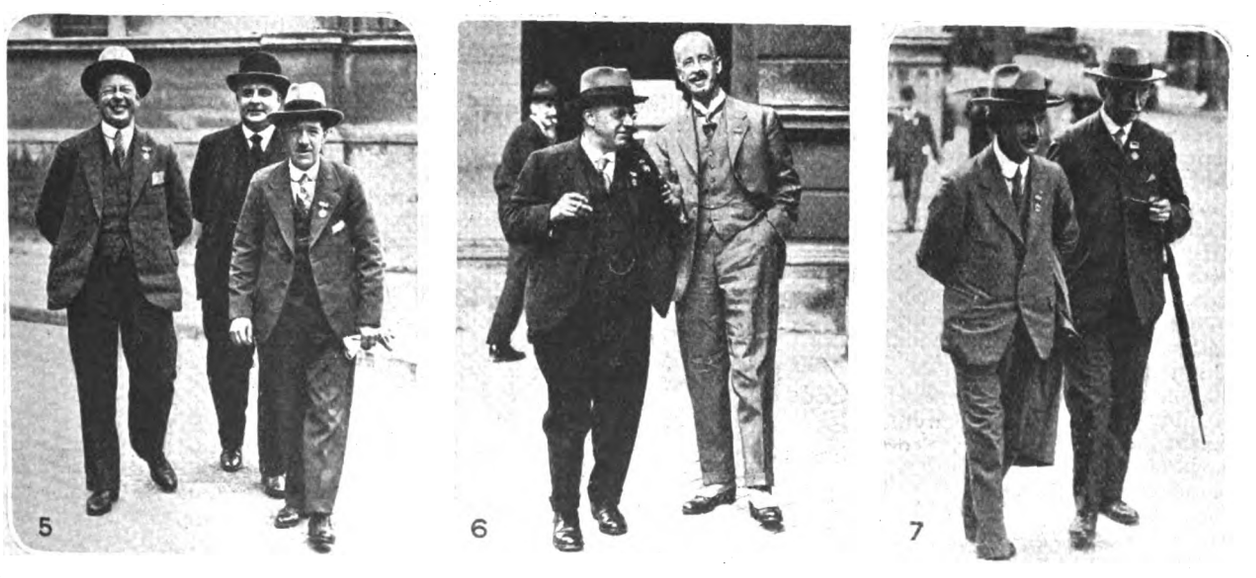

["Electrician" photos.

## *E.C.A. CONFERENCE SNAPSHOTS.*

*THESE happy groups, secured by* THE ELECTRICIAN'S *photographer at Cheltenham, show:* (1) *Messrs. H. W. Roberts and F. Boyes, Mr. J. Orringe, the pioneer of co-operative showrooms for contractors, and Mr. F. G. Quance;* (2) *a quartet in search of the Fleece (Messrs. H. Brown, A. G. Bannister, W. P. Port, and H. Bailey):* (3) *These Sheffield "blades" and their wives who appear to be rehearsing for the E.C.A. Revue. The group includes Mr. and Mrs. T. B. Marr, Mr. and Mrs. A. J. Wheeler, Mr. and Mrs. P. Hewitt, and Mr. and Mrs. H. J. Dean;* (4) *The President taking a stroll with the General Secretary;* (5) *Messrs. H. H. Casse, H. Bailey and A. G. Bannister;* (6) *Mr. R. A. Parsons, who arranged the Electrical Museum, with Mr. R. W. Kennedy;* (7) *Messrs. T. H. Wathes and S. H. Webb, who were among the "Royal" party.*

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pole, with a movable link only on the neutral, which connected up a neutral to earth on each consumer's premises.

Another important factor, apart from security to life, was the fact that only one insulated wire was necessary; and that single pole switches and single pole fuses, etc., formed a complete equipment for all installations. This would bring about, if universally applied, a very considerable reduction in installation costs, and it was the only system of earthing which could possibly safeguard the public. The Electricity Commissioners should, in the author's opinion, give this matter their very serious consideration.

### Faulty Earth Connections.

Although he had referred to fires caused by earth wires, the author said he had not mentioned fires caused by the absence of, or by faulty earth connections, causing damage by fire and loss of life as a secondary cause. It was known that there were many fires, not only in houses provided with an electrical service, but in buildings without any electrical equipment, due to semi-earth leakage breaking out at a distance and fusing and firing gas pipes.

In conclusion Mr. Rawlings said most positively that electrical contractors, whose interests were co-equal with the consumer, must, without fear of damage to the industry, be honest in all their dealings with, and advice to, the public. Just as increased speed in street traffic was responsible for added deaths and accidents, so also it might be predicted that the change now taking place to a universal three-phase a.c. system, would not be without its effect on public security. Accidents and deaths must increase unless some means were adopted to give more protection with enforced Regulations. Electrical contractors knew the dangers which lurked beneath a flimsy installation, and they should, in justice to the public, do all they could to protect their lives and property.

## THE DISCUSSION.

Mr. C. H. Flower, in opening the discussion, said the subject of earthing concerned manufacturers as well as contractors. While it seemed to him that there was very little danger from electrical shocks in most rooms of an average house, there was no question that the results of a shock at a pressure of 230 V a.c. would be very serious. Safety could be secured at very little extra cost, and it therefore seemed worth while to insulate everything in a house so that nobody could get a shock, either now or in time to come.

Mr. W. Cross said that at first sight Mr. Rawlings's paper gave him a shock, but on consideration he thought it was not unwise to let the public know about the dangers of electricity, though one saw so much electrical work that might give a shock or cause fire and did not, that he wondered whether it was really necessary to alarm the public. He did not agree that the average house had more "engineering" earths than heretofore. With regard to the reference to the practice of allowing inexperienced persons to interfere with electrical installations, he said he had found this to be of the greatest danger both in factories and houses, particularly in country houses, where the chauffeur was often expected to alter and extend lighting and other installations. The author had not pointed out that Mr. Scott Ram was reporting chiefly on the danger of shock, and not of fire. From the standpoint of fire a.c. was safer than d.c. on account of its freedom from electrolytic troubles. He had noticed that while the maintenance of, and alterations to, wiring installations were often badly done, the original installation was faultless. Although the I.E.E. Rules called for earthing connections on all motors and domestic heating appliances, most manufacturers said there was no demand for apparatus with earthing connections and three-core flexible cords. He suggested that the manufacturer should be educated to design earthing connections which did not look like an afterthought. To obtain a kettle or an iron with a three-core flex was a difficult matter. In regard to the suggestion that all wiring should be insulated, it was of interest to record that severe shocks had been received from main fuses, and even from meters which were not earthed. He found that there was considerable difficulty in using concentric wiring. He would like to know whether in a factory it was desirable to earth at one or many points. Circulating earth currents might be very disadvantageous, and then there was the difficulty of fitting up at joint points. Otherwise the concentric system overcame all earthing troubles.

Mr. H. Moss thought that the author's idea of informing the public of certain electrical dangers could best be carried into practice by the Electrical Association for Women, which organisation could be utilised in educating people instead of frightening them.

Mr. H. Willoughby Ellis, remarking on the author's reference to three-phase current, said he never used a three-phase board on an installation, as he considered it very dangerous. He was delighted to find that leading men in the industry were beginning to see the advantages of the concentric system, for the advocating of which he was reviled by fellow contractors when he recommended it many years ago. This system could be very efficiently earthed, and its few difficulties were easily overcome. For the information of Mr. Cross, there was no necessity for joint boxes on the concentric system. The possibility of leakages between the inner and outer in damp places was easily remedied, as the ends which caused the trouble could readily be isolated from the pervading dampness. He was convinced that the concentric system was the best for all purposes, and not only for lighting in houses. Wherever possible he arranged for installations to take a 440 V supply and then put in a double wound transformer to step down to 110 V. He had found that it paid, and it gave a more efficient light at a lower voltage.

Mr. C. W. Sully thought that all would heartily support the ideal put forward by the author, but the real question was how to get it adopted. Already it had the blessing of the industry's learned institution, and it might be backed up by a B.E.S.A. Specification; but even this might not be sufficient. The great difficulty was to get the public to adopt something which would cost more. A suggested way of helping this and other ideals along was to make use of the small local groups first set up in connection with the W.O.B. Campaign. By starting with the Circles and spreading gradually over ever-widening areas the industry could readily carry out any desired reform.

Mr. L. B. Atkinson said he felt strongly about the question of telling the public of possible risks. Of those present few would be so foolish as to take hold of a 250 V pair of terminals, but many members of the public were unaware of the danger, and as such risks existed he thought they should gradually be acquainted with them. As at the present time great changes were being made in the national systems of electricity supply it seemed a very favourable opportunity for the industry to let consumers know that certain precautions were necessary. In such warnings it was unnecessary to talk about death; the mere mention of the word "shock" was quite enough for most people.

With regard to the concentric system, he had favourable recollections of his early experience with a station ran entirely on this system. He thought the principal difficulty to-day was that there was not a sufficient range of electrical appliances on sale suitable for use on the concentric system. It seemed to him that we must make up our minds to wire all buildings with two wires and an earth wire, and to instal three-pole plugs throughout. The extra expense would not be very great. It should be made impossible to use three-pole plugs with two-pin sockets. He had experienced the greatest difficulty in getting an electric soldering iron provided with any sort of system of earthing.

During the last five years danger to the public had been very greatly added to by the introduction of wireless receiving apparatus placed within easy reach of metal that might become alive on the installation. He certainly thought that it was the industry's duty to let people know that they could not play the fool with 250 V when they might be in contact with an earth.

### Mr. Rawlings Replies.

Mr. W. R. Rawlings, in replying to the points raised in the discussion, said the object of his quotation from Mr. Scott Ram's reports was to show that danger existed; unfortunately, the public did not read these reports. He had himself advocated the concentric system for about 30 years. By putting insulating tape on the ends of wires in damp places practically all the difficulties with this system were overcome. As an instance of its efficiency he gave details of an installation with some 4 000 switches, of which only one failed. He agreed with Mr. Ellis as to the use of transformers, and himself used this method whenever possible. When it came to prices the concentric system was cheaper than the two-wire. The time was coming when the concentric system, which was in vogue many years ago, would again come into its own. Before reading his paper he had expected to be condemned as a scaremonger, but the reception of his remarks suggested that there was pretty general agreement with his point of view.

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["Electrician" photos.

## MORE SNAPS AT CHELTENHAM.

*IN the above pictures are seen:—(8) The wholesalers' contingent including Messrs. H. C. Weeks, A. G. Beaver, and F. C. Barnett; (9) Mr. A. G. Bruty, from Dublin, leaving with Messrs. A. C. Soutter, W. E. Furse, and D. C. McLagan; (10) Mrs. W. R. Rawlings with her husband; (11) A Bradford group, including Mr., Mrs. and Miss Moss, and Mr. and Miss Frillinghouse; (12) Mr. W. H. Walton, the new President, pacing the deck with "Admiral" W. Riggs; (13) Mr. J. N. Southern with the chief denunciator of shoddy wiring; (14) Mr. and Mrs. J. Kirkham with Mr. A. S. Barnard. Mr. Kirkham, who has just recovered from a serious illness, made a special journey to Cheltenham to hear Mr. Rawlings's paper.*

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# ELECTRICAL DEVELOPMENT AND RETAIL SALES.

## Enormous Scope for Expansion—Figures Prove that Co-operation Pays—Advantages of the Group Showroom—Electrical Shop-keeping a Sound Proposition.

THE second paper read on Thursday was by Mr. Joseph Orringe, and dealt with "Electrical Development, with Special Reference to Retail Sales." The author first drew attention to the enormous openings that have developed during recent years for the expansion of business within the electrical industry. Few British trades, he said, exhibited anything like the same rate of progress; and it was supremely important that electrical installation engineers should be constantly on the alert to improve and consolidate their trading position. Concentrated attention should be devoted, in particular, to the question of retail sales. How were installation engineers to develop and stabilise their position as the recognised retailers of electrical equipment to all consumers of electrical energy?

### Three Important Essentials.

In this matter there were, in the author's opinion, three all-important essentials:—

(1) We must have favourable domestic tariffs to encourage the use of electrical energy for all purposes—lighting, heating, cleaning, cooking, and water-heating.

(2) We must use every opportunity (and, if necessary, create such opportunities) to enter into the fullest co-operation with all other sections of the electrical industry. We must seek and use every opportunity to work in businesslike harmony with supply authorities, with manufacturers and wholesalers, and with the representatives of our employees.

(3) We must have a clearly defined trading policy—on the lines of the E.C.A. Trading Policy—mutually agreed upon by all sections of the trade immediately concerned. Such a policy should not be piously permissive. It should be adopted with vigour *and enforced* by all the subscribing parties.

With reference to the need for simple and favourable domestic tariffs, this question was almost entirely in the hands of the supply authorities.

The formation of the Electricity Board and the national schemes of the Electricity Commissioners had created a feeling of uncertainty and uneasiness among those in charge of our supply organisations. In some areas there had been an inclination to "wait and see" rather than to initiate new departures from existing practice; but it could not be too strongly insisted upon that cheap current was vital to the happiness and welfare of the entire community. Cheap current, indeed, was vital to our national progress, while its value to all sections of the electrical industry, to electrical manufacturers, wholesalers and installation engineer-retailers was far too obvious to call for any elaboration.

Coming to the second point, Mr. Orringe said it would be agreed that in those areas where the fullest possible co-operation exists between the supply authority and members of the Electrical Contractors' Association, the results secured were not only extremely gratifying to all the parties concerned, but they also secured the very best possible service to the public.

As an example of the progress brought about by sane, businesslike co-operation between a supply authority and local electrical contractors, he could not do better than refer to the progress made by the Electricity Department in Leicester. A table given to illustrate the enormous development that has taken place in Leicester's "domestic supplies" during the past five years showed that the sales of energy for domestic purposes only had increased from 4 006 742 kWh in 1922 to 18 560 293 kWh for 1926 and three months of 1927.

The important point in considering these Leicester figures was that the Electricity Department confined its energies almost entirely to the economical generation and distribution of electrical energy, leaving the "sales side" entirely in the hands of local installation engineer-retailers. The immediate consequence of this policy was that the working costs of the Leicester undertaking were very low, while the charges for current in the area were distinctly reasonable.

The Electricity Department did not employ a single person outside the Corporation showroom whose duty it was to canvass for new consumers. Local installation engineers and their staffs canvassed freely to secure new consumers, and the keenest competition prevailed. The Department would "survey" a new district from time to time in order to ascertain whether or not a profitable load would justify further mains extensions; but directly cable-laying commenced all possible new consumers were vigorously canvassed by local installation engineers with an eye to new business.

Finally, the Electricity Department's showrooms—fine, spacious premises situated in the best shopping street in Leicester—were run on co-operative lines, no sales being invoiced direct to the public by the Department. The whole of the stock displayed in the Corporation's showrooms had been purchased outright by a syndicate of local installation engineers, a fixed amount being paid to the Electricity Department towards the cost of the showroom, its supervision and administration. The showroom, and showroom stock, were used exclusively to develop the domestic load, and to this end an excellent electric kitchen had been organised and a comprehensive range of fittings and general domestic equipment was constantly maintained on public exhibition.

### Well-organised Showrooms Essential.

The author's experience in Leicester had convinced him that, in the organisation of properly equipped electrical showrooms, there was ample room for the fullest co-operation between all sections of the trade. Well-organised electrical showrooms—as distinct from "electrical shops"—were essential for the education and enlightenment of consumers and would-be consumers, and they were equally essential to the general welfare of the entire electrical industry. Electrical installation engineers could justly claim to be best qualified to control the policy of retail sales to the public, but they must not shirk their responsibilities when questions arose concerning the provision of additional or comprehensive facilities for electrical demonstration purposes.

In this matter electrical resellers in the same city or town would do well to co-operate one with the other. One well-organised and properly equipped electrical showroom was better than half a dozen unsuccessful "attempts." Then again, it might not be a business proposition for every reseller to have a properly equipped showroom; it might not be a business proposition for every reseller to have his own salesmen and demonstrators calling upon householders; but it

*DELEGATES snapped by "The Electrician's" photographer at Cheltenham included*:—(1) *Mr. H. E. Walker*; (2) *Mr. L. Wolstenholme*; (3) *Mr. A. C. Baker*; (4) *Mr. W. A. Baxter*; (5) *Mr. H. C. Bates*; (6) *Mr. J. H. Edwards*; *and* (7) *Mr. R. Brightwell.*

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*A further collection of heads and headgear at the Cheltenham Conference of the Electrical Contractors' Association, including:* (1) *Mr. Holmes;* (2) *Mr. F. Boyes;* (3) *Mr. S. A. Leathers;* (4) *Mr. A. Smith;* (5) *Mr. P. Collinson; and* (6) *Mr. E. W. Hobbs.*

was a business proposition for two or more resellers to co-operate with a view to improving their sales organisation, and in order to keep down overhead or establishment charges to the lowest possible level.

In point of fact they had, in Leicester, a specialised showroom, devoted to the sale of electric refrigerators, which was run jointly by two members of the Electrical Contractors' Association, and he was convinced that this principle of joint showroom ownership was capable of considerable development in other parts of the country. In the same way, also in Leicester, a number of installation engineers had joined forces in order to meet American sales methods in connection with vacuum cleaners. A competent sales-demonstrator was available who would follow up any hint from an installation engineer who was a member of the group concerned in this effort, taking with him that type of vacuum cleaner best calculated to met the needs and pocket of the client.

Reverting, however, to showrooms proper, the author was strongly of opinion that, where such effective electrical displays had been established, the retailers concerned should enjoy the very lowest possible tariff from the supply undertaking for demonstration and display purposes. He certainly did not suggest that electrical contractors should enjoy special rates for their ordinary requirements; but it was a simple matter to arrange for demonstration and display current to be separately metered, and charged for at a specially low rate.

Every electrical showroom and electric shop should be well and attractively lighted during every moment after nightfall that the street was reasonably in use by the public. Only by persistent "after closing hour" lighting of their own business premises would they persuade shopkeepers in general to organise better and brighter business thoroughfares; but it was neither reasonable nor just that the whole cost of this propaganda work should fall on the shoulders of the electrical trader enterprising enough to arrange the initial display. Special rates would encourage electrical traders to make these and other similar displays.

In many towns such special low rates for showroom purposes had been arranged by the supply authority; but there was ample room up and down the country for a wider recognition of the basic principle involved. During the National Electrical Week, for example, the E.D.A. addressed an appeal to all supply authorities asking them to provide free current to all retailers displaying the special window "fit up" sent out on that occasion. It was officially reported, however, that only some forty supply undertakings, out of about 800 in the United Kingdom, complied with this request.

In these, and other ways, increased business and benefit would be conferred on all sections of the electrical industry by a closer co-operative understanding between supply authorities and electrical installation retailers; and similar co-operative understandings with manufacturers were also called for in order to deal with stock depreciation occasioned by active demonstration. It was to the manufacturer's advantage that his equipment be demonstrated with the utmost freedom, and ways and means must certainly be found to deal with the inevitable depreciation that took place in connection with such continuously demonstrated equipment. Ways and means might be left to negotiation. It was possible that a preferential discount for showroom display purposes might meet the case; but in any event a firm agreement concerning the renovation of showroom stock soiled by active demonstration was certainly called for.

Then, again, by taking an increased interest in their employees, contractors could encourage them, and make it worth their while to co-operate in developing retail sales. The charge hand or wireman *inside* the home was in the best possible position to suggest the use of additional equipment and electrical conveniences of all sorts and descriptions, and it was a matter for serious consideration whether or not such sales possibilities should be actively encouraged and placed on a reasonable business footing for the men concerned.

The author then pointed out that electrical shopkeeping has undergone a revolutionary change in the past few years. Only a short time ago electrical shopkeeping was a very speculative proposition. Contractors had few things to sell, and still fewer people desired to purchase them. Nowadays, however, the range of electrical merchandise was very wide indeed, and in his own experience electrical shopkeeping was a paying "cash down" proposition that was improving in value almost day by day. Indeed, some installation engineers claimed that their "shopkeeping" was far more profitable than their installation work.

In conclusion, Mr. Orringe said it was futile to expect vigorous commercial initiative on the part of electrical installation traders when the ground might be cut completely from under their feet by some unexpected move on the part of another section of the trade. They must obliterate the term "Trade User" from their vocabularies and institute a list of "Registered Users" who would be entitled to discounts or rebates based solely on their quantity buying. Equally they must be in a position to execute any order, with appropriate discounts, from any customer, large or small; and when these fundamentals had been arranged he was confident that it would be possible for electrical installation engineers to trade, not only without tears, but equally without fears.

## THE DISCUSSION.

Possibly owing to the lateness of the hour the discussion was of short duration. Mr. H. Moss referred to his recent I.E.E. paper on "The Contractor's Place in the Industry," and expressed the conviction that electrical contractors generally have not given sufficient thought to the retail sales side of their business during the last few years. It was important to-day that every contractor should set up showrooms and make suitable displays in his windows. The well-arranged display window was, in his opinion, one of the best of all advertising media. Electrical contractors still looked upon themselves too much as engineers; they must now become shopkeepers. If they did not fit themselves for retail sales they would lose much valuable trade to the ironmongers and other non-electrical traders who were concentrating on sales of electrical fittings and appliances, but did not want the work of erecting and installing such apparatus. The sales side, moreover, was earning a bigger margin of profit than much of the wiring installation work which most electrical contractors had been doing. Some contractors considered themselves to be "above this shopkeeping business"; there was, however, nothing to be ashamed of in keeping a shop. Mr. Moss urged that contractors should clearly mark the prices on all electrical goods displayed for sale. Failure to do so was responsible for the loss of a considerable amount of business. Even in cases where a contractor, for one reason or another, could have only a small showroom, he would still find that if he ran it efficiently he would have no reason to doubt its financial results.

Mr. J. ORRINGE, in reply, said he did not altogether agree with Mr. Moss as to the desirability of having small individual showrooms. In many small towns there was not room for a number of small showrooms, and he thought that one good establishment was better than six attempts. As to the competition from ironmongers and others, he was not at all frightened. No other class of trader could ever give such service as the electrical contractor, and nobody else realised either the possibilities or dangers of electricity.

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# TRADING WITHOUT TEARS.

## Uneconomic Trading Methods Blamed for Poor Return on Capital—Menace of the "Trade User"—Advantages of the Quantity Discount—How Reforms can be Effected.

IN his paper on Friday morning, Mr. Howard Marryat pointed out that the electrical industry was looked upon with envy by all those who were not directly connected with it. To the onlooker it appeared to be a gold mine; and he had good reasons for thinking so. He saw its trade expanding by leaps and bounds, and he knew no other industry which catered alike for luxury and necessity over so wide a field. Not only did its customers multiply in an increasing ratio, but their individual demands expanded with the continual discovery of new electrical applications.

Mr. Howard Marryat.

In spite of all this promise of prosperity, however, it could be shown that the electrical industry, particularly in certain vital sections, was working upon a very narrow margin of profit.

An immense capital was invested in electrical enterprises of various descriptions. Did this enterprise meet with adequate reward? What financial results were obtained as a consequence of all the labour, thought and initiative that were applied to electrical affairs?

Among electrical manufacturing concerns alone, there was nearly ten million pounds of ordinary, preference and debenture capital upon which no dividend or interest was paid during 1926-7, while another ten millions of ordinary, preferred and loan capital secured a return to its holders of 5 per cent. per annum, *or less*. Due to common sense, businesslike organisation within the limits of their own trade, certain specialised sections of the industry earned larger returns, but among electrical engineering concerns last year, the net profits recorded were only 3·5 per cent. of the total turnover.

Thus, with immense possibilities in our hands, we were to a large extent missing the mark and acting as public benefactors, rather than as business men.

Apart from natural dissatisfaction arising from long hours and small salaries incidental to an industry showing a small return for capital, there was a very large amount of grumbling from all quarters. Everyone felt he was the victim in some way of unfair trading. There was evidence of overlapping and duplication of effort everywhere, and in place of the confidence which exists between manufacturers, wholesalers and retailers in the older industries, we found too often, mistrust and suspicion, with its attendant lack of co-operation and enterprise.

### Duplicated Effort.

In searching for the cause of all this unrest, one found a state of disorganisation and duplicated effort which was frittering away the resources of the producer and seriously reducing the efficiency of every sales effort. For instance, the manufacturer was generally not content to distribute his goods only through the medium of a wholesaler, whose business it was to guarantee demand, to warehouse, and to know and utilise the most efficient channels of distribution to the retailer; but he must set up his own sales organisation and approach the wholesaler's customer, the retailer, direct. He did more; he extended his sales efforts into every nook and cranny, and canvassed the retailer's customers, the actual users. For this purpose the user was often termed a "trade user" and was granted trade terms.

These so-called "trade users" constituted the only buyers who took sufficient material regularly to support a strong and healthy retail trade. Without this custom, the retailer could not carry the staff or the stock needed to keep his business the live thing it should be. He was called upon, in fact, to depend for his livelihood upon the odd lamps and sundries required in the homes of the few individuals who did not themselves happen to be connected with any business concern through which they could obtain their supplies at trade prices.

The result was that the man who put his brains and his capital into the retail side of electrical distribution had a difficult time. He must camouflage the name of his supplier, or his customer would buy direct. He must equally suppress the name of his customer from his supplier. In any case, so soon as the customer's name became known to a wholesaler as a regular user of any quantity of electrical material, his business, so far as the retailer was concerned, was gone. If the retailer was not to retire, as he too often did, he must busy himself and find new consumers to replace those which were passed on to the powers above. He could not hope to expand his trade in proportion to the demand, or to accumulate capital in his business.

### The Wholesaler's Grievance.

The wholesaler's grievance was one degree removed. He complained that the manufacturer quoted his retailer wholesale terms, and that often the manufacturer got to the retailer's customer before he, the wholesaler, had a chance to do so.

There was no doubt that many manufacturers and many wholesalers took the most elaborate means to ensure the protection of their customers; but, for all that, unfortunate incidents continued to take place, not occasionally, but daily, and not just here and there, but everywhere. Confidence was lost, and neither retailer nor wholesaler was able to take his proper place in the scheme of things.

The manufacturer's complaints against the retailer were often justified. More often than not they concerned an alleged lack of enterprise, a charge which ignored altogether the unwritten trade law, fully recognised in older industries, that, without confidence between the parties, enterprise cannot exist.

If the retailer was lacking in push and enthusiasm, it was the inevitable result of the existing conditions which undermined his confidence, and before he was proclaimed a spineless individual, one should look into the contracting side of his business. Here he was found daily taking risks and entering upon adventures which would make the average manufacturer or wholesaler shudder, and this with little hope of any continued reward from his work, when completed. In the electrical industry the retailer would do no spadework so long as there was the remotest chance of his supplier going to his customer behind his back.

From a very careful consideration of these matters, Mr. Marryat was convinced that the establishment of complete confidence in the fixity of terms from the manufacturer down to the consumer is what is needed to reduce the cost and retail prices of electrical commodities, and establish a basis of reasonable profit to the industry. The manufacturer should have his output assured well in advance by his main distributing agents. He should have nothing to worry about beyond the improvement of his designs and the reduction of works costs.

The wholesaler should be such, in fact. He it was who should take the risk of putting new designs on the market, and he should make it his sole business to distribute to established and accredited retailers, under conditions of a small profit and assured trade.

Under these conditions, the retailer, with renewed enterprise and capital, would throw his whole energy into the business of reaching every possible buyer. With the help of a graded quantity discount he would more than satisfy the so-called trade users, whilst at the same time encouraging those bulk orders which were so helpful in reducing the ratio of standing charges to turnover.

The E.C.A. Trading Policy, formulated in 1923, was then discussed at some length, the author pointing out that the policy sought first to assure to manufacturers a bulk demand in advance. It also sought to support such wholesalers "as do genuinely reduce distributing costs by carrying a substantial stock and supporting the manufacturer by large contract buying." Clause 3 (*b*) stated that contractors and retailers should support the industry by buying in quantity. The practical conception here was in the nature of a quantity discount offered by the supplier to secure bulk orders from his retailers.

The policy aimed to eliminate the redundant middlemen. There were about 10 000 people in this country who called themselves electrical contractors. They were, however mostly only wiremen. In addition, there were about 2 000 electri-

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cal shopkeepers. Of the total of 12 000, Mr. Marryat estimated 5 000 could be genuincly classined as retailers. As there were 1 000 people obtaining wholesalers' terms, it followed that there was one wholesaler or factor for every five retailers, a proportion which indicated the shocking inefficiency of the system.

Another aim of the policy was to cut out the manufacturer's selling expense. This was not capable of universal application. The man who made heavy plant or highly specialised commodities would require to carry through the whole of his transactions direct to the user. Nevertheless, it was reasonably contended that wherever a manufacturer found it possible to do his business through his own paid local agent, that business could be more economically conducted through a retailer.

The policy had been received with sympathy by friends among both manufacturers and wholesalers, and there were indications that general agreement to bring about its main objects would not be unwelcome. Assuming this to be so, what practical steps could be adopted? Presumably a joint committee of some sort would be a preliminary and necessary evil. Such a committee would be confronted with the difficulty of introducing any measure of reform into a vast and quickly growing industry, where there had been time for a large amount of vested interest and bad tradition to establish itself. Nevertheless, the interests at stake were so large that the effort was worth the making.

A practical course would be first to educate traders to a sense of the advantages to be gained by a better trading system, and invite them individually, and by groups, to declare their policy.

For this purpose a thoroughly competent body appointed by a committee of the various interests concerned might set out what it considered to be the best and most economic terms of trading for each section of the industry, and firms willing to do so should declare their willingness to adopt this clause or that, or all the appropriate clauses. Such a declaration should be subject to penalties for breach, and the joint authority, with the aid of paid officials, should have power to arbitrate and settle any differences which might arise.

The first practical step was to discover who, besides the E.C.A., was sufficiently interested to take the initial step.

## THE DISCUSSION.

Mr. A. G. Beaver said that if each section of the industry would put its cards on the table full confidence would be restored. In the textile and other trades manufacturers devoted themselves mainly to manufacturing, and most of the goods went through wholesalers, who in the main confined their business to the retailers. In the electrical industry one found manufacturers selling, as wholesalers, as many lines as they manufactured, and sometimes more. He agreed that the term "trade user" was a misnomer, and that "registered user" was a better name. The E.C.A. Trading Policy would take a long time to become operative, especially if it was not altered in some respects.

He wondered whether electrical contractors ever placed quantity orders, except for special big jobs. In the wholesaling business with which he was connected a census of invoices of small values gave a total of 500 invoices, all of which were for amounts of 5s. or less, some being even less than 1s. Was it to be wondered at that prices were high? People who bought in this way were evading the pedlar's licence and calling it service. The question whether trade discounts were too high depended on the class of trade. Appliances ordered and delivered to the job should carry a smaller discount, and the practice of fixing lighting fittings free of charge and relying for profit on the discount receivable was thoroughly unsound. If the redundant middleman still existed the retailer was most to blame for supporting him. Mr. Beaver considered the author's estimate of the number of wholesalers to be much exaggerated, as the Electrical Wholesalers' Federation, which included in its membership most of the reputable wholesalers of the country had less than 100 members.

### *EXPRESSIONS AT CHELTENHAM.*

*EXPRESSIONS depicting pleasure were much in evidence at the E.C.A. Cheltenham Conference, as the accompanying glimpses show. The pictures represent:—*(1) *Mr. J. Marshall;* (2) *Mr. W. H. Burton;* (3) *Mr. C. D. James;* (4) *Mr. A. F. Dunkley;* (5) *Mr. W. Bowthorpe;* (6) *Mr. F. Wingfield;* (7) *Mr. D. Edey;* (8) *Mr. P. A. Bennett;* (9) *Mr. W. J. Moran;* (10) *Mr. H. W. Roberts;* (11) *Mr. T. E. Alger;* (12) *Mr. A. E. Iliffe;* (13) *Mr. R. Grierson; and* (14) *Mr. C. O. Clark.*

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Mr. T. R. MARTIN said it was obvious that every section of the industry was full of goodwill. If every section meant what it said, and had been saying for years, why did we not get on? With all these expressions of goodwill all sorts of non-electrical people were getting money which should remain in the electrical fold. The difficulty was to put this goodwill to practical use. His view was that the remedy would only be found by appointing one man as a sort of general manager of the entire electrical industry. They might find the ideal man in one of the High Court Judges. To such a man the industry could well afford to pay £10 000 a year. He would make decisions which all sections would have to obey, and he would hold the scales evenly and with fairness to all sides. Failing the adoption of this somewhat revolutionary but practical plan the remedy was entirely in the hands of the E.C.A. Every firm in the industry should support the bona-fide electrical contractor in every possible way.

Mr. J. ORRINGE said there was not the slightest doubt that much goodwill existed, but one could not live on that alone. As to Mr. Beaver's query whether trade discounts were too high, his opinion was that if the contractor was to do the selling it was not too high. If, on the other hand, the contractor was indifferent and allowed the manufacturer and wholesaler to do the work he should be content with a smaller discount. Personally, he had no use for the contractor who expected 33⅓ per cent. for doing nothing. There would be plenty of enthusiasm apparent on the contracting side with a settled trading policy established. There was considerable uneasiness in the provinces, particularly with regard to lamps, regarding the way in which trade with municipalities was being taken out of the contractors' hands. Since the passing of the Electricity Act of 1926 municipalities had been able to buy small quantities of lamps at terms which completely cut out the contractors. Such a policy was no good to electrical contractors, and he expressed the wishes of the Midland and Northern Sections of the E.C.A. in saying that it must cease. The action of the Leicester contractors in establishing co-operative showrooms seemed to have been misunderstood by some manufacturers. Their real object was to assist the municipality in selling electrical appliances, and not for discount snatching.

Mr. W. CROSS supported the suggestion that lack of enterprise on the part of contractors was largely due to trading conditions which tended to cause the manufacturer or wholesaler to take business from the contractor when he had made it worth while. If all retailing were done by retailers costs would be lower and they could sell more cheaply. He did not agree that discounts should be smaller on goods supplied direct to jobs, as the contractor had to do the selling and this was often a great effort. If he did this work properly the discount was not too large, but if he was not selling it should be reduced. It had been suggested that electrical contractors did not buy in bulk. He did not wonder that they did not, as he could see very little advantage to the contractor in such procedure. If one asked for 11 switches most manufacturers or wholesalers would readily break a package and supply them at the same rate as for 12. He thought manufacturers should refuse to sell less than standard packages. One settled trade discount should be given for each type of product. It should be one figure, and a somewhat small one. In addition there should be a fairly substantial discount for those who bought in quantity; this would get over the difficulty of the "trade user." He would like to see the establishment of a strong joint committee to formulate such a scheme.

Mr. E. A. HARVEY complained that the wholesalers as a class were not progressive enough. While they should take the initiative and introduce new lines upon the market, he found that in practice the contractors had always to drive the wholesalers.

Mr. L. B. ATKINSON pointed out that the electrical industry was by no means the only one that was suffering from wholesale prices to the public. In some fields of manufacturing activity, such as with large cables, the manufacturers could not possibly distribute through the usual trade channels, and were obliged to maintain their own selling organisations in each district. Apart from this, if manufacturers generally were to shut down their selling organisations they would immediately place themselves in the hands of the wholesalers, any or all of whom might at any time refuse to handle a certain manufacturer's goods in a certain district. As a measure of self-protection manufacturers were obliged to keep up this organisation. The manufacturer's position with regard to wholesalers bristled with difficulties.

Mr. P. A. BENNETT expressed the opinion that there is no room in the electrical industry for any wholesaler or factor. Electrical manufacturers were well able to sell themselves to the retailer without the intervention of the wholesaler, who, though necessary in certain trades, was not necessary in the electrical business.

Replying to the discussion Mr. MARRYAT endorsed Mr. Beaver's plea for more frankness and Mr. Martin's suggestion for a general manager for the industry. Mr. Beaver had said that alterations should be made in the E.C.A. Trading Policy, but he had not indicated what should be altered.

Retail selling was a very expensive business, as manufacturers and wholesalers knew from personal experience. Mr. Marryat knew of a town in which there were 15 retailers, but in which a certain firm's travellers made over 150 calls; the majority of the people visited should have been customers of the 15 contractors. He did not agree that the electrical contractor was to blame for supporting the redundant middleman; his support came almost entirely from those who should be keeping the electrical contractors' shops busy.

## CONCLUDING ADDRESS.

### Future Association Activities Outlined by New President.

MR. W. H. Walton, after formal installation as President of the E.C.A. for 1928-29, brought the business sessions of the conference to a close with an address in which he considered that the Association's future efforts must be directed along three main channels, i.e., (1) the development of the Association itself; (2) the promotion of better trading understandings with all other sections of the industry; and (3) securing the closest possible co-operation with all electricity supply authorities.

"I am out," he said, "to do my level best to increase the strength and standing of the Association in order that it may become one hundred per cent. representative of the genuine electrical contracting industry. In this matter, however, I do not wish to be misunderstood. I am not out for mere numbers. I am strongly of opinion that the present status of the Association is such that it is an honour for any electrical installation engineer to be a member of our organisation, and I want to see that position firmly maintained in the future."

Membership of the Electrical Contractors' Association must become generally recognised as the hall-mark of installation efficiency, service and probity. They were, of course, fully prepared to cater for the small man; but they must insist that prospective members should prove their technical ability, and also that they possessed the business resources and equipment necessary to give the public, and therefore the industry, the requisite service.

Many trading conditions were widely recognised as unfair or unreasonable. They were the subject of constant discussion in the trade, but solutions did not appear to be readily forthcoming. This procedure would not do. Electrical contractors were beginning to tire of academic debate and procrastination. They were determined to get down to business—with the utmost good will on all sides if possible—but in any case to get down to business.

Manufacturers and others had every right to expect electrical contractor re-sellers to display their goods, to provide efficient "service," and to educate the public in the manifold uses of electrical energy; but they must see to it that the electrical contractor was given a square deal in return. In any case, he intended to do his utmost in this direction during his year of office. He believed in quantity discounts whereby the large buyer enjoyed preferential terms by reason of his large quantity buying; but there must be no interference with trade discounts as such.

It was essential that a very definite line of demarcation be laid down between the purchaser for his own use and the purchaser for re-sale. No other trading principle was worth five minutes' discussion. Quantity for quantity, the buyer for re-sale *must* enjoy a fair preference over the buyer for his own use.

Fair and useful co-operation involved a measure of give and take on both sides, and he wanted to give as clear an intimation as possible, at that open meeting representing all sections of the electrical industry, that the Council of the Electrical Contractors' Association would not stand for unequal or unreasonable treatment, no matter from what section of the industry such suggestions might emanate.

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# REALISM IN ELECTRICAL DISPLAYS.

## Materials Which Enable the Contractor to Make Convincing Demonstrations—The Value of Cut-Outs, Panelling, Moving Figures, and Scenic Effects.

By A. EDWARD HAMMOND (Author of "Shopfittings and Display")

IN addition to window fittings such as shelves, brackets, pedestals, and so on, for use in connection with representative displays of electrical goods, the contractor who wishes to get the best possible selling value out of his window will find it a good policy to make use of special display features from time to time, which enable him to add a touch of realism

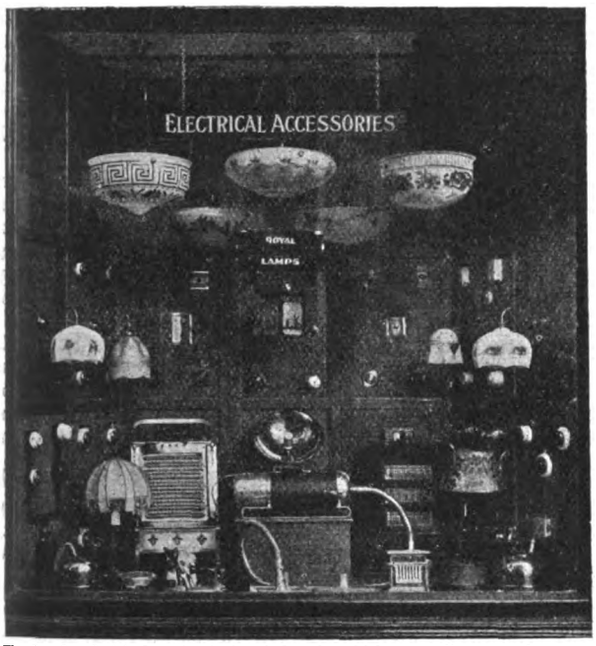


Fig. 1.—An electrical contractor's window in which many items are shown as they would appear in actual use.

to his window displays, and make it possible to show electrical goods, accessories, and components in actual use.

To this end it helps considerably if the contractor is conversant with the wide range of display materials at his disposal. It does not necessarily follow that demonstrative displays of this sort must be carried out by expert window dressers, and it is surprising what a man with little experience can do if he has suitable materials at hand.

In this article I propose to discuss the various types of display materials which can be put to use by the electrical contractor, and to include a few suggestions to show how they may be employed to best advantage.

Let us first take panelling. Special fibre panelling is now obtainable for use for pastel backgrounds, cut-out models, showcards, and so on. This is given a smooth, clean art surface on one side which will take any finish. This particular variety is particularly useful for display purposes, for it can be employed over and over again, and repainted when a different coloured setting is desired. Portable display panels and screens in three-ply laminated woods, fibre, and other materials enable the contractor to make frequent window changes, and reasonable quantities of them can be stored without causing congestion, for, when not in use, they can be folded flat and packed in the recess which is provided under the false floor of many shop windows.

One type of laminated board is now obtainable in panels ¼ in. thick, 36 to 48 in. wide, and in lengths of from 8 to 16 ft. In this form it is easily adaptable, and can be used for temporary purposes as a window background, or as a setting for a central window feature. A removable background of this sort has advantages over the permanent type of window enclosure, for it is flexible, and changes can be effected cheaply and quickly.

For use in the windows of high-class showrooms, however, it is sometimes advisable, in order to give the interior a uniform finish all round, that permanent window enclosures shall be used. In such cases it is essential that the panelling for the window enclosure shall be of the same material and colouring as that used for the interior panelling and fittings; but a pleasing effect can be given to the outer side, which provides the setting for the display, if the central panels in each section are covered with highly-polished and daintily-grained veneer in a darker or lighter colour to blend with the surround.

Fig. 1 shows a window in which a panelled enclosure is in use. It will be noticed that, in addition to serving as a background for the display, this enclosure has been employed to practical effect for demonstrating the various styles of switches, wall-brackets, and other electrical fittings This window is well laid out, and it is fully representative without being overcrowded. The false ceiling of the window provides an effective means for displaying hanging lamps, and the space above it (not shown) is used for showcards. This window is characterised by an "atmosphere" of realism, for, as far as possible, every item is shown as it would appear in actual use.

Figures and objects cut out in plywood, cardboard, fibre, or other similar materials are becoming increasingly popular for window display purposes. These, known as "cut-outs," can be obtained from firms specialising in the production of display materials. For introducing a realistic effect or for adding a "human touch" to the window, they are extremely valuable, and serve the same purpose as the wax model, with the additional advantage that they take up much less room, can be packed flat when not in use, and are infinitely less expensive.

Fig. 2 is a good example of what can be done with cut-outs in the window. This appeared in one of the windows of the Shropshire, Worcestershire, and Staffordshire Electric Power Co., and is reproduced from a block lent by the Priestley Studios, Gloucester, who designed and produced the background and cut-outs. Everything in the window, except the fire, chairs, and table, is cut out in plywood, so that it will be seen that this material affords scope for abundant variation in display, and enables the contractor to demonstrate the numerous advantages of electricity in a telling manner. In this case, the outstanding selling point seems to be the small amount of effort involved in illuminating a room by the electrical method. The idea of the child reaching for the switch is not, of course, original, but this detracts in no way from its forcefulness.

Movement is a powerful aid in attracting attention, and the occasional introduction of an animated element into the window is to be recommended. There are numerous moving display aids now available, worked either by clockwork motor or by electricity. One of the simplest for ordinary display purposes is the revolving stand, comprising a small motor in a compact cabinet, on top of which is fitted a revolving platform. This can be used in conjunction with pedestals supporting a series of glass shelves, by which means a varied range of small electrical accessories can be brought prominently before the attention of passers-by.

Fig. 2.—An example of the attractive appearance which may be given to a window by the introduction of well-chosen cut-outs.

Numerous forms of animated signs can now be obtained with moving effects. These can be employed to more particular

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advantage if made to link up with a definite line of goods in the window. If used indiscriminately, however, they may defeat their own ends by detracting attention from the actual goods, and merely provide a form of entertainment for the amusement of passing pedestrians.

A potency is added to the selling appeal if a seasonable "atmosphere" is inculcated into the window display. One aid in this direction is the painted scenic background. These are available hand-painted in full colours on stout cartridge paper, and measuring 96 by 60 in. A stock of, say, four of these, representative of the four different seasons, would provide the electrical contractor with suitable settings for his window for the greater part of the year, for they could be brought into use at intervals of about a fortnight or three weeks in their respective seasons, and when not employed in the window could be rolled up and stored.

## Artificial Grass.

Artificial grass is another form of display aid eminently suitable for spring and summer displays, and might well be used in conjunction with an outdoor setting demonstrating the pleasure of wireless in the garden, or the value of coloured electric lights for pleasure gardens, outdoor entertainments, and so on. Artificial grass is obtainable in the form of matting 1 yd. wide, and is sold in yard lengths. There are many varieties of window dressing papers available from firms specialising in display materials. They are generally supplied in rolls 12 yd. long, and 22 in. wide in numerous colour combinations, in check designs, or with a coloured ground overprinted with two-colour designs. These papers have a glossy finish similar to enamel, and can also be obtained with raised or embossed designs.

Display papers of this description are suitable for use on either the window base or enclosure, and can be rolled up after use until required again. Paper borders, for use as a frame for the window setting, can also be obtained in great variety in rolls 9 or 12 yd. long, in varying widths.

Odd lengths of wallpaper can be put to excellent use as window display aids, especially the Anaglypta and Lincrusta varieties. These latter have relief designs and lend themselves admirably for covering short lengths of panelling, or even the sides of packing cases, to be used as screens for dividing up the window into sections, when it is desired to display several different classes of goods at the same time without giving a confused effect. Local decorators can generally be persuaded to save their spare pieces of wallpaper, and to pass a bundle of them on to the electrical contractor occasionally, instead of consigning them to the scrap heap.

Colour has a distinct advantage in connection with window display. It has a definite selling value, for it can be used forcefully to demonstrate the seasonability of the electrical goods exhibited. A valuable aid in this connection is crêpe paper, for it can be obtained in nearly one hundred different shades, and can be employed in a variety of ways. The ordinary crêpe is useful as a background covering, while the decorative variety can be used to add to the general effect. Excellent booklets are obtainable from the firms specialising in this material, showing the multiplicity of ways in which it can be used for display purposes, and demonstrating the methods of fluting, ruffling, waving, and of converting crêpe paper into tubes or rosettes.

## The Topical Touch.

Topicality is another important factor in window display, and the electrical contractor who keeps in touch with local events will find it a good plan to introduce some reference to them in his windows from time to time, especially if he has carried out work in any way connected with them. For example, if he has supplied the footlights for a local dramatic show, or the illuminations for a dance hall, he can use his windows as a means of proclaiming his activities in this direction.

A particularly useful display aid for this type of topical or local-event display is a canvas screen upon which has been reproduced a coloured scene of a local place of interest or current event. By means of a special process, it is now possible to have photographs reproduced in colour on canvas, which can either be used as a background, or, on a smaller scale, as a screen for making a special central or side attraction for the window.

Such reproductions of actual scenes or personalities present obvious advantages over still-life effects, or merely imaginary scenes in the back of the window, and have a greater power in attracting and holding attention. Another point in favour of these photographic reproductions is that both scenic screens and scenic panels can be illuminated from behind. For this purpose they are supplied in translucent form.

There are now available special display fittings which enable the electrical contractor to exhibit individual products in a suitable setting without necessarily giving up a large space to each item. These display fittings can be adapted to show any of the smaller varieties of electrical goods. Each unit has a platform which affords adequate space for the display of the particular item in front, and a small painted scene in the form of a cut-out at the back. The units take up relatively little space, being only 12 in. to 15 in. high, and it will thus be seen that three or four of them can easily be used in a window of average size.

Fittings designed on similar lines, but with more pretentious effects, are box-form units. These are 4 ft. high and 2 ft. wide. They can be illuminated by means of concealed lighting at the top, and have a shelf upon which the particular article for sale may be displayed. One of these makes an admirable centrepiece for the electrical window, and is an effective and attractive means of bringing one particular line into prominence.

Another unit of somewhat similar type is also of box-form design with interior lighting effects. This is in the shape of a shield with two wooden pegs projecting from each quartering. These pegs are intended for the support of the goods or associated features, so that they form part of a heraldic design, and are thrown into prominence by the contrasting "field" of which they form the "bearings" or "charges."

This application of heraldic principles into window display is an interesting development, and there seems to be no reason why they should not be employed to a larger extent in window-dressing, as long as no actually existing coats of arms are used. Heraldry is an interesting subject, and offers scope for numerous new ideas in display.

One wonders how far the cult of modernism might be applied by the electrical contractor in dressing his windows. It obviously could not be used with the same freedom as it is by drapers and general stores; but there is much in its favour, if used with moderation.

## Modernist Experiments.

Some contractors seem rather afraid of the very word "modernism" as though it is something which will make window display an even more difficult undertaking than many of them now regard it. Modernism is merely a general term covering all art methods which have freed themselves from the conventions of the past. There are, of course, advanced phases of it, which are beyond the understanding of the layman; but the electrical contractor need not fear that, in order to introduce a modernist element into his displays, he must be *au fait* with cubism, futurism, impressionism, post-impressionism, expressionism, and other -isms which merely denote the different schools of modernist art.

As far as window display is concerned, modernism may mean nothing more than the introduction of a striking angular setting, which attracts a considerably greater degree of attention than the ordinary regularly arranged display. The motif being that the long-standing rules of balance must be ignored, and be replaced by angularity and sharp contrasting features.

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# FIFTY YEARS AGO.

## Local Authorities Consider Possibilities of Electricity for Lighting.

ITEMS of interest in THE ELECTRICIAN of July 13th, 1878, include the following:—

An illustrated description was given of Edison's micro-tasimeter or measurer of infinitesimal pressure, which was the outcome of his experiments with the carbon telephone.

* * *

A contributor drew attention to the fact that the "Illustrated London News," so long ago as August, 1844, gave an illustrated description of an instrument called the telephone. The apparatus was, however, not electrical, but depended on the use of compressed air. It was claimed to have been capable of conveying signals four or five miles.

* * *

A number of public authorities were considering the possibilities of electricity for lighting. The Metropolitan Board of Works had the question under consideration and the Chelsea Vestry, in view of continued complaints regarding the gas supplied to the parish, instructed their surveyor to visit Paris and prepare a report on the electric lighting installation there.

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# BOOK-KEEPING FOR CONTRACTORS.

## Keeping Proper Check on Goods—Examples of Working System—Analysis of Costs for Contractors—Comparing Labour and Material Costs—Collecting Accounts.

By HARRY MOSS, A.M.I.E.E.

FOR some years past the subject of book-keeping for contractors has had at various times more than passing attention, and although a certain amount of thought has been given to it by organised bodies, no definite step forward has been made. Electrical contractors, among others, have, in many cases, treated the accountancy side of their businesses as of minor importance, concentrating on the work of obtaining and executing orders. Such a method is bound sooner or later to result in chaos, and is, further, a distinct loss, in many ways, to the contractor. It is important that the man or firm carrying on a contracting business, however small, should have a reliable system of book-keeping which will prove, in any emergency, to be a true and faithful record.

A properly organised system of book-keeping is the only true guide to the results being obtained, be they good or otherwise. It will correctly show the true values of, and comparisons between cash and stock, between debits and credits, and between loss and profit. An argument often launched by some contractors is that a proper system of books is too costly to buy and run. This, however, is not correct.

In the following notes I will endeavour to explain the bare facts of a system which is working in my own business, and which has proved itself to be reliable. The system provides a check on goods dispatched to jobs, the labour costs per point, and allows a comparison to be made with other jobs. The

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**WORK SHEET.**

Issued to John Sparks. on May 12th. 1928

Job John Jones & Co. Ltd. 123 Blank St. Bradford.

| Date | Goods as per Sheets. Any deviations from schedule or extras on contract to be given on this sheet. |
|---|---|
| 9.A.3933 | Carry out Wiring work as per attached schedule in screwed tube and 600 Henzie wire. |

A specimen work sheet used by the author.

amount of profit made on a job within a day of its being completed is indicated, and all accounts can be kept up to date as far as it is possible to do so. The system also shows the number of purchases and sales each month which have brought in cash, reduced bad debts and left accounts in such a position that every manufacturer and merchant is paid every month.

As the sales and costing part of a contractor's business is the most neglected from a book-keeping point of view, I shall deal principally with this. In the ordinary course of trading, the contractor receives his suppliers' invoices and statements regularly, and can easily keep a record of these by prompt entry into his purchase day book and purchase ledger; these claims, invoices and statements should be checked as they arrive, and returned if incorrect. Since a contractor's business is a somewhat complicated one, and orders are received in many ways and forms, it is at this stage that the first check can be made. Some orders come in from firms bearing a number, some are received verbally by the principal or representative, others are given in the office or showroom by callers, while still more are received by telephone.

Assuming an order is received on an official order form by post for an installation as per a previous quotation, this should be acknowledged by the same day's post on a duplicate acknowledgment form, giving order number, etc., and bearing a number which can be reserved as a reference for the job. This acknowledgment form advises your customer that his official order has been received, confirms his acceptance of your quotation, and indicates that the order is receiving attention. At this stage a work sheet for the particular job can be issued, and this should contain all details necessary for the man working the job to know. Attached to this sheet should be a schedule of lights, points, switches, plugs, etc., a special duplicate of which should have been taken and filed when the quotation was tendered. This is then ready for handing to the man who is to take charge of the job, and will give him all the information necessary for him to carry out the work as intended. These remarks are not intended to apply to large public contracts where official specifications and schedules, blue prints, etc., are issued, although a similar routine would be followed in those cases, with the addition of a copy of specification for the charge-man's use, plans, etc. These hints are more particularly appropriate to those hundreds of jobs that come into the contractors' shops without the intervention of

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**SCHEDULE.** Page

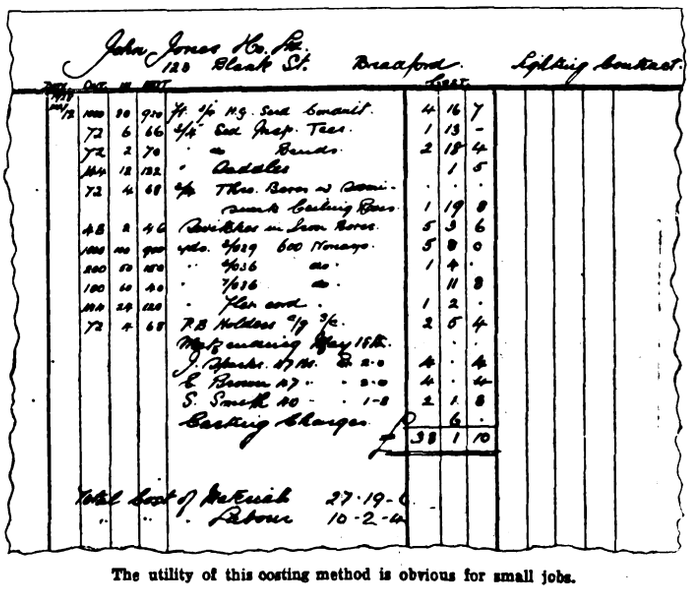
Messrs John Jones & Co. 123 Blank St. Bradford.

| Position | Lights | Switches | Plugs | Remarks |
|---|---|---|---|---|
| No 1 Warehouse | 12 | 8 | | All wired to lampholders only. |
| 2 do. | 13 | 8 | | Lamps and shades not included in |
| 3 do. | 10 | 4 | | Contract. |
| 4 do. | 9 | 3 | | |

Another form useful to contractors.

consultants, architects, etc., and where the contractor has received an inquiry, quoted and obtained the order.

The next link in the chain is the starting of work, with the consequent removal of stock from the stores to the job. In my case, all goods drawn from the stores for any job must be entered into a duplicate book and signed for, one copy going to the job, so that the man in charge may know exactly what he has drawn, and the other copy remaining in the book, to be transferred, daily, into a loose-leaf costing journal or day book. Into this latter book all goods booked out are transferred; from this the costing and invoicing is done. For small jobs lasting up to six days or thereabouts, the cost of goods is not entered until the job is finished, owing to the question of returns, which must be allowed for. For this reason the loose-leaf book has three columns prior to the list of names of goods, one for "out" goods, one for "in" goods, namely, returns from the job, and the third for net quantity used; the latter is the column that is costed. These returns must, of course, be checked and accounted for in the stores before they can be entered into the costing book, and are therefore entered into a goods returns book. (An ordinary foolscap book will serve for this purpose.) It is at this stage that the cost clerk is able to check the goods returned, in that, if a man has gone on to a twenty-two light job, on seventeen




The utility of this costing method is obvious for small jobs.

switches, and has drawn twenty-four ceiling roses and eighteen switches, it will naturally follow, providing he has not had instructions for any extra lights, that he should return

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two ceiling roses and one switch, and any shortage has to be accounted for. With regard to wire, tubes, etc., the returns, in yards and feet, are booked in the same way, and an average of goods per point made out by the clerk in his analysis. On some jobs, where all wiring is visible, the tube used is measured, and a check taken, to see that care is being used in the booking and use of materials.

In the case of verbal orders being given in the shop or on the telephone, for repairs and odd jobs, these are entered at once with all particulars available, on to a work sheet. They can then be acknowledged on the usual form by post, if not attended to at once. Each of these small repair jobs can have

HARRY MOSS, A.M.I.E.E., National Registered Electrical Contractor, 82 Leeds Rd., Bradford

TIME SHEET of C. [illegible] Week ending May 17th. 1928

| W/O | JOB | M. | T. | W. | T. | F. | S. | Total | EXPENSES | | DETAILS AND REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3801 | Mr Sparks Nigh St | 8½ | 4½ | 2 | | | | 15 | | 9 | Lighting Job. |
| 3807 | J Robinson. | | | 6½ | 8½ | 4 | · | 19 | | 9 | Lighting Job. |
| 3818 | Mr Power. | | | | | 4½ | 2 | 6½ | | 6 | Motor Mining |
| | Mr Jas. Nigh St | | | | | | 1 | 1 | | | Replacing Fuse |
| | Smith . . | | | | | | 2 | 2 | | | Lighting repairs |
| | Brown Mr. Bank St | | | | | | 1½ | 1½ | | | Replacing Bells |
| | Right St. Bank St | | | | | | 2 | 2 | | | Replacing faulty Motor. |
| | WEEK | 8½ | 4½ | 8½ | 8½ | 8½ | 5½ | 47 | | 1 11 | |

47 Hours at 1/8 Wages £3 18 4

Total expenses as given — — £ 1 1 11

Gross amount due £4 0 3

Less Insurance — — — £ 1 1 4

Net amount due £3 18 11

Received by

Give full details and names and addresses of every job worked on.

A specimen time sheet for contractors' workmen.

the time entered against it on the work sheet, so that the invoice can be sent without waiting for the time sheets at the end of the week. Naturally, labour is very important and the cost of a job cannot be obtained until the time has been ascertained. Every man must give a correct record of his time on all jobs he has been engaged on during the week, and the style of time sheet employed is self analysing, in that it gives the total hours on each job and the totals per day and week in a simple form.

After entering in the time and wages book the respective labour is then transferred on to each independent job, and as soon as the job is finished and signed off by the workman responsible, the job can be costed and the invoice rendered. All these latter must, of course, go out under a reference number, and different methods of invoicing are adopted by different firms. Whilst some will write invoices out in indelible ink and copy them in an invoice copy book, some will type them in duplicate, retaining one for office filing and recording, and others will use a duplicate invoice book, keeping the copies bound in the book.

My present method, and one which I have found highly satisfactory, is as follows: The terms are distinctly printed on each invoice form. Strictly monthly settlements are insisted upon if the 2½ per cent. discount is allowed, and interest is charged on overdue accounts. Since instituting this duplicate book method of invoicing, the account goes with the goods when such can be priced immediately, thus saving time in making out delivery notes, and re-writing in the invoice book. For instance, when anyone sends or calls for a dozen lamps, the invoice is made out and handed to them with the goods, and it has been found that since this was done, nearly 50 per cent. of these accounts, and also repair accounts which can be sent out weekly after the time is extracted from the time sheets, are paid before a statement can be sent at the end of the month. This is an important item, because the cost of bookkeeping is then considerably reduced, and there is, further, a saving in stationery and stamps, with the added advantage that the cash against these accounts is being received daily. As these invoices go through each day, they are posted to the sales day book and the sales ledger, with the result that the total value of the monthly sales and jobs completed is known during the first week of the following month. Immediately these are entered, statements are sent to everybody concerned, showing the state of their accounts up to the end of the previous month, these statements reaching them about the 6th or 8th day of the month. The statement forms show the total number of invoices rendered during the previous month, as "accounts rendered," the total of those a month older are shown as "overdue," and those prior, if any, as "much overdue;" if the account is not then paid at once, a charge for interest is sent.

If no reply is received after two applications, the account is put into a solicitor's hands, with instructions to take the matter to Court if not paid on demand. This may seem unreasonable to many, but it is business, and a customer is no use as a customer, if he will not, cannot, or does not intend to pay his accounts when due. This system of book-keeping has paid me, and fully warranted its adoption.

Another point is the question of keeping a check on progress of work, especially on jobs away from the shop and where the charge hand cannot be seen every day. This is done by means of daily progress sheets. Where a job or charge man has not been seen by me, one of these cards has to be left at the office, or, if away, posted each night; in this way the schedule in the office records can be marked off daily, so that each day's work is known and the general progress of the job noted.

A stamp book and a petty cash book should also be kept in order to show all small disbursements.

To some comparatively small contractors, this procedure may seem too elaborate, but once the books and forms are obtained it works out very simply, and is efficient. It is not contended that the system is perfect or would suit every business, but it serves to keep books up-to-date and the contractor in touch with all the jobs going through; it further gives an analysis of the costs of all jobs, the ratios between materials and labour, labour costs per point, the amount of profit each job makes, and many other things.

If contracts lasting some considerable time are being dealt with, then the cost of materials sent on to the job is entered and added daily, while the wages are added weekly. In this way as each week goes by the total cost up to date is known, and by checking the progress of the work a very good clue is obtained as to whether it is working out on the estimate.

Contracts. Analysis of Cost.

| DATE | JOB | Men in charge | SYSTEM | LIGHTING POINTS | SWITCHES | PLUGS | TYPE OF SURFACE | TOTAL LABOUR | LABOUR PER POINT | TOTAL MATERIALS | TOTAL NETT COST | COST INCLUDING OVERHEAD 44% | CONTRACT PRICE | PROFIT | LOSS | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb. 6 | Mr Sparks. — High St. | J.C. | C.T.S. | 11 | 13 | — | Surface | £ 2 12 0 | 4/- | £ 9 4 · | £ 11 16 · | £ 13 11 · | £ 14 18 · | £ 1 7 · | | |
| " 9 | Mr Light — Low St. | H.J. | C.T.S. | 6 | 6 | 1 | Sunk. | 2 5 · | 5/- | 6 2 · | 8 7 · | 9 12 · | 11 · · | 1 8 · | | |
| " 10 | Mr Power — Johns St. | R.C. | C.J. Box | Motor | Mining | | Surface | 1 18 · | — · · | 5 12 6 | 7 10 6 | 8 13 · | 10 15 · · | 2 2 · | | |
| " 11 | Mr Short — Market St. | J.C. | L.C. | 5 | 5 | — | Surface | 1 18 · | 4/7 | 2 4 6 | 5 2 6 | 5 7 11 | 5 10 · | · · · | 7 11 | Broken off job several times |
| " 17 | Messrs Smithers High Hill | R.C. | H.C. Steel Conduit | 195 | 84 | — | Surface | 9 7 10 | 10 · | 136 10 · | 234 · · | 257 8 · | 296 · · | 38 12 · | | |

Illustrating a clear and simple method of analysing electrical contractors' costs. The system used in this case is explained in the article above and on the previous page.

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# HOW DOES THE CONTRACTOR STAND TO-DAY?

## Can Contractors obtain Share of Increased General Expenditure?—The "Trade Terms" Joke—Results of Under-cutting—A Favourable Outlook despite Present Difficulties.

By DONALD SMEATON MUNRO, M.I.E.E.

THE question "How does the contractor stand?" might form a pleasantly ruminative speculation, tinged with a quality of wonder after, say, a very special conference dinner, where the wholesale agents had proved decidedly complimentary in word and deed. Then the query would be one of mere perpendicularity and of no permanent moment.

This short article purports to be a little more serious, and to treat of the influences and tendencies which indicate the present standing of contractors in the electrical industry, and to reflect from the writer's somewhat detached northern viewpoint, a few of the questions which his brethren at Cheltenham have recently been asking themselves.

Times are changing; the old-established contractors had as their best customers the landed proprietors, the upper middle classes, the busy capital industries and factories which made Britain the world's workshop. Taxation and other causes have greatly curtailed the possible revenue to the contractor from these sound sources.

Wages have doubled and there has been little increase in the number of larger buildings—except perhaps in central London, where hotels baited for Americans, emporium rivalries and leasehold conditions have had sufficient influence to overcome the tendency to wait for cheaper labour. In general, the money-changers rather than the crafts are having their day: the banks; the investment companies; the brokers and the bookies flourish. Although wages are high for the proportion of men employed, few have the will power to save when legislation is in the direction of relief from personal responsibility. There is a spreading out of the population into houses which cannot be paid for without Government help, and this, together with the lure of attractive clothing and other personal luxuries, has engendered, in a large section, a condition of letting the future look after itself. There is more spending, lending and speculating and less saving. There has been an increase in the proportion of the nation's money which is paid out in weekly wages, and the electrical industry has to win its share of the difference between what the pay clerk hands out on Saturday to the unthrifty, and what goes into the bookmaker's bank account on Monday morning.

Is the electrical contractor ready and competent to handle the mass business of this shiftless class? Can he tempt, by advertisement and display, small customers by the hundred thousand, and skin them neatly and weekly of little sums which in the aggregate, and in the end, must cover all the costs of expensive showrooms, advertising, sales organisation, collectors, generating costs and interest, and still yield profits which make electricity supply shareholdings among the most attractive on the market? The contractor, as at present constituted, is assuredly neither ready nor fit to work that sort of business. His share in it can only be as a wiring unit in the schemes promoted by corporations and other favoured supply authorities. The contractor sees all around him other wealthy sections of his industry launching on this new sea which presumably is chock-a-block with sprats. Corporations and supply companies are now active retailers, and the larger manufacturers seem to be preparing to enter in rivalry with their trade customers to drag-net the retail shallows.

### Indiscriminate Granting of Discounts.

There are other methods by which the slowly built-up business of contracting, as we know it, is being eroded, and these are felt more keenly than the loss of a class of trading we have barely touched. There is, for instance, a great extension of the practice of granting indiscriminate discounts, and it is a reflection on the honour of our industry as a whole that the retailer should be over-reached so systematically.

Take the experience—quite a common one—of an established contractor; at first he regularly supplied railway companies, ships and shipyards, country houses by the hundred, hotels, theatres and large shops with lamps and fittings. Now nearly all these customers can buy as, or more, cheaply than the most completely qualified certified electrical engineer who is at the same time a contractor. The contractors' protest of some years ago was countered by the reply that these customers were all big buyers—and that was that!

To-day it is not even necessary to be designated a big buyer. Take some typical examples from the last few weeks' trading of a common contractor.

A firm of motor-car agents asks him to fit a light and power installation, but to leave out lamps and fittings. A similar request comes from a retailer of cheap jewellery, a boot shop, and an architect; a church office-bearer presents radiators for the heating installation fitted by the contractor, but buys them direct at trade terms because he is connected with a firm of engineers. Another church stops lamp renewal orders since a son of the caretaker got a job with a manufacturers' agent. A lawyer claims discounts because he is the secretary of a cinema company. A doctor buys from his trade association. Almost anyone now apparently can claim trade terms for some of the every-day things which the contractor advertises and stocks.

The topic of discounts on electrical goods to the general public has now come to be accepted as a kind of playful joke played on the contractors by the genial manufacturers.

Real concerted action by our Associations, in fact, and not in form only, could greatly minimise this evil, but our interests are so divided that we often find it difficult to combine effectively in such matters. Many contractors have practically given over the stocking of certain appliances, and devote their energies in other directions where there are surer rewards for the labour of pushing and selling.

### The Sins of Contractors.

Let us have some more of this black side of the picture. It is what the technical Press have learned to expect from a scribbling contractor. Having briefly indicated some of the adverse omens which may affect us from the outside, let us humbly review some of the sins which, it seems, so easily beset us as contractors. We hide; we do work for less than nothing; our finance is rotten, we don't hang on to our jobs. These are not half our weaknesses, but let us consider these.

Complete neglect of, or spasmodic attention to, our windows and showrooms is a real and very common fault with us. Help to remove this reproach to our trade! If you do not feel justified—till that architect settles—in calling in the painter now, get busy with soap and water; fit plugs for varied lighting; throw out those dusty accessories which interest nobody; subliminate yourself into a possible client appraising your window. Look at other windows and learn what attracts. If you doubt your own abilities in window dressing appoint a junior member of your staff as your display agent; encourage him, or her, to read up and study the subject and to express to the community what your business can do for it. Some people live off their shop windows; you should at least be able to pay your assistants' wages from the increased sales acquired by the regular attention.

Expensive or extensive stock is not necessary for effective display. An armchair, a glowing radiator, an open book and a good standard with "just the shade" may be more compelling than a windowful of two-pin tinnies from the U.S.A.

Another common fault of the contractor to-day is his lack of proper advertising matter. Too often this is considered a last resort in dull times. Advertising by circular with invoices should be continuous, by letter should be frequent, and by newspaper should be regular; and the latter need not be expensive. Some distinctive phrase or even single word may convey the quality of your work to the right group of possible customers ready to respond. Spend a bit more than you think wise on wise advertising. It gives an increased feeling of confidence and importance which is of some psychological value in dealing with prospective clients. You can only buck up your clients if you yourself are mentally bucked up.

Undercutting is a common failing in contracting, and the commonest cause of failure. Any ignorant rogue can steal a profit, even at a low price, with scamped and shoddy work. Our trade has suffered from the rushing in of fools through the doorway of the lowest tender system. It takes character, reputation and energy to keep going year in year out at remunerative prices, and these must be obtained if the contractor is to continue to stand.

The new buying public has to learn the difference between good and bad electrical work. It may even be misled by those

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within our industry who more or less despise wiring and ask from it no excellence, other than it be cheap, and just durable enuogh to permit, in regard to their products, the biggest possible sale with the help of the largest possible variety of retailer. It is the duty and task of the contractor to educate the people to the fact that poor electrical work is dangerous, wasteful, and dear at any price. He who has the personal energy to follow up his inquiries and his estimates, and convince his prospective clients that good work is well worth paying for, can still reap his reward. In this sometimes difficult task the whole industry, the National Register and the insurance companies should, perhaps, help him more; but their tendency is in the right direction.

Our work is so varied that the writer has little faith in standard specifications as a means of eliminating the unfit and the fraudulent. Even the most detailed specification for a particular installation has its loopholes for the dodger. The client who gets the best work and the best value for his outlay is he who selects his contractor as he would choose his lawyer or his doctor.

Perhaps by temperament, some contractors are remiss on the accounting side of their business. At the end of each week one should know the outlay on all contracts in hand. Prompt, clearly worded invoices and monthly statements bring your best clients about, and there is no one more willing to place more orders than he who has already established himself as your patron.

Maintenance is a branch of contracting which should be more developed. Clients realise that no other is so likely to have at heart the best interests of an installation as the skilled man who fitted it originally. Being proud of his list of long-lived and efficient installations he should arrange for periodic visits of inspection, test and honest report.

### Bright Opportunities for Contractors.

Having made a hurried essay to alarm my contracting friends, and preached a little on some faults which we all know perfectly well how to correct, let me say that, in many ways, never did the contractor stand in such a favourable position as in the middle of the year 1928. There is a great and growing outlet for his work in a fair-minded country which is returning to prosperity and sound finance. He has many well-wishers in the industry and great associations with devoted officers and men of wide experience to lead their councils. The contractor is probably now the chief employer of really skilled electrical labour; through his shops pass the army of scientifically trained apprentices intent on the widest possible electrical experience. Knowledge has not ceased to be power, and no one knows the electrical requirements, the problems and their solution, or can so well serve the varied needs of the independent Briton as the contractor backing his own business with his own capital and efforts.

If there are difficulties and flaws in and around our business let us work to clear them away. We should not expect others to do for us what we cannot do for ourselves. Take an active part in your trade association. Have a way and a will of your own, and put both at the service of the Association. Share the responsibility. Contribute something to the Benevolent Fund when Robson asks for it, and so doing, taste the exquisite bless of a "brother to relieve." Above all, join and support and promote the objects of the National Register, and so show that you have "undertaken the responsibility" of being a real electrical installation contractor.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Shoddy Wiring.

[To the Editor.]

Sir,—To a mere wireman who has followed with interest the articles and correspondence in your paper about shoddy wiring, it would appear that the real factor in this matter—in fact the only one that counts—has not been taken into consideration: money and its worship.

While people strive to get the most they can for the least cost, electrical contractors can have no conscience, even if they wish to, in view of the cut-throat competition that prevails. To-day the finest and most efficient workman is the one who turns out most points per day, with the result that those workmen who prefer to do their work properly are considered to be incompetent for shoddy electrical work.

With some of the specialised wiring systems of the "tin-tack-hammer" type now on the market, electrical knowledge is not necessary. Anything will do if it is electrical, and many men bitterly regret taking it up as a career, with the glorious prospect of being out of work four months in the year. Of course, if a man by accident of birth is born under a lucky star he may obtain a post as under-chauffeur (as advertised recently) with the control of a 50 H.P. semi-Diesel engine and battery of 108 cells, and look after the installation, etc.

Even some of the supply companies turn out some high grade work on the contracting side of their business, especially, I understand, in the London suburbs.

Registration, in my opinion, will not improve conditions, as there are very few who carry out strictly the rules laid down by the Institution of Electrical Engineers, and I cannot see that, from results, there is any justification for their existence.

Still it is not the electrical industry alone which is afflicted, the trouble exists throughout the country, except in those 100 per cent. trade unions, the lawyers and the doctors.

Industry as represented by manual labour (skilled mechanics) is being boycotted by the rising generation, though it is stated that Great Britain is a manufacturing country. The average unskilled labourer, with no tools to buy and lend to those who deem it beneath their dignity to have any, is infinitely better off financially, taking the year through, than the deluded imbecile who dreams that by study and obtaining an efficient kit of tools for any job that comes along he will obtain a comfortable living.—I am, etc.,

"Wireman."

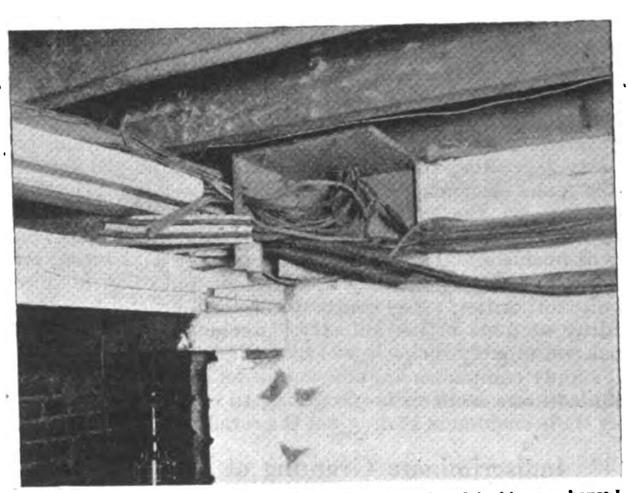
[The question raised by our correspondent as to the number of points which a wireman should complete in a day obviously has a bearing on the "Shoddy Wiring" question, and though the rate of working is obviously dependent on the class and construction of the premises in which the work is being done, it would be interesting to have the views of readers as to how far it is possible to speed up installation work without sacrificing good workmanship.—Ed.]

[To the Editor.]

Sir,—In issues of your journal in April you gave some examples of shoddy wiring.

As I am now residing at Ealing, and as at the beginning of the year I had notice given me that the pressure would be altered from 110 to 240 V, I had my wiring examined.

I enclose you a photograph of part of the wiring under the



**What the chairman of the Wiring Rules Committee found in his own house!**

ground floor, and I may explain that at the point shown there were wires run in wood casing, in slip conduit, also lead-covered twin wires and rubber wires with no protection, all meeting in a roughly made white wood box of which the front and side had been removed. Apparently, whenever a further circuit was needed, a little insulation was scraped off, another wire fixed on with a little solder, and sometimes the joint taped up.

"And this is what the chairman of the Wiring Rules Committee had in his own house."—I am, etc.,

L. B. Atkinson.

### Super Tension Cables.

[To the Editor.]

Sir,—I have read with interest Major A. M. Taylor's letter in your issue of June 22nd, in which he discusses the report in

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the "Electrical Power Engineer" of my recent lecture before the London Technical Group of the Electrical Power Engineers' Association.

Major Taylor appears to have supplied in his letter the answer to the questions he has raised, since I quite agree that my attention was in this particular paper concentrated, though not exclusively, upon cables for 33 000 and 66 000 V (where the advantages of "reduced stress types," including intersheath types, are as, Major Taylor points out, decidedly less marked than theoretical considerations would indicate to be the case at 190 000 V, say), which are within the realm of practical politics at the present time.—I am, etc.,

N. A. ALLEN.

London,
June 26th.

[We have shown Dr. Allen's letter to Major Taylor who has furnished the reply printed below.—ED.]

[TO THE EDITOR.]

SIR,—I have noted Dr. Allen's reply to my letter in your issue of June 22nd and regret that he has found it necessary to suggest that my proposals were out of the realm of practical politics. Does he suggest that *anything* of a higher voltage than 66 000 V is "out of practical politics?" And if so, is he aware that one or two of the leading German firms from time to time advertise their readiness to carry out transmissions with 110 000 V underground cables; and that one, at least, is carrying out an important commercial transmission at 100 000 V; or that the 132 000 V "non-oil-fed" cables at Newark, N.J., have now been under test for about a year continuously at this pressure, and transmitting, at times, 80 000 kW?

One of these days it will, I believe, come home to some of our consulting engineers that they are paying £400 000 on transmissions in certain cities where they could (I say "could"; but I might say "*can*") do the job for £100 000; and *then* pressures above 66 000 V will come into "practical politics." But it may be that this will be through the instrumentality of one of the firms that now advertises its ability to carry out 110 000 V installations.

However, it is satisfactory to know that at last two British firms are ready to make these cables (though apparently afraid to advertise the fact), and there are probably others.—I am, etc.,

A. M. TAYLOR.

Birmingham.

# THE BATTI-WALLAHS.

## Sir Philip Nash on the Requirements of the British Electrical Industry.

SIR PHILIP NASH, chairman of the Metropolitan-Vickers Electrical Co., was the guest of honour at a luncheon of the Batti-Wallah's Society held at the Hotel Cecil, London, on Wednesday, Mr. R. W. Hughman in the chair.

As an Anglo-Indian, Sir Philip said the name of their Society sounded familiar. To some it called up visions of the East, the glamour of which was said to linger, though that had not been his own personal experience. Batti-Wallahs, he understood, were amphibious, so he might make some reference to marine engineering, a field in which electricity, after many years, appeared now to be making very interesting progress. Only those who had seen the big P. and O. boat that was now being built and the electrical plant that was being installed in her, and the great Singapore floating dock, could realise the important part that electricity was destined to play in the future of marine engineering.

Coming back to land, however, Sir Philip pointed out that while the supply of power and the manufacturing of electrical goods formed two distinct sides of the electrical industry, their paths lay on the same route. The manufacturer's duty was to provide his customers with plant and machinery of the best possible design at the most reasonable cost, and he relied upon the supply undertakings to provide electricity for the people and to teach them how to use it.

There were, of course, differences in outlook between the two sides. In this country the supply industry had neither imports nor exports. On the Continent several countries were importing and exporting electricity. He would not say that similar development was possible here now, but it might be in time to come. To-day it was a self-contained industry.

On the other hand, the manufacturer had no limits to his territory. British electrical manufacturers sought for overseas trade, and they were not behindhand; in fact they were in the forefront of the world's electrical production. The biggest and most highly developed turbines, transformers and other large plant were made in this country for export long before similar apparatus was required for home use. So that to-day, when the home market wanted large plant, British manufacturers, having learnt the business, were excellently qualified to supply it.

The export of manufactured electrical goods, Sir Philip continued, was absolutely vital to the electrical industry, and he considered that not less than 50 per cent. of our output should in the normal way go overseas. To-day, Great Britain was the world's largest exporter of electrical apparatus; the margin, however, was not very large, and we should need to exert every effort to remain in that position.

Reverting to the supply side, Sir Philip said he was pleased to see the Central Electricity Board getting down to work in a businesslike manner, but when one learned that the first three schemes which they had produced and published had made 48 selected stations, one wondered whether they had not got away from the original intention of the Electricity Act of 1926. If they continued in this way it appeared likely that eventually there would be nearly 100 selected stations, a number which, in his opinion, was far too large.

It was also notable that while the three schemes so far produced covered only about one-third of the area of the country, they served the needs of about two-thirds of the population. As it was easier to devise schemes for densely populated areas it seemed as if the Board had their most difficult task before them.

### Problem of Selling Power.

While the powers of the Central Board covered generation and transmission, they did not deal with distribution. This was the side which would become more and more important in the future. But he did not believe it possible that we could increase the consumption of electricity by three or four times unless the methods of selling electricity were radically changed. It might be called educating the public to use electricity or merely the selling of power as a commodity, but the education of the public could only come from the setting up of commercial organisations to sell power. He saw very little evidence that this was being done to-day. The consumption of electricity would not quadruple itself of its own volition, and therefore the question of selling power was the most important one before the industry. The object of all within the industry was identical, and they must look to the power undertakings to set up the selling organisations to which he had referred.

The profits made in electrical manufacturing were totally inadequate. "I want volume of business," Sir Philip added, "but I cannot see it coming unless some one gets out and sells power."

Already, he continued, the industry has about £450 000 000 of capital invested in it, this being mainly in supply. It was a small figure compared with the investment in some countries, but there would be no lack of money for investment in public utility enterprises.

Speaking as a manufacturer, he had alluded to the importance of the export business, but he wanted to speak of one disadvantage of the electrical manufacturing industry in this country. The home market was small, and at present only absorbed about 50 per cent. of the output. Our competitors had the advantage here, for placing the ratio of Great Britain's labour costs and taxation at 100, Switzerland's figure was 93, that of France 95, Germany 85, and Belgium 58.

This was a serious disadvantage, but we could contend with it if we secured the requisite volume of business; if we could build up the home business, he for one was not in the least afraid of taxation. If we failed to get the volume we should lose our premier position.

It was up to all in the industry to work together, and to utilise every conceivable opportunity to hasten the march of progress. We must continue to improve manufacturing methods and re-group our manufacturing units to obtain greater economy and efficiency both in manufacture and distribution. We should also give liberal support to research work and raise the whole scientific level of the people.

Mr. H. Howard proposed the vote of thanks to Sir Philip, and it was announced that there were two new Batti-Wallahs present in the persons of Messrs. S. T. Allen and A. J. Hedgcock.

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# BATTERSEA EXTENSIONS.

## Details of New 10 000 kW Set and Sub-station Equipment.

THE Mayor of Battersea (London), Councillor R. C. Kiloh, who is also chairman of the Electricity Committee, opened on Friday of last week an extension of the Council's generating station at Lombard Road, while a visit was also made to the new automatic sub-station at Lavender Hill.

The two new boilers installed were manufactured by Babcock and Wilcox, Ltd. The boilers are of the cross type marine design, and steel cased. Each boiler has a heating surface of 10 202 sq. ft., and will evaporate 65 000 to 95 000 lb. of water per hour from feed water at a temperature of 175 deg. F. into steam at a working pressure of 325 lb. per sq. in. at the boiler outlet. The superheaters are of the integral type, each having a heating surface of 2 886 sq. ft., and being designed to superheat the steam to a final temperature of 700 deg. F. The economisers have 5 000 sq. ft. heating surface and are superposed on the boilers. The air heaters, also superposed on the boilers, are of the tubular type, and in this case the heating surface is 14 000 sq. ft. Boiler No. 12 is fitted with a forced draught compartment type stoker, which consists of two grates 9 ft. wide by 18 ft. long, giving a total grate area of 324 sq. ft. Boiler No. 13 is fitted with an Erith-Roe stoker, also of the forced draught type, and having twelve retorts. The stoker arches are of the Liptak flat suspension type.

The coal and ash handling plants were also manufactured by Babcock and Wilcox. The coal bunkers are fitted with outlet valves of the Simplex type, which give a discharge of coal from the bunkers into 2-cwt. weighing machines, supplied by W. and T. Avery, Ltd.

### Interesting Turbine Construction.

The turbine is one of the Fraser and Chalmers standard high pressure impulse multi-stage type, designed for a normal load of 10 000 kW, but capable of a maximum load of 12 500 kW, and runs at a speed of 3 000 revs. per min. at a steam pressure of 300 lb. per sq. in., 750 deg. total temperature. The turbine rotor is worthy of notice. The blades in the high pressure section are attached to a sleeve, which is provided with grooves, the blades being inserted by means of specially designed roots. The sleeve is arranged on the shaft with a small clearance, so that the shaft is protected against the high temperature of the sleeve. In the low pressure portion, the blading diameter has to be made larger, and wheels are, therefore, used to carry the moving blades. The discs are made from solid steel forgings, machined to a smooth surface, while the blades are fixed to the rim of the wheel by means of a method of riveted fixation. Each blade is milled from a solid nickel steel bar. Another feature in the construction of the machine, in respect of the high pressure portion, is the use of steel only for those parts coming in contact with high pressure steam. The high pressure casing is constructed of cast steel, while the nozzles, the guide vanes, and moving blades are made from nickel steel forgings and carefully machined. The glands, both at the h.p. and exhaust ends, are of similar design, consisting of boxes in halves, attached to the top and bottom halves of the casing respectively, and of sleeves mounted on the shaft. The boxes have at their inner periphery, and the sleeves at their outer periphery, a large number of fine edges turned out of the solid.

The high speed alternator for coupling to the turbine was built at the G.E.C. Engineering Works at Witton. It is designed for a normal rating of 12 500 kVA when running at a speed of 3 000 revs. per min., on a 6 600 V, three-phase, 50-cycle circuit. It is also capable of giving an overload of 25 per cent. for two hours. For controlling, regulating and protecting the new 10 000 kW alternator, and for linking up to the existing busbars, an installation of metal-clad switchgear, supplied by the Metropolitan Vickers Electrical Co., has been installed. The new equipment consists of two metal-clad compound-filled oil circuit breaker units, having duplicate busbars, together with a control board, an automatic field-breaking switch pillar and neutral earthing equipment. The units of this installation are insulated for 11 000 V service, and each unit has a rupturing capacity of 500 000 kVA. One unit operates in conjunction with Merz-Price balanced current protective gear for the control and protection of the 10 000 kW turbo-alternator; the other unit controls the interconnection between the new and the existing busbars.

*(To be continued.)*

# MINING EXHIBITION.

## Some of the Electrical Exhibits at the Manchester Show.

AMONG the exhibits to be seen at the Colliery and Mining Exhibition at Manchester this week is a wide range of apparatus manufactured by the Metropolitan-Vickers Electrical Co., Ltd., for practically every electrical application in colliery work. The exhibits are of both ordinary industrial types for use above ground and in non-fiery mines, and flameproof types for use in workings where Regulation 132 of the Coal Mines Act applies. An interesting development in a.c. motor design is shown by new lines of ball and roller bearing machines. Examples are exhibited of three types, designated respectively type S (squirrel cage), type W (wound rotor) and type MS (squirrel cage mining type). A type MW (slipring mining type) has also been developed. An important feature of the construction of these machines is that they can be dismantled and reassembled without disturbing the press fits of the bearings, thus obviating the necessity of skilled labour for refitting after inspection and cleaning. Another interesting feature is that the types S and W motors have end brackets which can be adapted or converted to any desired type of enclosure and ventilation system. The type MS motors have flameproof casing as standard. A special exhibit is made of a type MS motor dismantled as for inspection. A type SF flameproof switch pillar of 250 A capacity at 3 300 V is also exhibited, representing a range of units which have been extensively adopted for mining and other industrial applications. The units are made for service up to 3 300 V with flameproof enclosure and up to 6 600 V with non-flameproof enclosure. The switch is an oil circuit breaker fitted with loose handle and designed to give a high speed break. It is arranged to slide upon aligned steel bars fixed to the pillar, and when withdrawn from the sockets the breaker and all accessories are completely isolated from the supply.

### Safety Measures.

The instrument transformer compartment and the busbar chamber are compound filled. Special features are included to give automatic protection and also to guard against mistakes liable to be made by careless or unskilled operators. On the flameproof gear two instruments, e.g., an ammeter and a voltmeter, can be accommodated on each unit. A dwarf pillar mounting can be supplied to suit low headroom in colliery workings. A switch or control pillar of smaller capacity, and for non-flameproof service, is the Metrovick type OMS. The unit exhibited is of 125 A capacity for 440 V service. The switch mechanism is of the free handle type, operating through a toggle and giving two breaks per pole under an ample head of oil. A type OSV rotor starter is exhibited on the type OMS pillar already described. These starters are made in flameproof and non-flameproof types for motors up to 150 H.P. The starter has switch mechanism of the face-plate type, immersed with the necessary resistances in a welded steel tank of oil which gives a high thermal capacity. An ample number of contacts is provided to give smooth acceleration. A type OML starter forms another exhibit. This type is flameproof and can be arranged for direct, star-delta, series parallel, or auto-transformer starting. It is made in standard sizes for use with motors up to 100 H.P. on circuits up to 650 V, and is particularly suitable for the control of pumps, fans, screening plant, etc. For a.c. motors driving haulages, pumps, and other equipment for which speed regulation is required, an effective control unit is the Metrovick type MFA drum controller used in conjunction with suitable resistances. The exhibit is suitable for control of motors up to 60 H.P. on circuits up to 650 V, but the range of units built provides for service up to 160 A continuous or 240 A intermittent on circuits up to 3 000 V. For voltages above 650 the controller is used in the rotor circuit and interlocked electrically with a separate oil-immersed h.t. reversing contactor switch controlling the stator circuit.

The Metropolitan-Vickers exhibit also includes the gate-end box and control switch which constitute the equipment of the company's system of protection for motor-driven gear used at the coal face. The system is especially applicable to coal-cutters and coal-conveyors driven by direct-started squirrel cage motors. The flameproof gate-end box contains a main contactor with protective and re-setting devices. It is arranged for installation at the end of the feeder line, and is controlled by a flameproof control switch mounted in the coal-cutter or conveyor.

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# NEWS IN BRIEF.

ELECTRICITY has been substituted for the poleaxe in many slaughter houses in Berlin.

Thirty-five metal frame towers more than 150 ft. in height, each carrying six 1 200 c.p. electric lamps, illuminate Austin, Texas, at night.

It is expected that during 1928 no less than 550 000 H.P. turbine capacity will be installed in new hydro-electric developments or existing stations in Canada.

Electrical imports into the Irish Free State for the first five months of this year amounted to £178 605, compared with £162 192 for the same period last year.

The first of six 34 000 H.P. generators installed at the Gatineau Power Co.'s station at Paugan Falls has been turned over in preparation for its going into operation.

Electrical workers of a Western State of America are urging the passing of a law forbidding the training of climbing roses and vines on overhead power transmission and telephone poles.

During April central stations in Canada generated 1 262 661 000 kWh, of which 1 246 232 were produced by hydro-stations, compared with 16 429 000 generated in fuel power stations.

Worcester Electricity Committee are considering the adoption of an assisted wiring scheme for the smaller houses, together with the supply on a hire-purchase system of electric cookers.

Last week a party representing the Development Commission and the Rural Industries Bureau spent a day inspecting farms and rural industries supplied with electricity from the Chester undertaking.

A new transformer station is being erected at West Didsbury by the Manchester Electricity Committee at a cost of £10 000.

Final tests are being made of the hydro-electric scheme at Maentwrog. The scheme is reputed to have cost about £1 500 000.

The Tyne Electrical Engineers, R.E., under the command of Lt.-Col. H. H. Firman, completed their fortnight's annual training on Sunday last, when the Anti-Aircraft Searchlight Company returned from Kenley Aerodrome, Surrey, and the Coast Defence Searchlight Company from Kinghorn on the Firth of Forth.

## Blackpool Illuminations.

Blackpool General Purposes Committee have decided to hold the autumn illuminations from September 22nd to October 22nd. Amongst the new features that will be introduced will be a scheme whereby residents on the Promenade may provide shaded coloured lights to add to the effectiveness of the illuminations.

The minimum tariff rate of import duty on electrical apparatus for measuring electric current has been reduced under the Serb-Croat-Slovene Customs Tariff from 150 to 50 dinars per 100 kilogs, and the duty on cables for the subterranean or submarine transmission of electric current from 50 to 10 dinars per 100 kilogs.

Liverpool Council last week referred to the Electricity Committee a notice of motion that when giving out contracts for electrical work, such work (unless carried out by the Corporation) shall be the subject of a direct contract between the Committee and the electrical contractor, and not sub-contracted by the main contractor.

At a meeting of Manchester City Council last week Ald. W. T. Dagnall, moving the adoption of the minutes of the Electricity Committee, said the Committee proposed to accept tenders for cable amounting to about £139 000. A Berlin firm offered to supply cable at about half the price of the English tenders for similar cable, and they recommended acceptance of a German tender amounting to about £8 000. It was stated that the total order was divided between 18 firms, 17 of which were English. An amendment to refer the minute back was rejected.

The first meeting of the newly elected representatives of the District Industrial Council for the Electricity Supply Industry, No. 5 (West Midlands Area), was held at Birmingham Chamber of Commerce, on Monday. Under the terms of the constitution the nomination for the chairmanship rested with the trade union side. Mr. R. F. Dempster, of the Amalgamated Engineering Union, was elected chairman, and Mr. G. R. J. Parkinson, of the Midland Electric Corporation for Power Distribution, Ltd., was elected to the vice-chair. The secretary is Mr. C. Heathcock, 27, Temple Street, Birmingham.

# PERSONAL.

THE marriage of Mr. T. J. F. Oldham and Miss Madeline Kidwell was solemnised at St. George's Church on June 23rd.

Mr. S. E. Day, borough electrical engineer at Bury St. Edmunds, has successfully undergone an operation at the West Suffolk General Hospital.

The engagement of Lord Bective, joint managing director of the Bective Electrical Co., Ltd., electrical engineers and contractors, to Lady Elsie Clarke, widow of Sir Rupert Clarke, was announced on Monday. The "Electric Earl," as he is usually called, started in partnership with Mr. A. T. Hulance three years ago with one office boy. They now employ over 200 electricians.

[Photo: Claude Harris, Ltd.

**Lord Bective, whose engagement to Lady Clarke is announced.**

Mr. P. Priestly, general manager of the Liverpool Tramways, has been voted an increase of salary from £1 600 to £1 800 per annum.

Bermondsey (London) Electricity Committee have arranged to superannuate Mr. W. B. Smith, engineer-in-charge, on the ground of ill-health.

Tunbridge Wells T.C. on July 4th granted a request from the borough electrical engineer, Mr. R. N. Torpy, to be paid in accordance with the national scale of salaries for chief electrical engineers.

Mr. J. Andrew Lee has resigned his position as Engineering Inspector to the Electricity Commission, a position he has held since its inception, and has joined the staff of the Central Electricity Board.

Canterbury City Council have adopted for the salary of the chief engineer, Mr. C. A. Blascheck, a sliding scale based on kWh sold per annum which allows for a remuneration of from £800 to £1 055 per annum.

The following officers of the Committee of the London Students Section of the I.E.E. for next session, have been elected to fill the vacancies which will occur on October 1st. CHAIRMAN, S. H. Hart; VICE-CHAIRMAN, A. G. Brunker; SECRETARY, L. S. Crutch; and ASST. SECRETARIES (Visits and Social Functions), W. F. J. Walton and J. W. Moffatt.

Mr. Charles H. Ellison, late Telegraph Superintendent of the North Eastern Area, L.N.E.R., was presented at a luncheon in his honour at the Royal Station Hotel, York, on June 26th with a mahogany chime clock and a blue seal handbag for Mrs. Ellison. The presentations were made by Mr. George Davidson, who read letters from Sir Ralph Wedgwood and Mr. R. Bell.

Mr. W. H. Lynas, managing director of Graham Amplion, Ltd., has been compelled to resign his position on account of ill-health. Originally connected with the Apollo Plug Manufacturing Co., he joined Alfred Graham and Co. in 1921, subsequently becoming sales manager of the wireless side of the company's business. On reorganisation of the company in 1926, following the death of Mr. Alfred Graham, he became general manager. When the present company was formed, Mr. Lynas became managing director. He played a prominent part in the dissolution of the N.A.R.M.A.T., and was the prime mover in the formation of the S.R.M. He was on the Interim Committee of the R.M.A., which was in office until the first council was elected.

## OBITUARY.

MR. ALFRED LOEWENSTEIN, by a fall from an aeroplane, on June 5th, aged 49 years. He was president of the International Holding and Investment Co., and the Hydro-Electric Securities Corporation. The foundations of his fortunes as a financier were laid before the war when he undertook the placing with the Belgian public of large lines of securities of hydro-electric companies, such as the Brazilian, Mexican and Barcelona Traction, Light and Power Companies, that were promoted by Mr. Percival Farquhar and the late Dr. Pearson. It was then that Mr. Loewenstein acquired the knowledge of hydro-electric enterprises, which he later turned to account by his formation of the Hydro-Electric Securities Corporation —a Canadian concern holding large interests in a number of such undertakings in America.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

WARRINGTON EDUCATION COMMITTEE.—Electric wiring, etc., at the Silver Street Council School. Forms from J. Moore Murray, secretary and director, Education Office, Sankey Street, Warrington.

BARNSTAPLE CORPORATION, July 13th.—(*a*) One 100 kW Diesel oil engine, with d.c. generator etc.; (*b*) one storage battery of 240 cells, 75 Ah at one hour discharge rate, including removal of existing battery; (*c*) low pressure switchgear; (*d*) about 14 miles of low pressure, three core, lead covered and armoured cables, with boxes, pillars, etc., and removal of existing cables. Specification, etc. from Preece, Cardew and Rider, 8, Queen Anne's Gate, London, S.W.1; deposit £2 for each section.

DUNDEE CORPORATION, July 13th.—Supply of l.t., paper insulated, lead covered and double steel tape armoured cable, all to B.E.S. specification for working pressure up to 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

STIRLING CORPORATION, July 13th.—Electrical work in connection with erection of 36 houses at Raplock Road, Stirling. Specifications, etc., from Mr. A. H. Goudie, burgh engineer; deposit £1.

LLANDILO URBAN DISTRICT COUNCIL, July 14th.—One 75 kW crude-oil engine driven generating set, with accessories, one 10-ton oil storage tank; and one control panel, including connection of cable. Further particulars from the engineer, Mr. T. Bowen.

BELFAST EDUCATION COMMITTEE, July 16th.—Experimental electric lighting set, for mechanical engineering department in the Municipal College of Technology, Belfast. Specifications, etc., can be obtained at the General Office, at the College.

ISLE OF WIGHT EDUCATION COMMITTEE, July 16th.—Electric light installation at secondary school, Newport. Particulars from county surveyor, Mr. S. R. Cocks, St. Thomas Street, Ryde.

SHOEBURYNESS URBAN DISTRICT COUNCIL, July 16th.—Underground mains, switchgear, transformers, and meters. Specification, etc., from Messrs. A. Hugh Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

HARROGATE CORPORATION, July 17th.—Supply and erection of two 50 000 lb. boilers, with pipe work and accessories. Specification, etc., from Mr. N. McLean, borough electrical engineer, 33, Swan Road, Harrogate.

WEST RIDING EDUCATION COMMITTEE, July 17th.—Electric light and bell installation at Silkstone New School. Specification from Education Department, County Hall, Wakefield.

NEWRY URBAN DISTRICT COUNCIL, July 21st.—Two 100 B.H.P. and one 150 B.H.P. heavy oil engines, each direct coupled to l.t. three-phase alternator (contract No. 2); l.t. switchboard for three-phase 4-wire system (contract No. 3); 5-ton overhead crane (contract No. 4); and underground and overhead distributing mains and services, and street lighting installation (contract No. 5). Specifications from Town Clerk; deposit £2 2s. for each.

HODDESDON URBAN DISTRICT COUNCIL, July 23rd.—Lighting of street lamps, from September 1st, 1928, to March 31st, 1929. Particulars from Council Offices, Hoddesdon.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 33 000 V overhead transmission line between Brighton and Worthing. Specification (No. S.E.E.-S.L.1) from Sir J. R. Brooke, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

GLASGOW CORPORATION, July 30th.—Installation of electric light, telephones and heating apparatus. Specification from Office of Public Works, 249, George Street.

### Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

MONTEVIDEO ELECTRICITY WORKS, July 13th.—Supply of 12 three-phase 33 000 V 50 cycle oil cooled transformers. (Reference B.X. 4 461.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 17th.—Two 12-ton, four 4-ton and seven 4-ton battery locomotives; two 150 kW motor generators and switchgear; overhead line and equipment. (Reference A. 6 317.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 17th.—Switchboard cable. (Reference B.X. 4 431.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, July 17th.—Automatic telephone switchboards. (Reference B.X. 4 480.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, July 18th.—Six water-tube boilers and accessories, for Ultimo power house. Specification (£2) from Electrical Engineer, 61, Hunter Street, Sydney.

SYDNEY CITY COUNCIL, July 18th.—Supply of paper insulated 660 V cables. (Reference B.X. 4 319.)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, July 18th.—Supply and erection of 13 transformer stations, with switchgear and transformers (10 000/380-220 V), in the county of Dublin. Specifications, etc., from the Secretary, 60-62, Upper Mount Street, Dublin; deposit £5.

ARGENTINE NATIONAL SANITATION DEPARTMENT, July 19th.—Supply of machinery and materials for seven automatic pumping stations for dealing with sewage in the Belgrano, Saavedra, Hipódrome, Malcolm, Alvear, Penitenciaria and Cildánez districts, each plant consisting of three electric pumping sets, a three-phase static transformer, control switchboard, etc.; and 17 automatic pumping installations for the sewage of the Boca and Barracas district. (Reference A.X. 6 389.*)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 19th.—Incandescent lamps. (Reference B.X. 4 487.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 19th.—Supply of transformers, converters and d.c. and a.c. switchgear. (Reference B.X. 4 485.)

INVERCARGILL (N.Z.) TRAMWAYS DEPARTMENT, July 23rd.——Induction voltage regulator. (Reference B.X. 4 473.)

CAPE TOWN MUNICIPALITY, July 25th.—Supply of a.c. electricity meters. (Reference B.X. 4 527.)

VICTORIAN RAILWAY COMMISSION, July 25th.—Supply of electric train stops.

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply and delivery at East London of two 25-ton, six 10-ton, and two 2-ton electrically-driven overhead travelling cranes. (Reference A.X. 6 347.*)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply of crude oil engine, generator, and switchboard. (Reference A.X. 6 405.*)

DUNEDIN CORPORATION, July 30th.—Supply of 6 tons of hard drawn electrolytic copper trolley wire. (Reference A.X. 6 477.)

UITENHAGE MUNICIPALITY, SOUTH AFRICA, July 30th.—Supply and delivery of h.t. and l.t. switchgear, h.t. and l.t. cable, motors, fans, meters, transformers, kiosks, feeder pillars, and line material. (Reference B.X. 4 517.)

ECUADOR GOVERNMENT, July 31st.—Supply of two electrically-operated portal cranes, of 5 and 10 metric tons capacity, respectively, for Guayaquil. (Reference A.X. 6 387.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 31st.—Motor generator set for Seacliff Mental Hospital. (Reference B.X. 4 571.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Supply of armoured telephone cable. (Reference B.X. 4 518.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Electrically driven concrete mixing plant. (Reference A.X. 6 441.*)

VICTORIAN ELECTRICITY COMMISSION, August 6th.—Supply of three-phase, 60 cycles, interconnected star, oil insulated, self-cooled, outdoor type neutral earthing compensator. (Reference B.X. 4 519.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 7th.—Supply of 50 kVA transformers and 2 100 V, three-phase, 50 cycles, truck type switchgear. (Reference B.X. 4 526.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 9th.—Supply of six electrically-driven overhead travelling cranes. (Reference A.X. 6 409.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4 505.)

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kV switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B X 4 477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

BULUWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain grate, turbo-alternator, spray cooling equipment and circulating waterpiping and three-panel switchboard, with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

CAPE TOWN ELECTRICITY DEPARTMENT, August 15th.—Supply of l.t. switchgear for the New Pavilion, Linizenburg. (Ref. B.X. 4 562.)

VICTORIAN ELECTRICITY COMMISSION, August 20th.—Supply of 66 000 V transformers and spares. (Reference B.X. 4 541.)

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, August 22nd.—Supply of metal filament lamps. (Ref. B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Ref. B.X. 4 565.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21.) Specifications, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, E.C.; deposit £1 1s.

## Tenders Accepted.

HALIFAX CORPORATION.—J. Harrison and Co., electrical work in connection with erection of an arcade and shops.

HORNSEY EDUCATION COMMITTEE.—Southey and Co., electric light installation at Coldfall School, £1 117 8s. 7d.

CROYDON CORPORATION.—E. J. Hayes, electric light installation in block C. of borough hospital, £150 (recommended).

STOKE-ON-TRENT CORPORATION.—E. Holloway, wiring for trip circuits, motors, etc., at central power station, £288 12s.

HOLME VALLEY MEMORIAL HALL, HOLMFIRTH.—C. R. Tolson, electrical work in connection with erection of women's ward.

REIGATE TOWN COUNCIL.—The Brighton Lighting and Electrical Co., Ltd., for alterations in the public street lighting at £459 16s.

DEAL CORPORATION.—C. O. Clark, decorative electric lighting for the pier, £200. Other tenders: G. A. House, £313 6s.; Victors, £304.

HAZEL GROVE AND BRAMHALL URBAN COUNCIL.—Ferranti, Ltd., for single phase a.c. electricity meters, 10 A, £1 5s. each; 20 A, £1 18s. each.

BEDFORD CORPORATION.—W. J. Jenkins and Co., extension of coal conveyor, £68 15s.; British Thomson-Houston Co., Ltd., supply of additional main switchgear, £630.

LEEK TOWN COUNCIL.—Crompton Parkinson, Ltd., for electrical equipment consisting of one 400 kW and one 200 kVA rotary transformer and starting panel, £2 338 10s.

SHEFFIELD CORPORATION.—British Electric Transformer Co., Ltd., reconstruction of three 500 kVA Scott connected sets, one 1 000 kVA set and three 250 kVA transformers, £1 674 10s.

GLASGOW CORPORATION.—Power and Lighting Cables, Ltd., one year's supply of single, triple concentric, telephone, l.t. and h.t. cables; A. Robertson, electrical installation in 36 houses comprised in Westmuir Street rehousing scheme.

MANCHESTER CORPORATION.—Ferranti, Ltd., one 15 000 kVA transformer for Stuart Street power station; Fuller Electrical and Manufacturing Co., Ltd., five 150 kVA transformers; British Insulated Cables Ltd., supply of cable.

LUTON CORPORATION.—Brush Electrical Engineering Co., Ltd., 12 500 kW set, £37 200; Clarke, Chapman and Co., Ltd., boilers; Hewittic Electric Co., Ltd., 3-wire rectifier equipment of 130 kW capacity, for sub-station, £1 312.

MANCHESTER CORPORATION.—A. E. Sudlow and Co., electric light installation at Willert Street police station; J. Adams, Ltd., wiring of Dale Head Hall, Thirlmere; Clampett and Co., electric lighting of houses on various estates.

LEEDS CORPORATION.—W. Potts and Sons, Ltd., installation of electrical winding and control gear for town hall clock, £207; Macintosh Cable Co., Ltd. (£1 392), Greenwich Cable Works, Ltd. (£1 823 8s.), and Enfield Cable Works, Ltd. (£1 368), cables.

METROPOLITAN WATER BOARD.—Sun Electrical Co., Ltd., two portable electric drills, £39, and one portable stand, £31; General Electric Co., Ltd., ¾ H.P. grinding and polishing motor, on pedestal, with starter; Consolidated Pneumatic Tool Co., Ltd., portable electric grinder.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., electric light wiring and fitting of Lena Gardens School, Hammersmith, £369. Also tendered: H. J. Cash and Co., Ltd., £413; Burdette and Co., Ltd., £414; Tredegars (1923) Ltd., £513; Fordham Electrical Engineering Co., Ltd., £601.

BEXHILL CORPORATION.—William Lucy and Co., Ltd., supply of 200 joint boxes, 11s. each; General Electric Co., Ltd., supply of gasfilled lamps for 12 months at catalogue prices, subject to discount of 23 per cent., with further 5 per cent. for settlement within 30 days from end of month of delivery (both recommended.)

BRADFORD CORPORATION.—Taylor and Ashworth, electric lighting installations at council shops and houses, £203 11s.; C. and J. Weir, Ltd., supply of two feed water heaters for Valley Road power station; Keighley Electrical Engineering Co., Ltd., erection of passenger lift and repairs and alterations to goods lift at new tramway offices, Forster Square, £793 10s

MIDDLESEX EDUCATION COMMITTEE.—Rewiring Hornsey County School, £365; rewiring of Finchley County School, £482; G. A. Weston, electric lighting installation in lieu of existing gas lighting, in Uxbridge County School and Whitehall Council School, £274 10s. and £186 respectively; T. Clark and Co., Ltd., rewiring Spring Grove Secondary School, Isleworth, £358 (all recommended.)

GLASGOW CORPORATION.—Edison Swan Electric Co., Ltd., Hackbridge Cable Co., Ltd., and Craigpark Electric Cable Co., Ltd., v.i.r. cable; Bruntons, Ltd., armature binding wire; Harland Engineering Co., Ltd., one 500 kW rotary converter; Crompton Parkinson, Ltd., two 1 000 kW rotary converters; Hadfields, Ltd., Edgar Allen and Co., Ltd., Titan Trackwork Co., Ltd., and Thermit, Ltd., tramway special track work.

LISBURN ELECTRIC SUPPLY CO., LTD.—W. T. Henley's Telegraph Works Co., Ltd., supply, erection and complete installation of overhead line on "Anchor A" poles, also 33 000 V H.S.L. type and 6 600 V 3-core, paper insulated cables between Lisburn and Belfast. The contract also covers the supply and installation of switchboard, transformers, feeder pillars, distributors, house services, meters, cut-outs, etc.

LIVERPOOL COUNCIL.—The English Electric Co., Ltd., supply of one special bogie tramcar, £2 450; Hadfields, Ltd., tramway junctions and crossover, £1 175; Babcock and Wilcox, Ltd.; supply and erection of a water jet ash handling system for three new boilers at the Lister Drive No. 3 power station, £2 995; Edgar Allen and Co., Ltd., Sheffield, tramway junctions, £1 960; Hadfields, Ltd., tramway junctions, £1 236 (all recommended).

### THE BOYS' BALLOT.

Do you think you can say which is the most popular sport or pastime in the country? If you do, and you can place a short list of sports in correct order according to the popular vote, you can win one of a list of 350 prizes totalling in value over £1 500. A saloon motor car, a trip abroad, a gramophone, furniture, a wagon of coal, and hundreds of other splendid gifts are to be won in the Boys' Ballot organised by the East End Hostels Association in aid of the John Benn Hostel and Milner Hall, Stepney, opened by the Prince of Wales in 1927 for East End working boys.

Tickets for the contest are 1s. each, or 10s. for a book of 11, and may be obtained with full prize lists and posters from the Ballot Organiser, c/o Sir Ernest Benn, Bt., Bouverie House, Fleet Street, London, E.C.4.

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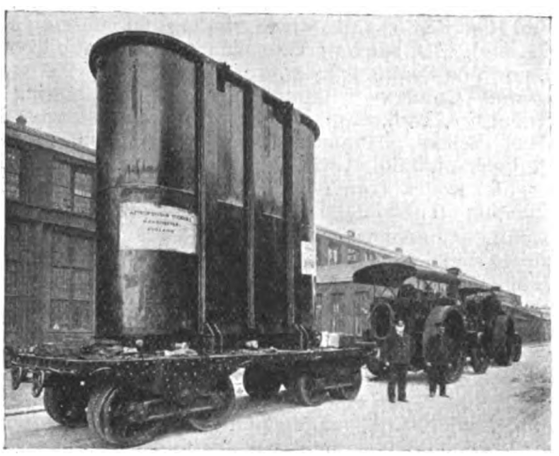
# ELECTRICITY SUPPLY.

## Cooker Hiring at Winchester—Manchester's £45,000 Loan for Sub-station Plant—Proposed Hackney Developments—Guildford Hire-purchase Scheme Adopted—Luton Extensions Approved.

RIPON Corporation are considering the question of public lighting by electricity.

Hastings T.C. have applied for a loan of £10 000 for prospective expenditure for house services.

Battersea (London) B.C. are to carry out mains extensions at a cost of £1 848; and to instal a boiler feed pump, at £1 000.



*THE above photograph shows what is claimed to be the largest British three-phase transformer yet constructed, leaving the Metropolitan-Vickers works for the Barton power station of the Manchester Corporation. It is one of two units of this size which are being installed as main step-up transformers for service with a new 40 000 kW Metropolitan-Vickers turbo-alternator set. The transformers are rated at 25 000 kVA, 6 600/33 000 V, three-phase, 50 cycles. They are of the core-type three-legged design, arranged for forced cooling with external oil coolers. Each unit is 15 ft. long, 7 ft. wide, 15 ft. in height to the top of the tank, and 16 ft. 6 in. to the top of the oil conservator. The makers state that the previous largest three-phase transformers of British manufacture were the six 19 500 kVA units installed some four years ago as the original main step-up transformers of the Barton power station.*

Inverness T.C. have decided, by a large majority, to erect electricity works and a refuse destructor, at a cost of £12 000.

The Shropshire, Worcestershire, and Staffordshire Power Co. are to erect a bulk supply sub-station at Hesters Way, Cheltenham.

Heston and Isleworth U.D.C. are to extend mains to 14 houses, which are to be erected at The Green, Heston Road, at a cost of £252 10s.

Stretford U.D.C. seek consent to the alteration of the system of supply from d.c. to a.c. in St. John's Road, Stothard Road, Ayres Road and Urmston Lane areas.

Aylesbury T.C. have received sanction to a loan of £20 879 for electricity purposes. to cover prospective expenditure during 1927-28, and to a loan of £4 911 in respect of over expenditure.

Blackburn R.D.C. have rejected the proposition of the Lancashire Electric Power Co. to supply electricity to Pleasington, and have decided to support Blackburn Corporation's application for the necessary powers.

Winchester Corporation have received sanction to loans of £5 000 for mains and services, £3 260 for feeder cable, and £2 500 for meters.—A further £250 is to be expended on the purchase of electric cookers for letting out on hire.

Manchester Electricity Committee have obtained sanction to borrow £5 000 for sub-station buildings and £45 000 for plant.—The Electricity Committee are seeking sanction for a loan of £6 000 for additional transformer station plant.

Barnsley T.C. have applied for a loan of £7 356 for extension of distributing and public lighting mains. Mains are to be laid in additional streets for public lighting, including reconstruction of the public lighting control, at an estimated cost of £4 881.

The Electricity Commissioners have given sanction to the Guildford Electricity Committee to supply bulk electricity to the Cranleigh Gas and Electricity Co. The Electricity Committee seek sanction to borrow £20 000 for mains extensions and £1 000 for street lamps.

Skegness U.D.C. have decided, subject to the consent of the Commissioners, to obtain a supply of electricity from the Boston and District Electric Supply Co. The Council will receive special terms for lighting and power for the orchestral Piazza and other foreshore attractions.

Hackney (London) Electricity Committee have prepared a revised scheme for the extension of the electricity undertaking, at an estimated expenditure of £24 895, during the years 1928-29.—The Committee seek sanction to borrow £8 000 for meters and indicators and £10 000 for service lines.

The Minister of Transport has consented to the erection by Luton T.C. of 6 000 V overhead lines between Linslade and Liscombe. The formal consent of the Commissioners to the extension of the generating station by the installation of a 12 500 kW set, two boilers, and additional buildings, has been received.

Plymouth Electricity Committee have received applications from the Plymouth Oxygen Company and the Devon and Cornwall Ice and Cold Storage Co. for the supply of electricity for power purposes.—Plymouth Electricity Committee have obtained sanction to borrow £5 000 for equipment of sub-stations on consumers' premises.

At a recent meeting of Fleetwood U.D.C., the chairman, Coun. W. Elliot, said the average price of electricity in Fleetwood compared favourably with undertakings of ten times greater output. They supplied practically the whole of the industrial power, public lighting, and tramway demand and about 70 per cent. of the private houses in Fleetwood, compared with about 25 per cent. in other towns.

Aughton Parochial Committee are to oppose the application of West Lancashire R.D.C. for an Order for the supply of electricity to the parish of Aughton. At a recent meeting of the Aughton authority the chairman stated that the application was not in conformity with the wishes of the ratepayers of Aughton, who asked for a separate scheme for the parish, whereas the West Lancashire Council had applied for an extension of the Order for the Maghull and Lydiate scheme, so as to embrace Aughton.

Guildford T.C. propose to extend the mains to Onslow village, where there are 53 persons waiting for a supply of electricity, at a cost of £3 307 10s.—No objection is raised by the London and Home Counties J.E.A. to the scheme for giving a bulk supply to Cranleigh.—A hire-purchase scheme for the wiring of premises and the sale of appliances has been adopted, on the basis of a 20 per cent. payment down by owners and 30 per cent. by tenants, with the balance spread over three, four, or five years.

Marylebone (London) Electricity Committee have made agreements with the Marylebone District Property Co., Ltd., to instal rising mains for six blocks of flats at Maybury Mansions, at a cost to the Council of £225; Mr. F. White (of the Sir Edward White Estate), for rising mains for 57 flats at Cumberland Mansions, cost £502; Mr. W. Huxley, for rising mains for 15 flats at 8-12, New Cavendish Street, cost £178; and E. G. and F. C. Simpson, of the General Building Co., for rising mains for 54 flats at Abbey Lodge, Park Road, cost £610.

Stoke-on-Trent Markets Committee have decided to replace sixty-four 150 W lamps in the Tunstall Market by a similar number of 200 W lamps, and that a lighting point with 100 W lamps be installed in each of the 16 side shops. The engineer is to report as to the lighting of the Hanley general market.—The engineer has reported that Mr. B. James is building a further six houses in Nelson Road, Hartshill, and that it has been decided that, subject to the builder agreeing to omit fireplaces in the bedrooms, and to his wiring, lighting and heating circuits throughout the houses, to the specification of the engineer, services shall be laid free of charge in each house.—The Electricity Committee have decided that a three-phase main be laid from the sub-station in Franklyn Street to Messrs. Bullers's factory at a cost of £300, and the single-phase supply to the factory will be discontinued.

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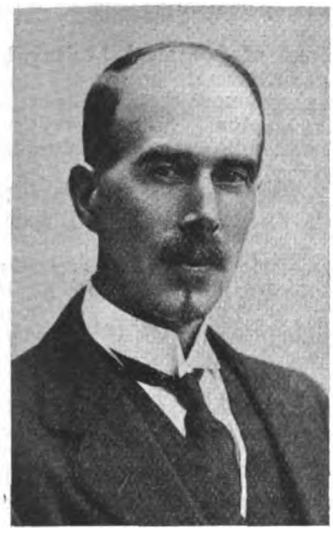
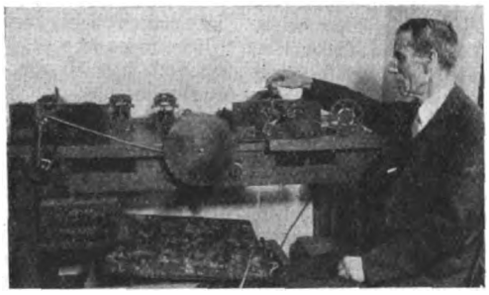
## NEWS IN PICTURES.



Mr. J. Johnson Foggo, who, as already announced in THE ELECTRICIAN, was elected President of the E.C.A. of Scotland at the annual meeting at Glasgow.



An instrument developed by the International Tele-Post Co. of New York, which is said to be capable of transmitting at the rate of 1 000 words per minute. It is claimed that the machine is so simple to control that the services of a skilled operator are no longer required.

Mr. T. Hughes, who recently assumed control of the Dublin Branch of the Edison Swan Electric Co., Ltd.

Three snapshots taken at the G.E.C. Sports held at Wembley on Saturday last. On the left is seen the head office staff tug-of-war team; in the centre is a competitor in the race for the 8.30 a.m. train, and on the right is the finish of the 100 yards flat race. The "Hugo Hirst" challenge cup was retained by London, the "Harold Hirst" cup was also won by London, while the "A. H. Railing" and "White" cups went to Sheffield and Coventry respectively. Of the challenge trophies open to London branches, the "Ernest Wilson" cup was won for the Union Works, Wembley; the "Railing" high jump by Fraser and Chalmers; the relay championship (three-quarter mile) by the team representing Fraser and Chalmers; the London ladies' relay championship by Union Works; tug-of-war for the "Byng" cup by Fraser and Chalmers; and the "Fletcher" Fire Brigade Competition by Osram Works. These trophies, together with the "Sir Hugo Hirst" cricket cup (won by head office) were presented by Mrs. Leslie Gamage.

Congleton T.C. are applying for authority to carry out an electricity scheme, to include the urban district of Buglawton.

Sanction to borrow an additional £1 700 in connection with the laying of cables to Humberstone, etc., is sought by Grimsby Electricity Committee.

Dartford U.D.C. have decided to instal 1s. slot meters in the houses on the Lowfield Street housing estate, and to supply electricity at 8d. per kWh.

Swansea Corporation Electricity Committee have arranged terms for a supply of electricity to the Mumbles Pier by the Swansea and Improvements and Tramways Co.

Maghull and Lydiate Electricity Committee are to extend mains to 16 houses in the Lydiate Boatyard district, and it is also proposed to supply electricity to the Epileptic Homes at Maghull.

Croston Council have consented to the Lancashire Electric Power Co.'s proposed application for a Special Order authorising the company to generate electricity for power in Croston urban district.

Whitby R.D.C. will oppose the application of the U.D.C. for a Special Order to extend their area of supply into portions of the rural district.—The U.D.C. have applied for a loan of £2 500 for a 300 kW rectifier.

Chelmsford Corporation have received a letter from the Electric Supply Corporation, stating that they are now in a position to go carefully into the question of a further reduction in charges for electricity, and hope to be able to give a definite reply very shortly.

Lytham St. Annes Council are applying for an Order authorising an extension of the electricity supply area to include the parishes of Warton, Freckleton, and Bryning-with-Kellamergh and a portion of the parish of Westby-with-Plumptons.

Birkenhead Electricity Committee recommend application to the Electricity Commissioners for sanction to borrow £2 200 for the purchase and laying of the 11 000 V main from Upton to Greasby, in connection with the supply of electricity in bulk to the Hoylake and West Kirby U.D.C.

At the last meeting of Lancaster T.C., the chairman of the Electricity Committee said the Central Board electricity scheme affected Lancaster beneficially. The Corporation would continue to operate the generating station at Caton Road with certain modifications, and they would have to erect a transformer sub-station of some 20 000 kW.

Watford Electricity Committee have received a letter from the Chesham Electric Light and Power Co. applying for consent to the Company's application for a Fringe Order to supply the Hermitage, Bourne End. The Committee have informed the company that the Corporation have already decided to supply the portion of the village within their area.

The L.M. and S. Railway Co. have asked Poplar (London) Electricity Committee to undertake the lighting of the roadway of Dock Cottages. The Committee recommend that the work be carried out by the Department subject to the company bearing the expense of the conversion of the lighting to electricity, the erection of the necessary standards, etc.

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# WIRELESS NOTES.

## A New Hospital Wireless Equipment at Sheffield.

AN interesting example of a large scale broadcast receiver installation has just been put into service at the Lodge Moor Isolation Hospital, Sheffield. It consists of a specially designed 9-valve Met-Vick mains-operated receiver, together with an output distribution system connecting 40 loud-speakers and 400 pairs of telephones throughout the hospital wards, administrative buildings and staff quarters. Owing to the scattered arrangement of the buildings, the distribution connections involved the laying of no less than eight miles of wire. The equipment has many features of interest. It is operated from one central receiver, which has one h.f. stage, detector, and two l.f. stages, the output stage consisting of six power valves with common grid connection and separate output to feeder lines. The set is energised completely from the mains power supply, being equipped with Cosmos a.c. valves, two l.t. eliminator units and six h.t. eliminator units. The first of the latter also provides the grid bias voltage for the output valves.

New Met-Vick hospital wireless equipment at Sheffield.

In the photograph the h.t. eliminator units are seen below the receiver panel, those for l.t. supply being located in the top compartment. The total power used in operating the set with these eliminators is about 300 W, which on the Sheffield tariff costs about one penny for four hours' service. The total load is divided into six fairly equal sections, each of which is choke fed from one of the six output valves. The lines are single cables with earth return. The loud-speakers are connected in parallel. The telephones on each section are in series, jacks being provided, so that should any patient withdraw his or her telephones the supply to the rest of the ward is not thereby affected.

### Compensation Unnecessary.

Volume control for the telephones in each ward is provided by a variable condenser in series. Using this method of telephone feed no device is necessary to compensate for the number of phones in use, there being very little difference in volume for a given condenser setting whether two or thirty pairs of phones are connected.

In addition to the arrangements for broadcast reception the set is equipped with gramophone pick-up for the reproduction of records and with a microphone by means of which addresses, announcements or urgent calls may be reproduced simultaneously throughout the hospital.

The cost of the installation has been defrayed by subscription organised by the "Sheffield Independent" and the "Sheffield Mail," this installation completing a series of seven Sheffield hospitals equipped for wireless reception through the efforts of the Sheffield Independent Press.

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### LEAD MARKET REPORT.

James Forster and Co. state that after the firmness of the last week in June the lead market has been very disappointing, the tendency, except for a short rally, being downwards again. Declarations of a considerable quantity of lead from Burma, due at the end of this week, widened the contango to 10s. per ton.

Closing prices on July 7th were :—£20 7s. 6d. for July; £20 11s. 3d. for August; £20 15s. for September; and £20 17s. 6d. for October, showing a decline on the week of from 6s. 3d. to 2s. 6d. per ton.

# BUSINESS ITEMS.

PHILIPS Lamps, Ltd., have opened larger premises at Leeds at Philips House.

Messrs. R. Preece and Sons, of Southend, Ledbury, have opened an electrical department.

Ward and Goldstone, Ltd., announce that Mr. Stuart Laird no longer represents them in London.

Mr. A. J. Wells, electrical and radio engineer, of Luton, Beds, has removed his business to 177, Cutenhoe Road.

Premises at 152, Montreal Road, Tilbury, Essex, have been opened by Messrs. Digby, wireless dealers and electrical engineers.

Mr. C. H. H. Kenworthy, electrical engineer, has opened new showroom premises at Charlesworth House, 86 to 94, High Street, Herne Bay.

R. I. and Varley, Ltd., announce that Mr. H. C. Saxby has been appointed as their representative for the home and South-eastern counties.

The Wandsworth Electrical Manufacturing Co., Ltd., announce that their Birmingham address is now Imperial Works, Kenyon Street.

Messrs. Frank Gale and Sons, of 133, Friar Street, Reading, have acquired the business of Reading Radio Installations, of 17, King's Road, Reading.

Messrs. Tamlyn and Hellier, radio engineers, of Barnstaple, have removed their business from Diamond Street to larger premises in Boutport Street.

With a view to extending his business, Mr. Horace Grensted, radio engineer, of 31, Station Road, Sittingbourne, is being joined in partnership by Mr. G. W. W. Brear.

The address of the British General Electric Co., Ltd., Wellington, New Zealand, will in future be 31–37, Taranaki Street, Wellington, instead of Empire Buildings, Willeston Street.

The wireless department of Hill and Co., of Warrington, has been removed to the premises of Mr. Harold Smith, of 77, Bridge Street, and is now owned jointly by Hill and Co. and Mr. Harold Smith.

Burne-Jones and Co., Ltd., have secured an order for 100 radio receiving sets for the Derbyshire Association for the Blind, for which tenders were invited some few months ago. Mullard P.M. valves will be incorporated.

Burton-on-Trent Corporation Commercial Development Committee report having successfully completed negotiations with Pirelli, Cables, Ltd., with regard to the establishment by them of a large new factory on the Derby Road.

The Consul General at Panama has informed the Department of Overseas Trade that constructional work on the Canal has been sanctioned to cope with the necessity for additional storage of water. Materials and plant required for the work include hydro-electric equipment.

At the recent Exhibition at Bury St. Edmunds a representative selection of Mullard products was exhibited on the stand of Mr. Ronald J. Bates. In addition, the Technical Department of the Mullard Wireless Service Co., Ltd., gave a demonstration of amplified gramophone music. Wireless reception was demonstrated with a portable wireless set by Cooks Wireless Co.

The British Thomson-Houston Co., Ltd., point out that since the use of the new pattern 100 W lamp will affect the lighting efficiency of existing installations employing shop window and industrial reflectors, owing to the change in the filament position in relation to the contour of the reflectors concerned, they have produced and are prepared to supply, free of charge to users of their fittings, suitable galleries or adaptors, which will afford the necessary correction.

Exhibits on the stand of the Nottingham Electricity Department at the Royal Agricultural Show, at Nottingham, include apparatus by the British Thomson-Houston Co., Ltd., the General Electric Co., Ltd., Metro-Vick Supplies, Ltd., Siemens Electric Lamps and Supplies, Ltd., the Hurley Machine Co., Ltd., F. W. Brackett and Co., Ltd., Drake and Gorham, Ltd., W. J. Furse and Co., Ltd., Electrolux, Ltd., the Freezone Co., Ltd., the Haslam Foundry and Engineering Co., the British Hanovia Quartz Lamp Co., the Associated Manufacturers Co., Messrs. Thomas Bradford, Ajax, Ltd., R. A. Lister and Co., Ltd., Wolseley Sheep Shearing Machine Co., Messrs. Hodgson and Hodgson and Spratts Patent, Ltd., Messrs. Harry Hebditch, J. Harrison Carter, Ltd., Harrison, MacGregor, Ltd., T. Danks and Co., Ltd., Ruston-Hornsby, Ltd., Messrs. E. A. Foley, Electromotors, Ltd., Bull Motors, Ltd., Skefco Ball Bearing Co., Pearson Bros., and Simplex Conduits, Ltd., Nottingham.

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# COMPANY NEWS.

## Few Changes Recorded in Prices of Electrical Shares—Eastern Telegraphs Maintain High Level—Improvements in Marconi Quotations—Appreciations in Cable Manufacturing Shares.

FEW changes have to be recorded this week in the prices of electrical shares. Eastern Telegraph stock has fully maintained the higher level reached last week, and Marconi descriptions have still further improved. The good dividend announcements of the London Underground group of railways have not had much lasting effect upon prices. Underground Electric ordinary shares are up to 26s. 6d., and London Electric stock is 2 points higher, but Metropolitan and District stocks both close slightly lower than a week ago. In the manufacturing section Callender's and Henleys are 1s. 3d. up.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/– | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/– | 27/– | 60/– | 10/– |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/– |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/– |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/– | 23/– | 40/– | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/6 | 37/– | 68/6 | 14/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/– | 23/– | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. /£1) | 26/6 | 26/6 | 104/6 | 3/– |
| (*b*) | Lon. Elec. Sup. Ord. (£1).. .. | 26/6 | 26/6 | 38/3 | 5/– |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48/9 | 48/9 | 43/– | 8/– |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 26/3 | 26/3 | 26/– | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/– | 23/– | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/– | 27/– | 62/– | 22/– |
| 1/4½ | Shrops,Worcs&Staffs PowerB.Ord. | 31/6 | 31/6 | 23/– | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/– | 27/– | 52/– | 18/– |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/– |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6 | 34/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 25/– | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124 | 124½ | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 125 | 125 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. | 82 | 82 | 103 | 50½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 70½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 75½ | 76 | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 80 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 77½ | 73½ | 89 | 65 |
| 4 | Lon. Un. Trams. 1st Deb. .. | 61½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69½ | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 68 | 68½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 75½ | 76 | 60½ | 12½ |
| 4½ | ,, ,, 4% 1st Pref. .. | 82½ | 82½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 140/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 26/– | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 7/6 | 7/6 | 27/– | 1/– |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/1½ | 23/1½ | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb... | 105 | 105 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/– |
| 15 | Callender's Cable Ord. .. .. | 85/– | 85/– | 86/– | 22/– |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/– |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 25/– | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/– | 8/– |
| 7 | ,, ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/– | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/–) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. .. | 25/– | 25/– | 26/– | 5/– |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/– |
| — | English Elec. Ord... .. .. | 8/1½ | 8/1½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/– | 11/3 | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/7½ | 20/7½ | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/– | 26/10½ | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/– | 19/– | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/– | 19/– | 19/3 | 13/9 |
| 7½ | General Elec. Ord. .. .. | 40/– | 39/6 | 59/– | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 116/3 | 115/– | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/– | 40/– | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 22/6 | 22/6 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 32/6 | 32/6 | 37/– | 13/1 |
| 8 | ,, ,, 8 C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/– |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 30/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25½ | 25½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½ | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 80½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 245 | 243 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 64½ | 64½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24½ | 24½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 39 | 39 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 44½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 66/3 | 67/6 | 9/10/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 50/– | 48/– | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24½ | 24½ | 23 | 11/3/6 |

(*a*) 1s. 7½d. per share. (*b*) £8 8s. 6.66d. per cent. (*c*) 1s. 6.949d. per share. (*d*) 1s. 8.706d. per share. (*e*) 1s. 9.3d. (*f*) 1s. 9.12d. (*g*) 1s. 7.223d. ‡Including 1s. bonus.

ARON ELECTRICITY METER, LTD.—Div. of 4 p.c. on ord shs. is recommended. Fwd. £160.

R. A. LISTER AND CO., LTD.—Int. div. 2½ p.c. for half-year ended May 31 to ord. shhldrs., payable July 23.

SMITHFIELD MARKETS ELECTRIC SUPPLY CO., LTD.—Intm. div. 3 p.c., less tax, on ord. shs., payable Aug. 13.

ELECTRICAL DISTRIBUTION FOR YORKSHIRE, LTD.—Int. div. 9 p.c. p.a., less tax, on ord. shs. will be paid August 1.

CROMPTON PARKINSON, LTD.—Div. of 6 p.c. p.a. for six months ended June 30 on the pref. ord. sh., payable July 31.

CHISWICK ELECTRICITY SUPPLY CORPORATION, LTD.—Intm. div. on ord. shs. of 7½ p.c. will be payable on July 23.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. on common shs. $½ p. sh. for qtr. ending June 30, payable July 31.

ASSOCIATED TELEPHONE AND TELEGRAPH CO.—Qtrly. div. of $1.75 a sh. on 7 p.c. pfd. stk. for qtr. ended June 30, payable on July 1.

SHAWINIGAN WATER AND POWER CO.—The issue by the directors, from time to time, of 1 000 000 shs. of additional stk. has been authorised.

ABITIBI POWER AND PAPER CO.—In New York last week, $50 000 000 of 1st mtge. gold bds., series A, 5 p.c., due 1953, were offered at 94½ and int.

ELECTRICITY CO. OF SOUTH AMERICA.—This co., which is registered in Zurich, reports net pft. of 3 155 000 francs for the past 17 months. Div. of 7 p.c. is proposed.

THE MEXICAN TELEPHONE CO., Ericsson, an affiliated co. of Swedish L. M. Ericsson Telephone Co. Net pft. 1·17 million kroner for past year. Div. 10 p.c. maintained.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—Intm. divs. on ord. shs, at rate of 8 p.c. p.a., less tax, for half-year to June 30 will be payable on Aug. 15.

ANCHOR CABLE CO., LTD.—Net pft. £62 498 for 1927, makg. available with £95 588 bt. fwd., £158 086. Final div. 10 p.c., makg. 15 p.c. agnst. 10 p.c. £15 000 to taxatn. reserve; £113 836 fwd.

COMPANIA HISPANO AMERICANA DE ELECTRICIDAD, S.A.—Shareholders have been invited to subscribe, at par, to the issue of 400 000 new 100 peseta E shs., in the proportn. of one new sh. for each 500 pesetas held.

KALGOORLIE ELECTRIC TRAMWAYS, LTD.—Net pft. for 1927, £4 300, agst. £4 223. During year mines in Kalgoorlie continued to work under very restricted conditions. Tramcars carried 1 499 082 passengers, agst. 1 554 809.

BRITISH EMPIRE TRUST.—Report states that the increase in profit from £71 210 to £240 826 for the year ended April 30, 1928, is attributed largely to the realisation of the co.'s holding of British Columbia Electric Railway Co.'s pfd. and dfd. stk.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Intm. divs. for half-year to June 30, 1928, at rate of 4½ p.c. p.a. on 4½ p.c. pref. shs. at rate of 6 p.c. p.a. on 6 p.c. 2nd pref. shs. and at rate of 12 p.c. p.a. on ord. shs. will be payable on Aug. 15.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—The following divs. have been declared: Fin. div. of 1 p.c., making 10 p.c. for 1927, and div. of 3 p.c. for half-year ended June 30, 1928, both less tax, on pref. shs.; fin. div. of 12 p.c., less tax, making 15 p.c. for year, on ord. shs.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Income acct. for qtr. ended March 31, 1928, does not include any portion of earnings of Mackay companies, which will not be included until the July-Sept. qtr. Net income for March qtr., $3 408 374, agst. $2 742 597, equal to $2.62 p. sh. on outstandg. cap. stk.

OLIVER PELL CONTROL, LTD.—Net pft. for 15 months ended March 31, 1928, after provisn. for income tax and depreciatn., £6 653, plus £5 846 brt. in. After payment of div. on pref. shs., blce. is £10 500. First and fin. div. on ord. shs., 6¼ p.c., subject to tax; to res., £2 500; fwd. £3 349. Turnover for April, May, and June, 1928, was nearly 40 p.c. in excess of that for corresponding months of 1927. Ord. sh. transfer books will be closed from April 12 to 18, inclusive.

MARCONI'S WIRELESS TELEGRAPH CO., LTD. (CANADA).—Net pft. for 1927, $46 555, agst. $24 362, plus $62 345 surplus brt. in. Rpt. states that the beam service, which came

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into operation with Great Britain towards the end of 1926, is working satisfactorily, and the traffic is showing a gradual increase. The beam service with Australia, it is hoped, will be open to the public within a short time. The branch which deals with the manufacture and sale of radio sets shows an improvement, both in volume of sales and profit.

INTERNATIONAL HOLDING AND INVESTMENT CO.—Directors have made arrangements with a group, headed by J. Henry Schröder Banking Corporatn., for an issue of $25 000 000 5 p.c. bds. as soon as market condtns. permit. A statement issued by the Advisory Committee, of which Capt. A. Loewenstein was president, points out that for the nine months since incorporatn. to the end of May last income, less exes., amtd. to $2 464 202, or at the rate of $3 285 600 for a full 12 months. Directors' policy has been to select for investmt. of co.'s fds., industries which are still in the early stage of development, but which hold out a promising future, such as the electrical and chemical industries.

UNDERGROUND GROUP.—The following announcements of intm. divs. for the past half-year have been made by the Underground Electric Railways Co. of London, Ltd., and companies under its control: *Metropolitan District Railway Co.*, 2 p.c. on 4 p.c. guaranteed stk., 2½ p.c. on 4½ p.c. 1st pref.stk., 2½ p.c. on 5 p.c. 2nd pref. stk., 2½ p.c. (agst. 2 p.c.) on ord. stk. *London Electric Railway Co.*, 2 p.c. on 4 p.c. pref. stk., 2½ p.c. (agst. 2 p.c.) on consol. ord. stk. *City and South London Railway Co.*, 2½ p.c. on 5 p.c. pref. stks. 1891, 1896, 1901 and 1903, 2½ p.c. (agst. 2 p.c.) on consol. ord. stk. *Central London Railway Co.*, 2½ p.c. (agst. 2 p.c.) on undivided ord. stk., 2½ p.c. (agst. 2 p.c.) on pfd. ord. stk. *Associated Equipment Co.*, 4 p.c., tax free (same as last year) on ord. shs. *Underground Electric Railways Co. of London*, 3 p.c. on 6 p.c. 1st. cum. income deb. stk., 3 p.c., subject to British tax (same as last year) on 6 p.c. income bds., 3 p.c. (agst. 2 p.c.) on ord shs.

MEXICAN LIGHT AND POWER CO., LTD.—Rev. for 1927 was $4 566 838. Adminsitratn. and gen. exes. and exes. in connectn. w. scheme of arrangement absorbed $259 841. int. on bds. $2 474 917 and transfer to res. for sinkg. fds. $567 758, leavg. blce. $1 264 321. After paying one div. in respect of half year May 1 to Oct. 31, 1927, on 7 p.c. pref. shs. and div. for same period on 4 p.c. 2nd pref. shs., surplus carried fwd. was $940 321. The scheme of arrangmt. which came into effect during 1927 has resulted in discharge of all arrears of int. on outstandg. bds. and all unpaid accumulatns. of div. on 7 p.c. cum. pref. shs. Durg. 1927, and continuing into current year, business and general conditns. in Mexico have been still somewhat disturbed, and there has as yet been very little, if any, improvemt. in this respect. There are indications that a recovery in general business is setting in. Blce. due from Federal, State and Municipal Governments amt. to $4 624 366, compared with $4 222 415, or an increase of $401 950. Co. again suffered considerable loss on conversn. of Mexican currency into Canadian dollars, due chiefly to depreciation of Mexican silver peso.

## New Companies.

SOUTHERN HARDWARE CO., LTD.—Cap., £5 000. Electrical engineers, manufacturers and of dealers in electrical fittings, lamps, etc. Reg. office: 138, Southbridge Road, Croydon.

RADIO RELAYS, LTD.—Cap., £2 500. Distributors and relayers of radio television or other programmes, radio engineers and manufacturers, etc. Solicitor: J. Robson Byers, Lytham.

ALLITE, LTD.—Cap., £300. Importers and exporters of and dealers in electrical goods, wireless instruments and accessories, etc. Reg. office: 94, Clerkenwell Road, London, E.C.1.

FAIRBOURNE DEVELOPMENT CO., LTD.—Cap., £1 000. To carry on business of an electric light company. A first director: A. Peacock, junr., Ynys Faig Hall, Fairbourne, engineer.

HEPPLEWHITE (PARKGATE), LTD.—Cap., £500. Electrical, radio and mechanical engineers, suppliers of light, heat, sound and power, etc. Reg. office: 24, Goosebutt Street, Parkgate, Rotherham.

FRED B. WILSON, LTD. Cap., £1 000. To carry on business of electrical, radiographic, microscopic and scientific apparatus, etc. Reg. office: 28, Church Road, Upper Norwood, London, S.E.19.

PASSMORE, GILMORE AND CO. (1928), LTD.—Cap., £500. To manufacture and supply electrical plant and undertake electrical work of all kinds, etc. Reg. office: 35, Craven Street, Charing Cross, London, W.C.2.

ARTHUR BAILHACHE, LTD.—Cap., £2 500. Electrical engineers, manufacturers and general factors of electrical goods, vacuum cleaners and refrigerators, etc. Reg. office: 120 and 122, Victoria Street, Westminster, S.W.1.

NORTHY-BAKER AND CO., LTD.—Cap., £500. To acquire the business of electricians, etc., now carried on by A. E. Northy-Baker and E. Northy-Baker, at 35 and 69, Royal Arcades and 1, Regent Street, Weston-Super-Mare.

A. L. M. ENGINEERING CO., LTD.—Cap., £1 000. To promote the interests of Rowe Bros. and Co. (Bootle), Ltd., to carry on business as mechanical and electrical engineers, etc. Reg. office: Hawthorne Road, Bootle, Lancs.

KNAP CONCRETE MACHINES, LTD.—Cap., £150 000. To carry on business of mechanical and electrical engineers, manufacturers, importers and exporters. Solicitors: Herbert Smith and Co., 62, London Wall, London, E.C.2.

EXCEL WIRELESS COMPONENTS, LTD.—Cap., £250. To acquire business of manufacturers of wireless sets and components carried on by F. Barratt and J. P. Smart, at 53, Abington Street, Northampton, as "Excel Radio Components."

CHARLES PAYNE, LTD.—Cap., £1 500. To acquire business of electrical engineer and contractor and wireless dealer now carried on in Coventry as "Chas Payne." Solicitor: J. Arch, Halifax Chambers, Warwick Row, Coventry.

BROWN AND WARD (LATHES), LTD.—Cap., £1 000. To carry on business of civil, consulting, mechanical, electrical and general engineers, machinists, tool makers, millwrights, etc. Reg. office: Warwick Road, Tyseley, Birmingham.

EPOCH RADIO MANUFACTURING CO., LTD.—Cap., £500. Manufacturers of and dealers in wireless, telegraphic and telephonic apparatus, valves, loud-speakers, instruments, etc. Reg. office: 53, Gracechurch Street, London, E.C.3.

VIOZONE, LTD.—Cap., £2 000. To carry on the business of electrical engineers, general merchants, manufacturers of and dealers in electrical goods, etc. Secretary: Mr. C. L'Estrange Ewen, 106, Southampton Row, London, W.C.1.

WIRELESS ENGINEERING CO. (SCUNTHORPE), LTD.—Cap., £1 500. Objects: To acquire business of wireless engineers now carried on by S. Holliday, S. Todd and H. Crooks, at Scunthorpe and Frodingham, Lincs., as "The Wireless Engineering Co."

PEARSONS ELECTRICALS, LTD.—Cap., £100. To carry on business of engineers, electricians, mechanical engineers and manufacturers, and workers of electricity, motive power and light, etc. Reg. office: 90, Fenchurch Street, London, E.C.2.

FRANKLIN EBONITE CO., LTD.—Cap., £5 000. Manufacturers of and dealers in ebonite, synthetic resin compound, bituminous compound, gutta percha, balata, articles for the electrical trades, wireless requisites, etc. Reg. office: 47, Franklin Street, Salford, Lancs.

JOHNSON AND CO. (BRADFORD), LTD.—Cap., £1 000. Electrical engineers and contractors, suppliers of electricity, manufacturers of and dealers in electrical, magnetic, galvanic and other apparatus, wireless and radio engineers, etc. Reg. office: 23, Piccadilly, Bradford.

FULLER ELECTRICAL AND MANUFACTURING CO., LTD. Cap., £100. To carry on the business of manufacturers, producers and sellers of electric, mechanical and any other kinds of machines, appliances and apparatus, etc. Reg. office: 5, Chancery Lane, London, W.C.2.

SANDON WIRELESS CO., LTD.—Cap., £100. Manufacturers, importers and exporters of and dealers in all kinds of electrical and other instruments, appliances, materials, and components in connection with wireless telegraphy, etc. Reg. office: 41, John Dalton Street, Manchester.

## METAL AND CHEMICAL PRICES.

TUESDAY, July 10th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 15 0 | — | 5s. |
| Electro Wirebars | ,, | £69 0 0 | — | — |
| H.C. Wires, basis | per lb. | 9¼d. | — | — |
| Sheet | ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0¼d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8¼d. | — | — |
| Sheet ,, | ,, | 9¼d. | — | — |
| Wire ,, | ,, | 9¼d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 10 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £21 15 0 | — | 5s. |
| Foreign or Colonial | ,, | £20 5 0 | — | 5s. |
| *Tin*— | | | | |
| Ingot | per ton | £206 17 6 | — | £5 2 6 |
| Wire, basis | per lb. | 2s. 8¼d. | — | ¼d. |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £25 2 6 | — | 5s. |
| *Mercury* | per bottle | £21 10 0 | — | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2¼d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3¼d.
*Rubber*—Para fine, 11½d.; plantation 1st latex, 9⅝d.

∴ The metal prices are supplied by British Insulated Cables Ltd. and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ELLIOTT RADIO MANUFACTURING CO., LTD., 87, Senhouse Street, Maryport, wireless engineers. £10 6s. 5d. May 31st.

HOOPER AND STONES, 21, St. James Street, Derby, electrical engineers. £40 5s. 6d. June 6th.

JAGGER, J. AND CO., 30, Gerrard Street, Halifax, wireless dealers. £27 0s. 4d. May 24th.

ROBERTSON, Mr. A. D., 260/266, High Street, Balham, electrical engineer. £33 10s. 8d. May 24th.

W. D. BATTERY CO., 29, Bradford Row, Batley Carr, battery dealers. £10 3s. 8d. June 1st.

X.L. WIRELESS STORES, Albert Road, Portsmouth. £13 6s. 10d. May 23rd.

## Deeds of Arrangement.

HUGHES, Stanley Crowther, trading as HUGHES BROS., 1090, Manchester Road, Bradford, electrician. Dated July 2nd, filed July 3rd. Trustee, F. R. Thurlow, 2A, Tyrrel Street, Bradford, I.A. Liabilities unsecured, £280; assets, less secured claims, £93.

KELLY, Stanley Sherzell, trading as KELLY AND CO., 59, North Road, Durham, electrical engineer. Dated June 30th, filed July 4th. Trustee, J. W. Harker, Barclays Chambers, Durham, C.A. Liabilities unsecured, £1 884; assets, less secured claims, £800.

## Receiverships.

GILBERT AND LANGLEY, LTD. W. A. Prestage of Abbey House, S.W.1, was appointed receiver and manager on June 9th, 1928, under powers contained in debentures dated January 24th, 1927.

LEWIS (H.), LTD. W. F. Whiting, F.C.A., of Bridge Buildings, Nene Quay, Wisbech was appointed receiver and manager on June 21st, 1928, under powers contained in instrument dated January 22nd, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.*]

ELECTRICAL SUPPLIES (LIVERPOOL), LTD., electrical and wireless dealers, Liverpool. At the statutory meeting of the creditors in this voluntary winding-up, the Receiver and Liquidator submitted a statement of affairs which showed liabilities of £3 984, all due to unsecured creditors, and net assets (including stock-in-trade, £2 697, valued at £1 500; and book debts £1 490, expected to produce £1 250), or a deficiency as regarded the unsecured creditors of £2 247. The issued capital of the company was £9 720, so that the total deficiency amounted to £11 967. It appeared that although the company was formed in February, 1918, it did not actually commence operations until a year later. For the year to January 31st, 1920, there was a turnover of £21 172, on which there was a gross profit of £3 452, and a net profit of £830. For the following year there was a net profit of £797 on sales of £40 083, the gross profit totalling £5 873. For the 12 months to January 31st, 1922, the turnover was £19 018, the gross profit fell to £1 392, and there was a net loss of £2 849. In the next year, the sales were £23 687, the gross profit £2 019 and the net loss £1 415. For the year to January 31st, 1924, on takings of £21 260, the gross pr fit was £2 856, and the net loss £1 599, while in the following 12 months the turnover was £21 467, the gross profit £2 966, and the net loss £2 163. In the year to January 31st, 1926, the turnover was £17 747, the gross profit £2 401, and the net loss £464, while for the next 12 months the net loss was £727, on a turnover of £17 228, the gross profit totalling £2 174. The creditors decided that the voluntary liquidation of the company should be continued, subject to Mr. Parkin S. Booth, accountant and auditor, of Liverpool, being appointed to act as joint liquidator with Mr. R. R. Bailey. An advisory committee was also elected. The principal creditors are: — General Electric Co., Ltd., £1 006; British Thomson-Houston Co., Ltd., £294; Philips Lamps, Ltd., £229; Sanders and Co., £146; Greengate and Irwell Rubber Co., Ltd., £496; Henley's, W.T., Telegraph Works Co., Ltd., £141; Edison and Swan Electric Co., Ltd., £120; Liverpool Electric Cables, £114; Callender's Cable and Construction Co., Ltd., £120.

PEARL ELECTRICAL CO., LTD. At the statutory meeting of the creditors in this voluntary winding up, held last week at 72, Finsbury Pavement, Mr. A. W. Archibald, the liquidator, submitted a statement of affairs which disclosed liabilities of £844, and assets, consisting of book debts, £60, or a deficiency of £784. It was stated that in addition to the book debts there was a small amount of cash at the bank. The company had not been in the habit of carrying any stock, and did not possess any office furniture. The company was registered in June, 1925, with a nominal capital of £100, all of which was fully paid. No deficiency account was presented, but it was stated that the present position had been brought about through the profit being insufficient to meet the overhead expenses. It was decided that the meeting should be adjourned with a view to an offer being submitted to the creditors. The following are creditors:—Amalgamated Lamp Co., Ltd., £384; Lunar Electrical Co., £197; Maybrook Electrical Co., £76; Electric Lamp Services Co., £161.

SUPER SUCTOR SALES, LTD., 75, Victoria Street, Westminster, London, S.W. The statutory meeting of the creditors in this voluntary winding up was held on July 10th at the offices of Hubbart, Durose and Pain, accountants, 46, Holborn Viaduct, E.C. Mr. E. L. Donald, the liquidator, reported that the assets were only estimated to realise £515, and they were subject to Crown debts of £75, and preferential claims amounting to £1 243. There was a deficiency so far as the preferential creditors were concerned, of £803, and there were no assets available for the unsecured creditors, who were scheduled for £2 227. The company was formed in November of last year, for the purpose of carrying on business as electrical engineers and marketing an electrical vacuum cleaner. The capital of £5 000 was increased on January 1st last to £10 000, divided into 20 000 ordinary shares of 1s. each, and 9 000 preference shares of £1 each, carrying interest at the rate of 10 per cent. per annum. There were issued 19 400 of the ordinary, and 630 of the preference shares were issued for a consideration other than cash. On May 29th last, it was found that the company was getting into deep water. The shareholders were called together, the financial position considered, and a new Board was constituted. After going fully into the position, the new Board realised that unless considerable funds could be raised, there was no alternative but for liquidation to take place. The shareholders were again called together, and in view of the seriousness of the position, a resolution for voluntary liquidation was passed. Owing to the incomplete state of the company's books, and the debtors being widely scattered, it was difficult to place a value on the book debts. In some instances, collections were made by local managers, who retained a portion of the proceeds to meet their own claims. County Court proceedings would be taken where necessary and desirable. With regard to the stock a large number of the machines were incomplete, or second-hand. Other machines had been sequestrated by the landlords of the branches, who had levied for rent. The position of the company had been brought about through the heavy expenses. The company were only sub-concessionaires. The price charged for the machines, of £15, was, he understood, as much as better known makes. In addition, the machines were of German manufacture, and there was a prejudice in favour of English goods. The company had also entered into enormous commitments to pay salaries of £350 per annum in consideration of persons subscribing from £500 to £1 000 for shares. Mr. Wells enquired what the sales of the company had been, and the liquidator said that up to May 18th last, the turnover was £5 870. On the other hand, the expenses at the branches had totalled £5 142, whilst the head office expenses totalled £3 569. Apparently from £8 000 to £9 000 was received in cash for shares in the company, and had been absorbed in the heavy expenses. In answer to further questions, the liquidator stated that there could not be any dividend to the unsecured creditors. Dissatisfaction was expressed by creditors at the position disclosed, but eventually it was decided to confirm the voluntary liquidation of the company with Mr. Donald as liquidator.

## London Gazette, etc.

### Company Winding-up Voluntarily.

DIRECT ELECTRIC SERVICE (BURY), LTD. Being unable to meet its liabilities, W. Nuttall, 82, Bolton Street, Bury, chartered accountant, appointed as liquidator, June 27th. Meeting of creditors at the Masonic Hall, Parsons Lane, Bury, on July 16th, at 2.30 p.m.

### Bankruptcy Information.

HILL, Clement Sanderson, trading as SANDERSON, HILL AND CO., Waltham Chambers, Waltham Street, Kingston-upon-Hull, electrical factor. First meeting, July 17th, 11.30 a.m., Official Receiver's Office, 37, Scale Lane, Hull. Public examination, July 23rd, 2 p.m., Guildhall, Alfred Gelder Street, Hull.

## Bankruptcy Proceedings.

BANKS, George Baldwin, trading as the REDDITCH RADIO CO., 16, Market Place, Redditch. The first meeting of the creditors herein was held on July 9th at the Official Receiver's Offices, 191, Corporation Street, Birmingham, when the case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. According to the statement of affairs there was a deficiency of £491 and the failure was attributed to general depression of trade in the district. It appeared debtor commenced business as a radio engineer at Market Place, Redditch, trading as the REDDITCH RADIO CO., without capital, but his father lent him £150. The business had not provided sufficient profit to meet his living expenses and debtor stated that during the last two years trade had declined and that to enable him to carry on he had further loans from his father, whom he scheduled as a creditor for £350. His father had also guaranteed his banking account to the extent of £100. Debtor's father withdrew his claim, and the other creditors agreed to accept a composition of their claims at 13s. 4d. in the £.

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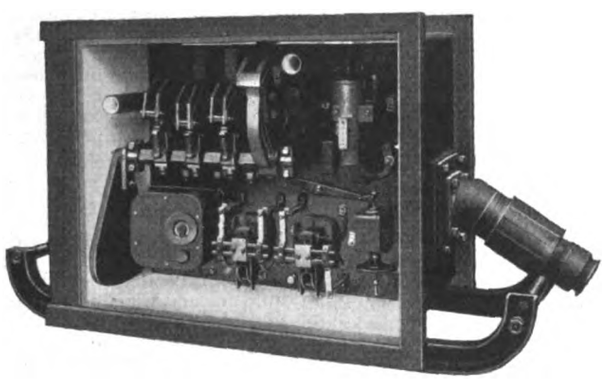
# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### June 8th.

16 716 KABELWERK DUISBURG. Paper insulated multiple conductor cables. (8/6/27, Germany.)
16 715 J. KREMENEZKY. Adjustable resistances. (31/3/28, Austria.)
16 706 E. C. R. MARKS (H. N. JASPER). Disturbance neutraliser for radio communication.
16 643 J. MILLER and D. WILLIAMS. System of electric transmission.
16 703 SIR C. A. PARSONS and J. ROSEN. Ventilation of dynamo-electric machinery.
16 639 H. B. PRENTICE. Electric fuse carriers.
16 640 H. B. PRENTICE. Electrical distribution boards, etc.
16 650 J. R. QUAIN. Electric lamps.



*ONE of the exhibits of the Metropolitan-Vickers Electrical Co., Ltd., at the Colliery and Mining Exhibition at Manchester, is the gate-end box illustrated, used for the protection of electrical equipment at the coal face.*

16 671 T. S. RAMSDELL. Overload control devices. (14/6/27, U.S.)
16 732 E. REISZ. Electrostatic loud speakers, etc.
16 735 H. N. ROBINSON, G. W. WORTLEY, and R. AND A. MAIN, LTD. Device for demonstrating effects of thermostats.
16 646 SIMPLEX CONDUCTS, LTD. Electric cut-out systems.
16 733 SOC. DES TELEPHONES GRAMMONT. Filter for telephone currents. (15/6/27, France.)
16 631 STANDARD TELEPHONES AND CABLES, LTD. Electrical testing apparatus.
16 742 M. TROUTON, and WIRELESS MUSIC, LTD. Electrically operated vibratory devices for sound transmitting devices, etc.
16 656 F. WHIPP and WHIPP AND BOURNE, LTD. Electric fuse handles.

### June 9th.

16 831 AKTIEBOLAGET LJUNGSTRÖMS ANGTURBIN. Steam, etc., turbines (11/6/27, Sweden.)
16 800 J. L. BAIRD, and TELEVISION, LTD. Television apparatus, etc.
16 804 M. BERGOIN. Pneumatic devices for making and breaking electrical circuits. (11/6/27, France.)
16 794 BRITISH THOMSON-HOUSTON CO., LTD., and F. H. CLOUGH. Transformers.
16 805 S. G. BROWN. Indicating instruments.
16 830 E. CAYE, and SOC. ANON. DES CONDENSATEURS DE TREVOUX. Electrical condensers.
16 811 E. W. L. COWAN, W. E. KING, and MEASUREMENT, LTD. Electric switches.
16 760 C. W. COX. Electric supply service boxes.
16 795 EDISON SWAN ELECTRIC CO., LTD., and S. ROGERS. Junction boxes.
16 796 EDISON SWAN ELECTRIC CO., LTD., and S. ROGERS. Methods of fixing covers in distribution systems.
16 808 FERRANTI, LTD., and W. HOLMES. Electrical testing sets.
16 809 FERRANTI, LTD., and W. HOLMES. Electrical switches.
16 810 GAS METER CO., LTD., and W. E. KING. Gas or electric controllers, etc.
16 802 KYE ELECTRICAL, LTD., and H. SILVERBERG. Incandescent lamps.
16 646 H. F. MCLOUGHLIN. Electric cut-out systems.
16 815 E. C. R. MARKS (APEX ELECTRICAL MFG. CO.). Laundry machines.
16 812 H. N. MARVIN. Means for tuning radio sets.
16 772 L. F. MOON. Television apparatus, etc.
16 790 J. S. MURRAY. Valve modulators for wireless telephony.
16 788 E. REISZ. Electromagnetic loud speakers, etc. (29/12/27, Germany.)
16 760 C. E. C. SHAWFIELD. Electric supply service boxes.
16 819 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Control of point operating mechanism. (9/6/27, British India.)

### June 11th.

16 921 AKT. GES. BROWN, BOVERI ET CIE. System of automatic control for generation of energy in power plant. (11/6/27, Germany.)
16 894 J. BARTIK. Electric thermostats. (19/4/28, Austria.)
16 910 H. H. BERRY. Electric fires, etc.
16 875 BRITISH THOMSON-HOUSTON CO., LTD. J. H. BUTCHER, and A. P. YOUNG. Sound reproducing instruments.
16 876 BRITISH THOMSON-HOUSTON CO., LTD. Thermionic apparatus.
16 858 T. EAVES and R. MYERS. Storage batteries.
16 931 R. E. GORE and A. R. UPWARD. Primary batteries.
16 843 KELVIN, BOTTOMLEY AND BAIRD, LTD., and F. A. KING. High frequency electrodes.
16 922 S. C. W. LARSEN. Wall plugs for wiring. (30/7/27, Denmark.)
16 924 METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and K. BAUMANN. Elastic fluid turbines.
16 835 G. H. SCULTHOUP and R. L. VINEY. Disinfecting telephone transmitters.
16 903 SIEMENS-SCHUCKERTWERKE AKT.GES. Iron core for electrical machines. (28/6/27 Germany.)
16 926 SOC. ANON. DE TÉLÉPHONE PRIVÉE. Automatic telephone systems. (11/6/27, Belgium.)
16 900 W. J. UNDERWOOD. Electric control of railway points.
16 901 W. J. UNDERWOOD. Arrangements for control of trains at junctions, etc.

### June 12th.

17 043 AKT.-GES BROWN, BOVERIE ET CIE. Transformers. (13/6/27, Germany.)
17 056 ALUMINIUM INDUSTRIE AKT. GES., W. D. TREADWELL, J. WEBER and A. VON ZEERLEDER. Electrolytic extraction of aluminium. (25/10/27.)
17 052 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., F. KESSLER and C. R. WOODLAND. Telephone equipment.
17 024 H. H. BERRY and W. J. MARKHAM. Signs.
17 002 BRITISH THOMSON-HOUSTON CO., LTD. Electric furnaces. (16/6/26, U.S.)
17 028 A. M. H. R. BROWN and S. G. BROWN, LTD. Sound reproducing or transmitting instruments.
17 033 A. M. H. R. BROWN and S. G. BROWN, LTD. Transformers, etc.
17 053 C. G. CARROTHERS and R. O. KAPP. Electric protective arrangements.
16 981 J. A. CRABTREE and B. G. HARRISON. Electric couplings.
17 019 W. E. DALE. Motor control systems. (29/6/27, U.S.)
16 961 T. EAVES and R. MYERS. Storage batteries.
17 001 E. M. EDEN and GENERAL ELECTRIC CO., LTD. Apparatus for controlling mechanism by light.
17 013 J. GLANVILLE and F. E. SPINNER. Apparatus for supplying high and low tension currents to radio receivers.
16 947 F. W. LANCHESTER. Field magnets for microphones, etc.
16 999 LANGENDORF WATCH CO. Manufacture of electric contact pins, etc. (21/5/28, Switzerland.)
17 000 LANGENDORF WATCH CO. Electric contact pins. (21/5/28, Switzerland.)
17 070 A. J. LAWRENCE. Electric lamp or torch.
16 991 J. NEALE. Mounting for high sensitive bridges.
17 027 SIEMENS-SCHUCKERTWERKE AKT. GES. Washing machines, etc.
17 026 E. J. WYBORN. Variable condensers.

### June 13th.

17 124 ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI. Means for securing and ventilating windings of electrical machines. (24/6/27, Belgium).
17 157 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and P. N. ROSEBY. Magnet cores.
17 099 J. G. BINNY. Apparatus for measuring strength and direction of magnetic fields.
17 125 BRITISH THOMSON-HOUSTON CO., LTD. Preparation of discharge devices and resistance materials. (13/6/27, U.S.)
17 151 ELECTRICAL RESEARCH PRODUCTS, INC. Synchronising systems. (23/6/27, U.S.)
17 178 D. GOUNOUILHOU. Electromagnetic ticket distributors. (27/3/28, France.)
17 175 A. E. HARRIS. Electric heating tubes.
17 131 R. H. HOWES. Cover for mouthpieces of telephones.
17 130 IGRANIC ELECTRIC CO., LTD., and A. H. MACKLEY. Counting devices. (11/4/27.)
17 079 A. MARR. Methods of distributing sound waves from telephones, etc.
17 114 J. H. ST. H. MAWDSLEY. Dynamo-electric generators for electric welding.
17 174 MONTECATINI SOC. GENERALE POUR L'INDUSTRIA ED AGRICOLA. Electrolytic cells. (14/6/27, Italy.)
17 160 NORDDEUTSCHE AFFINERIE. Process of electrolytically refining antimony. (18/7/27, Germany.)
17 129 A. PREEN. Radio receiving apparatus.
17 105 A. G. SMITH. Multiple filament lamps.
17 102 STANDARD TELEPHONES AND CABLES, LTD. Electron emitters. (12/9/27, U.S.)
17 100, 17 101 STANDARD TELEPHONES AND CABLES, LTD. (G. DEAKIN). Automatic telephone exchange systems, etc.
17 103 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO.) Signalling systems.
17 104 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO.) Resistance units.
17 121 A. WRIGHT. Electromagnetic devices. (22/12/27.)

### June 14th.

17 225 P. BAXTER and E. J. REID. Electrical pick-up devices for gramophones.
17 289 CABLON, LTD., and DUSSEK BROS. AND CO., LTD. Insulating compound for electrical conductors. (11/1/28, Germany.)
17 226 F. W. COOK. Printing telegraph receiver.
17 297 N. DEUNES and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Thermally-operated electric switches.
17 283 G. DOUGLASS, A. GODDARD, IGRANIC ELECTRIC CO., LTD., J. LYONS AND CO., LTD., and S. R. WRIGHT. Electric signalling apparatus.
17 254 EDISON SWAN ELECTRIC CO., LTD., and N. E. MILLER. Packing method for lamps, etc.
17 214 C. GAUDIE. Lamp holders.
17 274 E. J. LEVER (TRIX), LTD., and D. A. LYONS. Frame aerials.
17 284 E. N. LIGHTFOOT. Electric heaters.
17 279 E. C. R. MARKS (RILEY STOKER CORPORATION). Magnetic separators.
17 272 R. MAY and W. E. STANWELL. Electric sound reproducers.
17 296 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Mercury arc rectifiers. (14/7/27, U.S.)
17 186 P. F. MURPHY. Device for imposing variations, etc., on an electric current.
17 304 P. S. O'DONNELL and S. RICHARDSON. Inductances.
17 199 A. E. and H. POSTLETHWAITE and POSTLETHWAITE BROS. Inductances.
17 285 A. PREEN. Variable condensers.
17 190 A. PRESTON. Switch boxes for wiring systems.
17 216 SOC. ELECTROMETTALURGIQUE DE MONTRICHER. Electrodes for furnaces. (31/3/28, France.)
17 231 STANDARD TELEPHONES AND CABLES, LTD. (L. J. J. SCHREIBER). Switching mechanism for telephone systems.
17 300 TELEFONAKTIEBOLAGET L.M. ERICSSON. Electric excess supply meters. (16/6/27, Sweden.)
17 245 A. VOGEL. Preventing occurrence of excess voltages in electrolytic cells. (14/6/27, Germany).

### June 15th.

17 406 AKT. GES. BROWN, BOVERI ET CIE. Exhaust joint between steam turbine and condenser. (15/6/27, Switzerland.)
17 407 AKT. GES. BROWN, BOVERI ET CIE. Mercury vapour rectifiers. (20/6/27, Germany).
17 418 E. E. ANDERSON. Electric heater.
17 361 BRITISH THOMSON-HOUSTON CO., LTD. Vehicle headlamps. (16/6/27, U.S.)
17 410 A. M. H. R. BROWN and S. G. BROWN, Ltd. Sound reproducing or transmitting instruments.
17 357 C. F. and H. BURTON. Dials for electrical condensers, etc.
17 415 H. J. COATES and GENERAL ELECTRIC CO., LTD. Protection of electric systems.
17 356 COVENTRY AUTOMATIC TELEPHONES, LTD., and C. W. WILMAN. Telephone systems.
17 316 A. DAVIES. Electromagnetic separation of ores.
17 346 H. D. EDIS. Telephone instruments.
17 390 FERRANTI, LTD., and S. Z. DE FERRANTI. Magnetic suspension devices.
17 391 FERRANTI, LTD., and S. Z. DE FERRANTI. Electromagnets.
17 311 W. W. E. FRENCH and S. G. HEARN. Automatic electrical torque regulator for transmission of power.
17 414 GENERAL ELECTRIC CO., LTD., and W. WILSON. Time switches.
17 420 GENERAL RAILWAY SIGNAL CO. Train despatching systems. (16/6/27, U.S.).

## Coming Events.

**Wednesday, July 18th.**

ELECTRICAL CONTRACTORS' ASSOCIATION (SUSSEX BRANCH).—Midland Bank Chambers, Brighton. Ordinary meeting.

OVERHEAD LINES ASSOCIATION.—Visit to Mr. R. Borlase Matthews' Farm. Leave Savoy Place (I.E.E.), 11 a.m.

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# THE ELECTRICIAN

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# Current Topics.

## The Super-General Manager.

It was only to be expected that the suggestion that the electrical industry would only secure a sane system of trading by appointing a £10 000 a year man as a sort of super-general manager would excite wide, and not altogether favourable, interest. As our correspondence columns to-day show, this expectation was not unfounded. While the views thus expressed are mainly in favour of the proposal or some modification thereof, it would be idle to pretend that we have not also heard a number of distinctly unfavourable opinions. One distinguished industrialist frankly declared that if such a man were appointed he would "breed endless troubles for all of us." Another, in explaining why in his view the suggestion is futile, pointed out that the only way in which this method of control could be achieved would be for the man himself to force himself into the position, "a task which would require a great deal of money, a lot of hard work, much enthusiasm, plus a type of inspiration which is unknown in the electrical industry." Others took the earliest opportunity to express their very great sympathy with any man who undertakes the job. But while there is a sharp division on the original proposal, there is another school of thought which holds that it would take about a year to find a suitable man and a further two or three years for his appointment to become really effective, and that the industry cannot wait so long. It is, therefore, suggested that a strong "Cabinet" of, say, five men should be appointed immediately. The "Big Five" would comprise a manufacturer of plant, a manufacturer of apparatus, a progressive municipal electrical engineer, a progressive supply company engineer, and a contractor. This "Cabinet" would be appointed annually, would meet once a week, its members receiving a fee of £500 each for their services; a further £2 000 per annum would be required for the secretarial staff. The preference for a group of men, as opposed to a one-man appointment, is supported by the assumption that each member, carrying out his normal duties in the industry, would be in constant and close touch with its problems and conditions, whereas an individual would promptly tend to become isolated from the real trend of thought in the industry. In order to facilitate adequate discussion of the problem from all angles, we do not propose at this stage to do more than repeat our invitation to readers to make use of our correspondence columns for that purpose. Upon one point there is general agreement; something must be done—and that soon—to ensure to those putting brains and capital into the industry a fair return for their enterprise. With full realisation of the need and its urgency some satisfactory means for meeting it may be looked for as the result of current deliberations.

## The Public Lighting Conference.

The Conference of the Association of Public Lighting Engineers, held at Sheffield from July 9th to 12th, was an interesting event. The public lighting engineer of this city, Mr. J. F. Colquhoun, is the new President of the Association, and has certainly done good service, both to Sheffield and to the Association, by organising the series of demonstrations of street lighting which formed the chief feature of the gathering. Such conferences doubtless exercise a considerable influence on the minds of public lighting authorities and help to raise the status of street lighting. At present, unfortunately, there are not many cities which have the services of a qualified public lighting engineer. But the number is increasing, and we hope the time is not far distant when the control of public lighting will be regarded as a full-time job for an expert in all cities of any size. Apart from their influence on public opinion these conferences afford good opportunities for experts to exchange views—and the unofficial discussions which raged at the Grand Hotel throughout the period of the proceedings were by no means the least important element in the proceedings. On this occasion special zest was given to such discussions by the unique series of demonstrations of methods of street lighting, arranged by Mr. Colquhoun, and extending over about eight miles of streets. The installations were designed to illustrate the practical workings of the Specification, and must have furnished many useful hints to the members of the B.E.S.A. Committee on Street Lighting, who also attended.

## Visibility Tests.

The inspection of the installations was supplemented by visibility tests by the aid of standard discs, superintended by experts from the N.P.L. A good number of those present allowed themselves to be pressed into the service, and their labours extended, on several occasions, into the small hours of the morning. Generally speaking, a high standard was reached in these street lighting installations, though we understand that there was only one which

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came within Class B in the Specification, which requires a minimum of 1·0 foot-candles. The experiments certainly showed that the requirements of the Specification, at least as regards all but the highest grades of streets, can be readily met. How far they represent the ideal in public lighting remains to be seen. We fancy that most of those present came to recognise that even a well-designed street lighting installation is not free from glare; not infrequently amateur observers were discovered shading their eyes with their test-card in the effort to detect the white spot on the disc—a practice which was promptly discouraged by the experts in charge! Interesting papers were also read by Coun. THRAVES, Mr. J. M. WALDRAM, and others. Of special interest in MR. WALDRAM'S paper was the description of ingenious methods of conducting tests on streets in miniature.

## Low Kilowatt Costs.

A STRIKING feature of the report on the working of the Tientsin municipal electricity supply undertaking for 1927 is the very low capital cost of £18·9 per kW installed. This figure, it should be noted, covers everything—generating plant, transmission, distribution plant, and even the apparatus on hire—and Mr. R. A. WILLIAMS, the engineer and manager, claims that his figure is better than the lowest cost of the power station alone in Great Britain, and that the cost per kW of the generating plant (£13·8) is probably a record. In view, however, of the various factors which should be taken into consideration in making comparisons of this kind, we should not be surprised to see this claim challenged by more than one station in this country. At West Ham, for instance, extensions involving a total cost of nearly £250 000 are now being made at slightly under £8 per kW, and we believe there are several undertakings here which cost about £12 per kW for plant, and about £20 all-in. At these stations distribution is mainly underground, and this, of course, should be considered when making comparisons with stations employing overhead distribution. Then, in the case of super-stations, the cost of the buildings alone is a heavy liability which the smaller stations escape. A further point is that while in this country the practice is to take the maximum continuous rating of plant, it is possible to make a better showing by calculating on, say, 25 per cent. overload; and while the Tientsin claim does not take advantage of this, the possibility should be borne in mind when making comparisons of this kind.

## Our Overseas Trade.

EXPORTS of United Kingdom produce and manufactures in June, 1928, were greater by £918 000 than in May, and over £2 500 000 more than in June last year. The position of our overseas trade for the first six months of this year, while still leaving room for improvement, is distinctly encouraging. The fact that, for the first half-year, our export trade can show an increase of £12 890 000 over the corresponding period of 1927 would seem to indicate that the long-awaited revival in general trade has definitely passed from the stage of being a hope to one of definite improvement. On the electrical side of the country's industry, exports for June exceeded imports by £100 349, while for the six months there was a margin of £6 412 105 on the right side. Details of export and import figures, in so far as they concern the electrical industry, and as given in the Board of Trade returns, will be found in detail elsewhere in this issue. From these it will be gathered that while we have lost a certain amount of ground on the month's export business, when compared with the same month of last year, those items which show considerable improvement are chiefly in heavy machinery. From this increased business in traction and generating plant it may be concluded that further trade will follow; that is to say, railway extensions, power station erection and additions are all forerunners of bigger business in other electrical equipment. While, therefore, there are some who may bemoan the fact that the June figures show some decline when compared with June, 1927, those who apply reason and common sense to their conclusions will see, through the detailed figures, ample excuse for maintaining our present mildly optimistic point of view.

## Electricity and the Farmer.

THERE can be few within the electrical industry who do not know roughly what electricity can do to assist agriculturists, and what it may be made to do in this field in the future. Unfortunately, farmers as a whole are not so well informed, and, having either seen or heard of some of the experimental applications, which they dismiss as impracticable, tend to overlook the many ways in which electricity can really help them at the present time. It was therefore appropriate that a severely practical account of the existing, rather than potential, uses of electricity should have been given to a large gathering of farmers, assembled at Nottingham last week for the Royal Agricultural Show, by Mr. WALTER RIGGS, who, in addition to his electrical activities, finds time for farming on a moderate scale. To most of our readers, the ground he traverses is familiar, but his treatment of the subject is, we feel sure, more likely to arouse the real interest of the farmer than any amount of prophetic wisdom. There are not many farmers who will suddenly set up an all-electric farm, but, once we get a supply of electricity in his house, the farmer can readily be persuaded to try the effect of a lamp in the poultry houses; and so, by easy stages, to an installation which will render him great service, and at the same time provide a paying load for the supply undertaking.

## The "Ack-Acks."

EVER since its inauguration, by the late Dr. JOHN HOPKINSON and Colonel R. E. CROMPTON, just before the South African War, the voluntary corps of Electrical Engineers forming a branch of the Royal Engineers has unassumingly carried out work of prime importance to our land forces. The value of this work, so willingly done in their spare time by busy men in the electrical industry, has never been sufficiently appreciated, and for that reason we draw attention to the brief account, published on a later page of this issue, of a demonstration of modern anti-aircraft methods which have been devised by one of the London battalions of the "Ack-Acks." With the constantly increasing danger of air attacks upon this country, the rôle of these Territorial units assumes added importance and interest, and the need for continuous development in the means for "spotting" and repulsing hostile aircraft naturally provides a fertile field for the exercise of specialised electrical knowledge. Most of the units are at present under strength, and would be glad to hear from likely recruits. From personal observation, we can guarantee that suitable candidates will find both an interesting job and congenial companionship.

## Protecting the Public.

WHILE Mr. W. R. RAWLINGS was at Cheltenham advocating the compulsory earthing of domestic electrical appliances with universal three-pin standard plugs, a youth was electrocuted in a London fish shop. A few days later a London housewife was electrocuted by an electric suction cleaner. "Accidental death" was the verdict of the coroner's jury, but those knowing how easily such dangers can be obviated might place an entirely different construction on fatalities of this kind. As the result of the vacuum cleaner case many members of the public have had their confidence shaken, and unless energetic steps are taken to restore it a slump in the sales of portable domestic apparatus may be looked for. The position is hardly improved by the advice given in a widely circulated daily paper that all housewives using electrical appliances in their homes should first don a pair of electrician's rubber gloves! We all know that it is possible to make domestic appliances which can safely be used without rubber gloves, and it is our duty to the public to see that they *are* safe.

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# FUTURE OVERHEAD TRANSMISSION LINE DESIGN.

## Reasons for Recommending Changes—Problems Overlooked in "Economical Span" Theory—The Real Safe Height of Conductors—Safety and Reliability of Wood Pole Lines—Informative Tables.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

ALTHOUGH during the pioneer days of overhead line design and construction we did not understand in the light of to-day's knowledge such matters as lightning voltage, insulator flashovers, the arc voltage and its direct proportion to arc length, and so forth, we were nevertheless guided by circumstances and common sense in the erection of safe lines; in other words, we used wooden construction throughout, and kept the conductors low. After all these years of experience it is not as yet generally realised that where the resistance of steel structures or poles and/or the earth connections thereto is low, the total flashover voltage is much lower than that of a wood-pole line with or without low-resistance earth connection, and is still lower compared with a wood-pole line properly installed and set in earth of high resistance, which latter is a natural consequence when the creosoted wood-pole is used. Taking only one example of safety and reliability of a line, let us consider a primary distribution line designed for 11 000 V using pin type insulators. The approximate impulse flashover of such an insulator is around 300 kV, and the average height of bottom conductors for such a line is around 22 ft. This design, which is of the common type (without overhead ground wire installation), permits us to operate at no higher value than 14 kV per ft. of height of conductors. This low figure is one of the reasons for recommending a change in designs to secure safer and more reliable lines.

For protection against over-voltage rises, we had in past years to rely almost exclusively on the lightning arrester; we later installed an overhead ground wire, we then sought means to increase the flashover value of insulators, and the latest important practices put forward are to keep the conductors low, either by means of conductor arrangement, restrict the sag or span, or to use both these means, to use wooden supports and insulate all wires and conductors from them, and to combine the neutral conductor and overhead ground wire properly installed. The height of conductors and wires and their arrangement on the supports in relation with the conductors and wires (with or without transpositions of the power conductors), as also the kind of material used for supports (steel, reinforced concrete, wood, etc.), have much to do with increasing or decreasing dangers and hazards. The so-called "economical span theory" does not consider any of these problems, nor does it account for the *real* safe height of conductors, best stress on insulators, best insulation, best arrangement of conductors in relation with the ground wire or wires, and many other factors; hence, it is a theory electricity undertakings should seriously condemn.

### Increased Flashover Value.

Many advantages have accrued from the use of a properly installed neutral conductor as the overhead ground wire and/or continuous earth guard wire. No matter where it is situated on the line in relation to the power conductors, it offers desirable shielding value, positive relaying, better operating conditions, much decreased length of arc resulting from flashovers, longer time duration for clearance and quenching of an arc; all these aid the switch problem, etc. Best results are obtained when it is used on wood-pole lines and insulated therefrom; especially for those lines operating at voltages of 33 000 and under, due to the induced potential gradients of the lower voltage lines being relatively more severe—see the accompanying summary of calculations. The long standing practice of this country has been to locate the overhead ground wire (commonly called "guard wire") below the power conductors. It is, however, becoming more generally understood that raising the ground wire to the same level, or to a limited distance above the power conductors, is equal to lowering the height of the conductors above ground level so far as protection from induced potentials is concerned. In other words, we may say that placing the ground wire below the conductors is equivalent to raising the height of conductors above ground level, i.e., if the same ground wire protection was placed above (or on a level with) the power conductors, the same induced potential on the conductors would be equivalent to placing them at a lower height above ground level, all of which makes for a safer and more reliable line. This advantage is further improved upon by retaining the insulation of all the supports, which results in increased flashover value, i.e., the total voltage is much higher for wood than for steel supports (structures, poles, pins, etc.). It is therefore evident that, for equal height and arrangement of conductors, a wood-pole line is the safest and most reliable line; furthermore, as the spans of most lines are of moderate or short length, the total advantages ultimately become extremely important.

For the different voltage lines the engineer knows approximately the average height of conductors above ground level for the different dispositions and line voltages; they vary a little with span lengths, but can be very closely approximated for practical calculations. Depending on the arrangement and the line voltage, the vertical separation of conductors will vary somewhat; allowances have been accounted for in arriving at the final figures given in the accompanying table and summary.

TABLE I.

| Line Voltage. | Line to Neutral. | Maximum Line to Neutral. | Dry Flashover. (Effective.) | Dry Flashover. (Maximum.) | Number of Units. | Impulse Flashover. | Factor of Safety. |
|---|---|---|---|---|---|---|---|
| 132 kV | 76·2 kV | 108 kV | 500 kV | 700 kV | 9 | 1 300 kV | 6·4 |
| 110 ,, | 63·5 ,, | 90 ,, | 400 ,, | 565 ,, | 7 | 1 150 ,, | 6·4 |
| 88 ,, | 50·9 ,, | 72 ,, | 360 ,, | 500 ,, | 6 | 900 ,, | 6·9 |
| 66 ,, | 38·2 ,, | 54 ,, | 310 ,, | 430 ,, | 5 | 760 ,, | 7·9 |
| 44 ,, | 25·4 ,, | 36 ,, | 270 ,, | 360 ,, | 4 | 620 ,, | 10·0 |
| 33 ,, | 19·1 ,, | 27 ,, | 225 ,, | 300 ,, | 3 | 480 ,, | 11·0 |
| 22 ,, | 12·7 ,, | 18 ,, | 160 ,, | 230 ,, | pin | 310 ,, | 12·7 |
| 11 ,, | 6·3 ,, | 9 ,, | 85 ,, | 120 ,, | pin | 300 ,, | 13·3 |

The safety of any line depends on the maximum induced voltages for the potential gradients afforded by the particular design and construction. For the worst conditions, the relations between the maximum induced voltage and the lightning flashover of insulators are approximated in Table III.

At the Institution of Civil Engineers Centenary, 50 kV/ft. of height of conductors was quoted;* up to the present time, and conforming to the general practice of this country, we have very largely limited ourselves to the low values (c') shown in Table II.

TABLE II.

| Maximum Line to Neutral in kV (a') | Line Voltage in kV (b') | Impulse (Lighting) Flashover in kV (c') | kV per foot of height for: (Line Voltage) (a') in kV | (Impulse Flashover (b') in kV | (c') in kV |
|---|---|---|---|---|---|
| 108 | 132 | 1 300 | 2·3 | 2·8 | 27·6 |
| 90 | 110 | 1 150 | 2·0 | 2·6 | 25·5 |
| 72 | 88 | 900 | 1·8 | 2·2 | 22·5 |
| 54 | 66 | 760 | 1·5 | 1·8 | 21·7 |
| 36 | 44 | 620 | 1·2 | 1·4 | 20·6 |
| 27 | 33 | 480 | 1·0 | 1·2 | 17·4 |
| 18 | 22 | 310 | ·75 | ·9 | 14·1 |
| 9 | 11 | 300 | ·41 | ·5 | 13·6 |

In terms of three different potential gradients, taking 50 kV/ft. of height as a mean figure for reference, the maximum induced potentials for lines without ground wires and in terms of the bottom conductors only, is given in the following table. It will be seen that these voltages are far too high, and it is evident that we must resort to other practices, such as the use of insulators of higher flashover values, instal overhead ground wire or wires, or/and use wood poles and insulate all wires from them, etc. Much information can be obtained from the accompanying tables; for instance, one of the common understandings is that lines under 11 kV obtain relatively no protection as compared with lines of the order of 110 kV—the relations are given in Table III, but the more correct relations are forcefully brought out in the final summary (Table IV).

TABLE III.

| Line Voltage in kV | Number of Units. | Average Height of Bottom Conductor in ft. | Impulse (Lightning) Flashover in kV | Maximum Induced Potential in kV (*without Ground Wires*) *for Potential Gradients of:* (25) | (50) | (75) |
|---|---|---|---|---|---|---|
| 132 | 9 | 47 | 1 300 | 1 170 | 2 350 | 3 520 |
| 110 | 7 | 45 | 1 150 | 1 120 | 2 250 | 3 370 |
| 88 | 6 | 40 | 900 | 1 000 | 2 000 | 3 000 |
| 66 | 5 | 35 | 760 | 870 | 1 750 | 2 620 |
| 44 | 4 | 30 | 620 | 750 | 1 500 | 2 250 |
| 33 | 3 | 27 | 480 | 670 | 1 350 | 2 020 |
| 22 | pin-type | 24 | 310 | 600 | 1 200 | 1 800 |
| 11 | pin-type | 22 | 300 | 550 | 1 100 | 1 650 |

* "Electric Transmission of Power," by Mr. Archibald Page, President I.E.E.

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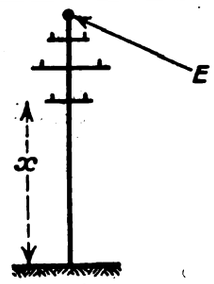
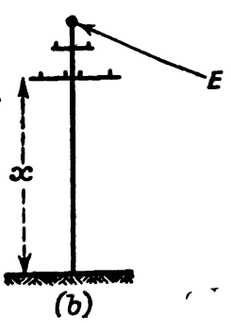
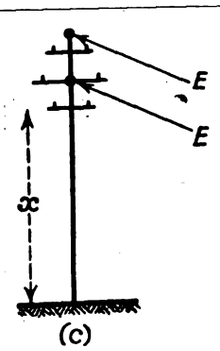
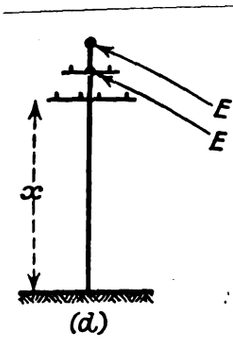
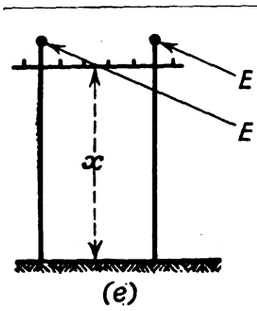
TABLE IV.

| Three-phase double-circuit lines, showing different arrangement of conductors and number and positions of overhead ground wire. | Line Voltage in kV | Impulse flash-over of insulator in kV | Maximum Induced Potential in kV for (a) | (b). | Percentage Voltage above impulse flashover value of line insulator, in kV for (a) | (b). |
|---|---|---|---|---|---|---|
|  (a) | 132 | 1300 | 3070 | 2980 | 136 | 119 |
| | 110 | 1150 | 2860 | 2790 | 149 | 142 |
| | 88 | 900 | 2500 (Middle conductors) | 2480 (Bottom conductors) | 179 | 174 |
| | 66 | 760 | 2130 | 2170 | 180 | 185 |
| | 44 | 620 | 1770 | 1860 | 185 | 200 |
| | 33 | 480 | 1560 | 1680 | 204 | 250 |
| | 22 | 340 | 1360 | 1490 | 300 | 338 |
| | 11 | 300 | 1250 | 1370 | 316 | 354 |
|  (b) | 132 | 1300 | 2770 | 2500 | 113 | 92 |
| | 110 | 1150 | 2590 | 2380 | 125 | 107 |
| | 88 | 900 | 2260 (Top conductors) | 2120 (Bottom conductors) | 150 | 135 |
| | 66 | 760 | 1930 | 1650 | 154 | 117 |
| | 44 | 620 | 1600 | 1590 | 158 | 156 |
| | 33 | 480 | 1410 | 1430 | 193 | 200 |
| | 22 | 340 | 1220 | 1270 | 258 | 273 |
| | 11 | 300 | 1130 | 1170 | 277 | 290 |
|  (c) | 132 | 1300 | 2560 | 2240 | 97 | 72 |
| | 110 | 1150 | 2200 | 2010 | 91 | 74 |
| | 88 | 900 | 1940 (Top conductors) | 1800 (Middle conductors) | 115 | 100 |
| | 66 | 760 | 1690 | 1660 | 122 | 118 |
| | 44 | 620 | 1370 | 1300 | 120 | 110 |
| | 33 | 480 | 1190 | 1140 | 157 | 137 |
| | 22 | 340 | 1080 | 1030 | 211 | 202 |
| | 11 | 300 | 940 | 910 | 213 | 203 |
|  (d) | 132 | 1300 | 2130 | 1980 | 64 | 52 |
| | 110 | 1150 | 1980 | 1890 | 72 | 64 |
| | 88 | 900 | 1730 (Top conductors) | 1680 (Bottom conductors) | 92 | 86 |
| | 66 | 760 | 1480 | 1470 | 97 | 96 |
| | 44 | 620 | 1230 | 1260 | 98 | 103 |
| | 33 | 480 | 1080 | 1140 | 125 | 137 |
| | 22 | 340 | 940 | 1000 | 176 | 193 |
| | 11 | 300 | 870 | 930 | 190 | 210 |
|  (e) | 132 | 1300 | 2020 | | 55 | |
| | 110 | 1150 | 1940 | | 68 | |
| | 88 | 900 | 1720 | | 91 | |
| | 66 | 760 | 1500 | | 98 | |
| | 44 | 620 | 1290 | | 108 | |
| | 33 | 480 | 1160 | | 141 | |
| | 22 | 340 | 1030 | | 202 | |
| | 11 | 300 | 940 | | 213 | |

$E$ = Ground wires. $x$ = Height above ground level of bottom conductor.

Transposing the power conductors complicates the results, due to changing the conductors to different levels and to different distances from the ground wires; the differences will not materially alter the design relations shown here and desired in practice. It will be seen that, for the same disposition of conductors and method of protection, the induced potential gradients differ for the different voltages. This is due to the fact that the vertical separation of conductors is not the same for the different line voltages—this is so, independent of the height of bottom conductors which decrease in height differently, down to a minimum limit as the voltage is decreased. The accompanying sketches are for line voltages up to 33 000; above (or at) this voltage the suspension insulator can be used, but the vertical separation need not be changed. Table IV is for voltages from 11 000 up to 132 000.

It is interesting to note from Table IV that the worst overhead line, for the different conductor dispositions and protective arrangements shown, is (*a*); this type conforms with the conductor disposition and protective arrangement chosen by the Central Electricity Board for the 132 000 V "grid." Vast improvements can be made by arranging two ground wires at the top, or, arranged as shown in (*c*), which latter offers a slight improvement over ground wires located at the top of the tower (one above each of the top conductors). Locating one lower ground wire as shown in (*c*) allows of less mechanical stress as well as other advantages. It is interesting to see that, for the lower voltage lines (*c*) type comes out best of all the types, with type (*d*) second best for the lower voltages. For the horizontal arrangement of conductors, type (*e*) runs very close to type (*d*) for all line voltages with advantages in favour of (*d*); arrangement (*d*) offers the best all round advantages.

## BOOK REVIEWS.

**Electrical Engineering Practice.** Vol. 2. By J. W. Meares and R. E. Neale. (London: Chapman and Hall.) Pp. xii+514. 25s. net.

This is the second of three volumes into which the fourth edition of this now well known work has been expanded from its initial single volume edition.

The subject matter comprises (1) transformation, conversion and storage of electrical energy; (2) distribution and systems of supply; wiring systems, control and wiring of branch circuits; fittings and accessories, and cost of electrical installations; (3) the application of electrical energy in lighting, heating, and welding.

Volume 1 dealt with definitions, generation, prime movers, sale of electrical energy, transmission and control; and Volume 3 is to include applications of energy to motive power and industrial processes, specifications, testing, and rules and regulations. It is clear, therefore, that the three volumes together will form a very complete treatise.

This present volume, No. 2, proves a worthy follower of the first. The same high standard is maintained in the thoroughness and comprehensiveness with which each separate section covers its subject, which has been the characteristic feature of the work right from its inception. This merits emphasis, for, although so many branches of engineering are included, the grasp shown by the authors in each one constitutes a point rendering the books of peculiar value as a standard work of reference.

The section on transformation deserves, and can best be described by a full list of sub-headings. It treats of basic principles of transformers, voltage regulation, connections, tap changing, boosting and regulating types, operation, points of manufacture, insulation, costing, losses and efficiency, rating and temperature, care of oil, and an explanation of harmonics; then comes an equally full treatise on rotary converters, including voltage ratio, rating, voltage control, power factor, parallel running and inverted operation; then motor converters, cascade converters, binary converters, and transverters. The chapter on rectification covers theory, electrolytic, mechanical, crystal and metallic oxide types of rectifiers, thermionic diode and triode valves, and mercury vapour and mercury rectifiers, with a valuable comparison of conversion methods and efficiencies, and the special applications of the various types of sub-stations to particular duties.

This subject of transformation is of especial interest and usefulness to the fast increasing number of supply engineers perforce becoming interested in bulk supply, and the section will amply repay at least one reading. It is practical and full of helpful information, and, indeed, provides the equivalent of years of varied experience in a nutshell.

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Both storage of energy and systems of supply are practical treatises and cover some useful ground.

Wiring and lighting may sound a dry subject to all who have anything to do with it, but, on the contrary, in some magic way these chapters are made, not only extraordinarily interesting, but, better still, intensely informative. They will be found valuable reading to supply engineers, wiring contractors, wiremen, and, please, architects. A rut is a terrible thing to get into, but these chapters are calculated to dig out a victim, lift him clear, and set him on the high road of modern progress—and the rescue is very cheap at 25s.—and, incidentally, immensely humane to the mere user of electricity. A mere summary of contents does not help much. On might guess the headings—but one cannot guess the mode of treatment.

Heating should be coupled with wiring and lighting by reason of its equal value. Air and water heating are dealt with in a thoroughly practical way, and methods of calculation, with examples, are given freely, nothing being left hazy. Cooking follows, on the same lines. Then comes industrial heating with a full description of processes and types of furnaces and ovens, and actual figures of power consumption and time-length of processes.

Welding covers arc, carbon arc, metal electrode arc and quasi-arc welding among other methods, with resistance, butt, spot, seam, electro-percussive and cyc-arc processes. Again, a thoroughly practical treatise.

Rules and regulations are inserted at appropriate places throughout. A useful device.

The authors, right back at the start, set themselves the task of filling the gap between the pocket books of bare data and the highly technical works written for specialists in various branches of electrical engineering. In this it is only fair to say that they have succeeded to a very high degree, and must have earned a debt of gratitude from their evidently growing number of readers. They have not only provided a comprehensive survey of each branch of the subject, but have contrived to condense the salient points in it to such an extent that it seems that only designers and specialists would need to seek further, so practical is the method of treatment. The technical sections make wonderfully attractive, as well as valuable, reading, and the section on lighting and heating is a veritable illumination and warming of the respective subjects. This latter comment, however, must not detract from the more important worth of the volumes as engineering text books and as a standard work of reference—which electrical engineering students and engineers will be fortunate in possessing.

C. F. MOUNSDON.

**Elektro-Wärmeverwertung.** By ROBERT KRATOCHWIL. Second Edition. (Munich: R. Oldenbourg.) Pp. viii + 695.

This is a rather unusual type of book, dealing as it does with the applications of electrical energy for various heating purposes as a means for increasing consumption. At the outset a daily load curve is reproduced showing how the load on the Bâle station has been made practically constant over the 24 hours by the use of heat storage in water for domestic purposes.

A general chapter on economics follows, in which the laws of energy conversion are set forth and illustrated by examples; the relative cost of coal, gas and electricity; and tariffs in various countries.

In the section on heat storage, the fundamental laws of heat conduction and storage are considered. This involves a study of Fourier's fundamental equation of heat flow. It is doubtful, however, whether many designers of tanks would employ such advanced theory.

The practical part of the book starts with electric cooking. This section comprises a collection of data and appliances, such as is to be found in many technical journals. In addition to houses, institutions, bakeries, etc., are discussed. Following this, hot-water tanks, thermostats and control clocks are reviewed. Electric heating for rooms, schools, churches, police on point duty and coffee-stall holders are examples of direct heating by electricity; while indirect methods involve air or water circulation. Heat storage stoves, built like Dutch stoves, are not likely to find favour here, where radiant heat is preferred.

The steam boiler affords many illustrations of electric heating for industrial purposes. In many cases, high-voltage can be employed. Welding in its various forms is dealt with at considerable length in one of the longest sections in the book. Another long section is devoted to the numerous electric furnaces. A great variety of applications of electric heating are then briefly touched upon. These include the warming of metal tyres, tar, air, oil, the melting of quartz, the thawing of frozen meat, and the heating of soldering irons. The last chapter deals with electricity applied to agriculture.

It will be gathered that much of the material in the book consists of photographic reproductions and technical descriptions such as abound in manufacturers' publications: perhaps this is unavoidable. Much of the data may be useful for engineers employed in developing electric supply business, but the material is by no means complete. Despite what we say of ourselves, many important applications of electricity have been developed in this country, and it is not too much to say that some of the most successful appliances owe their origin to British engineers. The author, however, says comparatively little about these—most of his examples being taken from Continental practice. Nevertheless, the contents of the book justify its title.

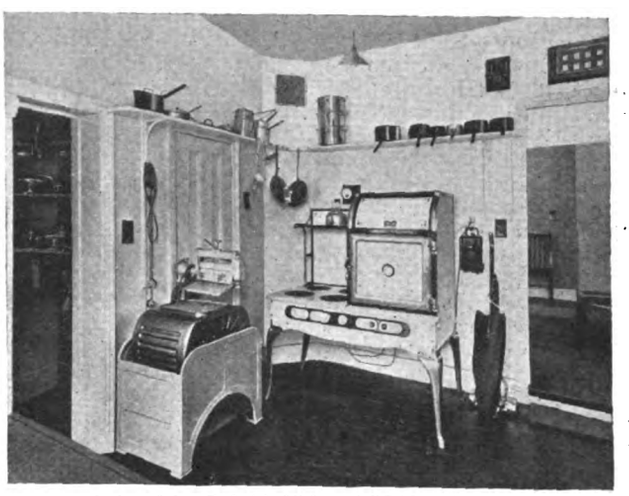
S. PARKER SMITH.

# "LITTLE HALDON."

## Details of an All-electric House at Deganwy.

ON Tuesday and Wednesday of last week, Dr. and Mrs. S. Z. de Ferranti, entertained members of the Manchester Branch of the Electrical Association for Women at their all-electric house at Deganwy. The house is similar in size and structure to that usually used by people of average means, and contains four bedrooms, with the usual downstairs accommodation.

In order to convert the house from its original non-electrical condition, electric lighting, heating, cleaning, cooking, washing and thermal storage water heating were introduced, while other points decided upon have resulted in the absence of switches in the bathroom, the installation for violet ray equipment and a mains-operated wireless receiving set.



A view of the all-electric kitchen at "Little Haldon."

The removal of the kitchen range and the installation of electric cooking in the scullery has changed the old kitchen into a sitting room with a large cupboard in the place of the kitchen range. This has added a further living room to the downstairs accommodation, while at the same time decreasing the labour involved in cleaning both a fairly large kitchen and scullery, to the cleaning of a scullery only. The bathroom is warmed by a radiant heat fire, fixed to the ceiling as accommodation is limited, and the linen-press has been fitted with an electric air heating apparatus for circulating heated air within and amongst the clean linen in order to air the clothes before use.

The apparatus detailed constitutes an attempt at inaugurating a complete electric house of moderate size. The bedroom fittings, in addition to electric fires, include an electric plate on which water can be boiled for the early morning tea. All bedrooms are also fitted with hot and cold water. The electro-thermal storage system adopted comprises a large central storage tank, thoroughly lagged with heat insulation, and with electric heating elements under control of a thermostat.

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# ELECTRICITY AND THE FARMER.*

## Present Agricultural Applications Outlined—Wireless and Telephones—Question of Financing Installations—A Sixty Per Cent. Farm Load.

By WALTER RIGGS, M.I.E.E.

THE object of this paper is not to make a comprehensive survey of the possibilities arising from the full use of electricity in agricultural operations, but is intended merely to indicate the very many directions in which electricity can be applied to the present help of the farmer, both in the farmhouse and in the farm buildings.

Mr. Walter Riggs.

The uses to which electricity can be put on a farm are so numerous already that it would take a very long time to go into them in detail. I therefore propose to invite you to take a walk with me round a farm where electricity is utilised, in the hope that some one or other of the operations mentioned will appeal to individuals as meeting their own requirements.

On approaching the house we notice that there is a wireless aerial very much in evidence. We find that this is of great use to our host, as not only does he have the privilege of listening to certain farming talks on specialised subjects, but is able to get the weather reports, morning and evening. We also notice in the hall a telephone. How many cattle have been lost through not getting the "vet." in time? How many good markets for corn or cattle have been missed through being a few hours too late, or not being able to get in touch with the right man at the right time?

The many advantages of electric light over any other form of illumination are too well known to need any eulogy, especially as the cost of electric light is less than the cost of paraffin for the same number of oil lamps. Special mention must be made, however, of the great advantage accruing from lighting the farm buildings, yard, etc., by electricity. In cowhouses a good lighting effect is secured by pendant lamps suspended from the roof, the light being reflected from the limewashed walls. In any lighting scheme the yards must not be forgotten. When there is no moon it is difficult and often dangerous to enter cattle yards at night.

In entering the kitchen the first thing that one notices is the electric range standing against a wall. Here a consumption of electricity amounting to a unit per person per day covers all the expense.

In the washhouse we find an electric washing and wringing machine. This is driven by a ½ H.P. motor, and in an hour will do all the washing that previously took the better part of a day to accomplish. Then, on a table by the wall we see a maid busy with an electric iron.

As we want to hurry on to the farm buildings we have not time to go further over the house; but it is to be understood that one or two portable electric radiators serve to give very useful warmth in the winter in various rooms where a fire is not always kept going, while an electric suction cleaner is in everyday use.

### Dairy Equipment.

We now come to the dairy, and find a ½ H.P. motor operating the cream separator, while another of the same power is used through worm gearing for driving the small churn. In the corner of the dairy we find a sink where there is an electrically-driven bottle-cleaning equipment. Attached to the dairy is the cold room, where the milk is cooled directly it comes from the cows. This equipment also embraces an electrically-operated cold storage cabinet where butter, dressed fowls, and other perishable food can be kept at a uniformly low temperature until such time as it is required. A ½ H.P. motor is all the power that is required for this equipment, which is automatic in action and keeps a constant temperature in the cold chamber, as well as providing a certain quantity of ice. With a cold chamber of sufficient capacity only one journey to the railway station per day need be made, which alone constitutes a very great saving in transport costs.

Next door we are shown the cowhouses where the actual milking takes place. In this instance there are 12 cows kept, and electric milking machines are found of great help. These are each operated by a ¼ H.P. motor.

In the yard there is the well from which the main water supply for the farmhouse and farm buildings is taken. The water is pumped up into a tank in the roof of the farmhouse and pipes are led to the dairy, kitchen, scullery, cowhouses, horse troughs, cattle troughs, and generally over the farm buildings. A 1 H.P. motor here provides all the power that is required for water pumping.

We are next taken to the workshops where repairs are carried out to implements, gates, etc., as required. A 3 H.P. motor is installed which drives, either direct on to a circular saw or on to counter-shafting as required.

Our next move takes us to the poultry houses, and we notice that the incubators and foster mothers are all electrically heated, the heat being controlled by a thermostat. The fowl-houses are electrically lighted so that in the winter time, by means of a time switch, the light is switched on two hours before sunrise.

### Portable Motors.

On leaving the poultry section we visit the barn, on the first floor of which is fixed a chaff cutter, driven by a 2 H.P. motor. We notice that the green maize, which is being cut at the time, falls from the machine through an aperture into the dry mixing house on the ground floor. Here is the root slicing and cleaning machine, operated by a 1½ H.P. motor. Next to this is a small motor-driven cake crusher. On the other side of the barn, adjoining the granary, is a mill, which is belt driven from a 5 H.P. motor. This motor is not fixed on foundations, but mounted on a low trolley, the wheels being locked. The starting gear for this motor is attached to it and connected electrically to a wall socket by means of tough rubber-sheathed cable. This motor, being portable, is thus available for emergency use as well as being used when needed to operate the hay elevator.

We note an electric shearing machine standing in a clean dry place. This machine is equipped with a ¼ H.P. motor. The universally jointed shaft is attached directly to the motor spindle. With this machine is also supplied a horse and cattle clipping attachment.

We are next taken to see the silo in operation. The cutter and blower are dealing with heavy crops of tares, and at the rate of 5 tons in the hour. The motor, which is of 15 H.P., is mounted on a low lorry, the wheels of which are chocked.

The motor used for driving the ensilage cutter is also used for driving the drum for threshing. While this work is generally done in the stack yard in the usual way, we understand that both ends of a large barn are used for stacking corn. When weather conditions are not favourable for outside work the hands are turned to, and, by using the electric motor, which is always on the spot, the corn is threshed out and the straw is trussed under cover.

The question of financing the installation and purchase of motors and apparatus is one that very often precludes the farmer from taking advantage of the use of electricity, however much he would like to do so. It does seem to me that the agricultural credits, of which we have been hearing quite a lot recently, should be of some assistance to the farmer in this direction; but if these cannot be applied to this purpose, there will be no difficulty whatever in the farmer obtaining all his requirements on the hire-purchase system.

Some very interesting figures have been supplied to me by the chief engineer of a corporation in the north, who, out of a total number of farms that could be served by their low-tension lines, have over 60 per cent. connected, either for lighting, cooking, heating and power, or lighting, cooking and heating only.

I make no apologies for leaving out of consideration the interesting topic of electro-culture in its many forms, nor for my failure to make any reference to the major operations in agriculture, such as ploughing, cultivating, harvesting, etc. Although it is possible to work these processes electrically, I think further experimental and research work will be necessary before it will be possible to recommend the farming industry to use electricity generally for these purposes.

* Extracts from a paper read at the Royal Agricultural Show, Nottingham, on July 11th, 1928.

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# PUBLIC LIGHTING ENGINEERS.

## Association's Annual Meeting and Conference at Sheffield—A Practical Test of the Standard Specification—Effective Illumination Not Always Attractive.

THE Association of Public Lighting Engineers held its fifth annual meeting and conference in Sheffield last week, under the Presidency of Mr. J. F. Colquhoun, the City Lighting Engineer. A feature of the programme was the inspection by the members and delegates of the experimental street lighting installations which have been prepared by Mr. Colquhoun, in conformity with the British Engineering Standards Association Street Lighting Specification, covering eight miles of streets, in order to demonstrate the practical results of the Specification. The installations were also inspected by the British Engineering Standards Association Street Lighting Section and by officials of the National Physical Laboratory, and the latter took the opportunity, in view of the annual meeting of the Association of Public Lighting Engineers, to obtain the help of its members as observers, in order to get a mass opinion.

The business of the annual meeting and conference was commenced in the Town Hall, Sheffield, on Tuesday morning, when the Lord Mayor (Ald. M. Humberstone, J.P.) extended to the members and delegates a very hearty welcome. Sheffield he said, was particularly interested in lighting problems. and the Corporation was very anxious that the whole of the district should be lighted as well as possible. In view of the speed of our traffic to-day, we could not possibly make our streets too light.

On the motion of Mr. Alex. C. CRAMB, the retiring President, who presided, seconded by Mr. S. B. Langlands, a hearty vote of thanks was accorded the Lord Mayor.

The formal business of the meeting included the announcement of the election of a number of new members, among whom were Dr. C. C. Paterson, Chairman of the International Illumination Committee, which will meet in America in September this year, and Director of the General Electric Co.'s Research Laboratories at Wembley.

After his induction as President, Mr. COLQUHOUN asked the Lord Mayor to present to the Past-Presidents of the Association some lithographed certificates which had been prepared to mark the services they had rendered to the Association.

### The Presidential Address

Mr. Colquhoun then delivered his Presidential address, in which he pointed out that the membership had increased during the year from 113 to 146. The Association had certainly justified its existence, though its work was hampered by lack of funds. The President then made detailed comparisons between the 47 specimen installations which he had had erected to demonstrate the various classes of the British Standard Specification for Street Lighting, and observed that in viewing the installations he had been struck by the fact that effective illumination is not always attractive illumination. Consideration of this point led to the assumption that installations equal in minima illumination were equal in effectiveness, but if they differed in maxima illumination they would differ in attractiveness, and only very slightly in effectiveness. The one with the greater contrast was the more effective so long as the ratio minimum to maximum illumination did not exceed about 40, over which figure contrast seemed to become unattractive.

Continuing, Mr. Colquhoun said quite confidently, that the demonstration proved the Specification. If the installations were in the order of their minima illumination, investigators would find that they arranged themselves into what would be their order of preference from the point of view of effectiveness. If they arranged them in their order of maxima illumination they had, again from the point of view of effectiveness, obvious contradictions.

The glare clause might be made mandatory, in order to prevent or handicap an installation with a high minimum illiumination and considerable glare. He also suggested for consideration the change of distance between the lamps from "actual" distance to "effective" distance.

On the whole the Specification had come through the test of this demonstration creditably, and it should be put into operation in every city and town in the country. If this was to be done properly, Lighting Departments would require to be much better staffed and equipped.

The President assured representatives of local authorities that the need for proper staffing and equipping of Lighting Departments was very real. An instance was quoted of an experience in fitting up the Sheffield demonstration. They found in a certain case that it was impossible, even by the most careful adjustment, to get the illumination on the road surface which they knew they should get from the distribution of llght given by the particular refractor used. Eventually they found that the outer globes by absorption, plus uncontrollable refraction of light by the outer globes themselves, and also possibly by internal reflections, were entirely cancelling the effect of the prismatic glassware. They took the outer globes off, and the minimum illumination was raised from 0·275 to 0·45 foot candles.

Two papers on the non-manual control of public lighting were then read. The first was by Mr. F. H. Horstmann, and dealt with gas lighting; but the second, which was by Mr. E. E. Sharp, dealt exclusively with electric lighting.

### Automatic Lighting Control.

At the outset Mr. Sharp pointed out that the details common to both gas and electricity for public lighting are very little in evidence from the point of view of automatic control. Even when similarity apparently existed, there were the following differences:—

(1) Remote control is possible by a greater number of methods electrically; there are four methods in use with two other possibles, besides the rarely used method of switching direct from the power or sub-station. With gas the only *practical* methods are by clock and by pressure, with one other *possible* way.

(2) For the control of electricity the clocks have to be designed bearing in mind that they never have the protection of the lantern and the help of a bye-pass flame to keep off condensation and the worst extremes of cold.

(3) With electricity the absence of a bye-pass increases the saving to be effected by automatic control.

Of all the forms of control, time switches were the only automatic means of control that shared with hand-switching the possibility of universal application.

Direct switching from the station meant laying mains or at least one extra core in a cable for no other purpose than to carry the street lighting, and it was doubtful if it could ever be justified on cost.

After pointing out the impracticability of the selenium cell and the "Aga" system, the author, dealing with methods actually in use, referred first to the Olipel system, which operated by superimposing an alternating current of comparatively high frequency on to the existing lighting mains. It had the advantage of being adaptable to any existing network without alteration to any of the mains, but its disadvantages were that it involved an initial outlay of some hundreds of pounds in the power station. On a complete scheme, the cost of this station equipment worked out at from 10s. to 20s. per switching point, which must be added to the cost of the relays, which was, approximately, the same as that of time switches. A technical disability was the limitation of the impressed voltage. Five places employing this system at the present time were Leatherhead, Winchester, Douglas, Tilbury, and Maidenhead.

In certain circumstances relay systems had advantages, but no relay system was truly automatic. In every case the relays had to be actuated by hand or by time switch at the actual moment that lighting or extinguishing was required. This applied equally to the Olipel system, and to direct switching from the station, of course.

Dealing with time switches, Mr. Sharp first outlined the technical requirements of the clock, the most suitable treatment to ensure good operation, insulation, methods of mounting, and fuses.

Electrically-wound clocks, he said, were taking a position of increasing importance in connection with street lighting work. An electrically-wound clock without a solar dial would still require a man to go round, say, once a fortnight, to reset the times of lighting and extinguishing. On the other hand, a hand-wound clock with solar device would still require attention for winding.

The combination of the two theoretically did away with all need for attendance. Actually, no clock in commercial working would keep exact time, and, therefore, even the combination would require attention occasionally for the purpose of adjustment of this feature. A good deal of advance had been made,

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however, in recent years in time keeping, and it seemed highly probable that accuracy within 30 minutes a year could be expected. His belief was that for large current switches, at all events, the use of this combined device would become more general, although on smaller switches the matter of cost and size would put it out of the question for some time to come.

Reference was made to a method that does not use a clock in the ordinary acceptance of the term. The device, commonly

**An untouched night photograph of Prince of Wales Road, Sheffield, illuminated by "Wembley" lanterns and 1 500 W Osram lamps.**

known as the Warren motor, consisted of a synchronous motor, the speed of which was dependent on the periodicity of an a.c. circuit. If, for instance, this device was connected to the standard frequency of 50 cycles, speed would be definitely 3 000 revs. per min. If the periodicity went up to 51, the clock would be 2 per cent. fast. By installing a special master clock at the central station, it was quite easy to keep this periodicity correct over the twenty-four hours, although it might vary from second to second. Such an instrument had the great advantage of doing away with any necessity for winding or of the use of an escapement, but it had the great drawback that, in the case of cessation of supply, the apparatus stopped for so long as the supply was off, and when the supply came on again all the clocks were slow by the length of the stoppage.

Coming now to the commercial side of the subject, Mr. Sharp believed that everyone was now satisfied that time-switch control was cheaper than hand-switching, while the advantages of not being dependent upon the human factor for this important work were generally admitted. As an instance of the saving, even where a separate switch had to be put on each post, he quoted one case as being a fair average, namely, Leyton, where on an installation of 1 850 time switches, the net annual saving was 14s. per post per annum. Experience had shown that this saving was never less than 12s. per post per annum, while in some cases it was more than even that at Leyton.

The life of a time switch and the cost of maintenance were, of course, important features to consider as regards the financial advantage of automatic control. A really good time switch had a life of 20 years on street lighting, and during this time the maintenance would be mostly confined to oiling and winding the clocks, with an occasional replacement of some small part, or perhaps of burnt-out contacts in case of a short circuit damaging these before the fuse operated. Five per cent. per annum for maintenance was ample to allow in the case of small switches, and as clock maintenance was much the same in cost on the larger size switches, the percentage in this case became a very small one on the first cost of the switch.

## THE DISCUSSION.

In the discussion, Mr. B. KELLY drew attention to Mr. Sharp's statement that a technical disability from which the Olipel system must necessarily suffer was the limitation of the impressed voltage. As one with considerable experience of the system, he thought the condition of the mains had very little to do with the question. No reference had been made to the flexibility of the Olipel process, which was one of its chief advantages. With an electric clock switch it was difficult suddenly to vary the time for switching on or off, but with the Olipel system it was simple to switch on early if, for any reason, it was desired to do so. As an offset to the cost of the rippling current, which in the case of the relay system was required from the relay station, he said that with clock switches there was an annual bill for winding the clocks. Probably Mr. Sharp would reply that the lamps had to be cleaned in any case, and that the clocks could be wound at the same time.

Mr. HAYDN T. HARRISON said that although Mr. Sharp had condemned the Olipel system, it had been wonderfully successful for the illumination of aerial ways, sea buoys, etc., where it had to be left for months without attention.

Mr. T. WILKIE believed there was less chance of the failure of control apparatus with electric lighting than with gas lighting.

### Group Switching.

Mr. E. C. LENNOX, referring to the relay system, thought that where a switch was used it was surely economical to put in a switch wire sufficiently large to deal with a group of lamps, and then to switch the lamps on in groups. When new underground networks were laid down it was not very expensive to incorporate an extra core in the cable for the purpose of switching the lamps on in groups, using the neutral as a return. In existing networks, however, the most economical method was to instal a small time switch in each lamp. In overhead networks the advantages were undoubtedly with the installation of the switch wire of sufficient size to control groups of lamps.

Mr. M. H. WARDLE thought that time switches should be produced more cheaply.

Mr. COLQUHOUN said that time switches were very efficient and helpful, but they required attention. In Sheffield he had nearly 2 000 lamps controlled by time switches.

Mr. E. E. SHARP, dealing with Mr. Haydn Harrison's reference to the "Aga" system, agreed that it was working extremely well for coastal lighting in many parts of the world. With regard to the Olipel system, Mr. Kelly was in a position to speak of it authoritatively. Since writing the paper he had heard of a similar system being used in Paris, and had been there to inquire into it. They had been experimenting with it for three years, and had just come to the conclusion that the relays, which were fixed on the posts, were not good. These had been scrapped, therefore, and a new type of relay installed, but so far they had had only a short experience of it. He was not sure that the use of relays was the best way of dealing with the problem. In certain circumstances, perhaps, they might be adopted, but much depended on local conditions. The system called for at least one extra wire in the cables for the purpose of operating the relays, and one might just as well use that as a direct switching wire, as suggested by Mr. Lennox. They could not as a general rule take the place of time switches. Emphasising the President's remarks as to the need for proper attention to time switches, he said he had often seen the cases left open after winding, and if there were other parts which could be left open they also were left open sometimes.

Coun. F. THRAVES (chairman of the Sheffield Watch Committee) then read his paper on "What the Public Want from a Street Lighting Department as Pedestrians, as Motorists, as Ratepayers," and after a short discussion the paper by Mr. J. M. WALDRAM, on "The Visibility of Objects in Artificially Lighted Streets," was then presented.

Mr. Waldram's paper dealt with the subject in a very detailed way. The conclusions reached are summarised in the following schedule :—

SCHEDULE OF EFFECTS ON VISIBILITY OF VARIABLES IN AN INSTALLATION.

| Variable. | Effect on Visibility. |
|---|---|
| Illumination Level .. | Increase produces higher perceptibility, and if sufficiently increased allows discrimination by internal contrasts. Less important on wet roads. |
| Diversity of illumination .. | On dry roads increases diversity of brightness and contrasts. On wet roads unimportant. |
| Height of source .. .. | Increase reduces brightness diversity and gives smaller background contrasts, but less glare and greater internal contrasts. |
| Spacing-height ratio .. | Increase produces greater glare, but higher brightness diversity and more marked contrasts. It should not be carried too far. Long spacing is bad on wet roads. |

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| | |
|---|---|
| Arrangement of sources— | |
| (*a*) single side .. .. | Not recommended : bad on polished or wet roads. |
| (*b*) central .. .. | Better than (*a*), but liable to be bad on wet roads. |
| (*c*) staggered .. .. | Good, but should be used with caution on wide roads. |
| (*d*) double side .. .. | Better than (*c*) for wide roads ; good for wet roads. |
| Shading of sources .. .. | Considerably reduces glare and increases comfort. Light should not be cut off buildings and kerbs. |

## THE DISCUSSION.

Dr. C. C. PATERSON pointed out that Mr. Waldram had shown the necessity to consider factors other than that of the illumination on the road. He had shown that the positioning of the posts was an additional factor which must be considered very carefully indeed. There was nothing in the paper which gave any support to what Mr. Haydn Harrison had called beacon lighting, a system in which the posts were so wide apart that the result was merely to give small patches of light along the surface of the road. He hoped it would not be considered that the beacon system was now tolerable.

Dr. J. W. T. WALSH thought the essence of the paper lay in the pointing out that a certain degree of contrast in street lighting was desirable, if not essential. In the past, the idea had been to obtain uniformity of illumination along a street, and only recently had it been realised that that was the wrong ideal to aim at. There might be some danger, however, of going right away from the old idea of uniform brightness to the idea that large contrasts on the roadway were desirable for bringing about the greatest degree of "noticeability" of objects. Too much contrast could be as dangerous as too little.

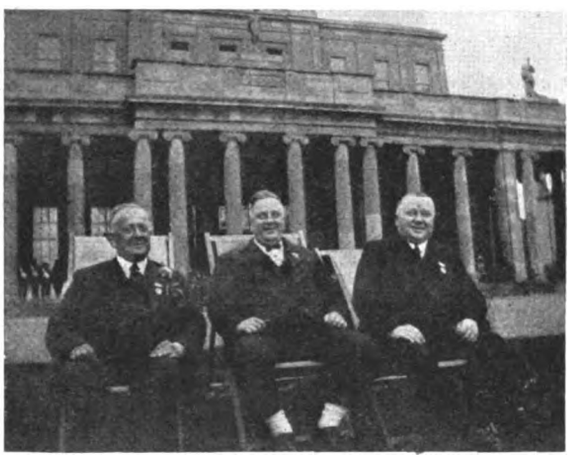
Mr. S. B. LANGLANDS said that undoubtedly in the future there must be closer working between city engineers and lighting engineers, and the reflective values of various road surfaces would have to be studied.

Mr. HAYDN T. HARRISON pointed out that visibility had not been dealt with in the past to the extent that it ought to have been dealt with, because it was the object of all lighting. The things one wanted to see in the streets had very often the same reflecting value as the surroundings, and that was why everything, in the course of its movement down a street, nearly always reached a point at which it was almost invisible. The distance within which it became nearly invisible was sometimes considerable. He suggested that some means might be discovered whereby objects using the streets, such as vehicles, could be made to have bright surfaces.

Mr. W. J. JONES also urged the need for intimate contact between lighting engineers and city engineers, because the nature of the road surface played such an important part. It should be borne in mind that variations of 10 or 20 per cent. in the amount of illumination available did not give a

## *MORE CHELTENHAM SNAPS.*

"Better late than never" was the title suggested for this picture of Mr. H. T. Young, who only arrived in time for the garden party, but pronounced the E.C.A. Conference an excellent one.



The question "Is the electrical industry starving its members ?" is definitely answered in the negative by this group representing electrical manufacturing, contracting and wholesaling interests, who, together, turn the scales at over 48 stone.

Mr. L. C. Penwill, having heard many delegates' personal views on hotel accommodation at Cheltenham, could still manage to raise a smile on the last day of the Conference.

Two more photographs taken at the E.C.A. Conference garden party in Pittville Park, Cheltenham. To the left is a section of the crowd listening to the band. In the more formal group are seen Mr. and Mrs. R. E. Robson, Mr. and Mrs. W. F. T. Pinkney, Miss C. Haslett, Mr. H. T. Young, and Mr. Ll. B. Atkinson.

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sensible reaction to the eye; the eye was sensible only to changes of 50, 100 or 200 per cent., so that if we were going to improve our street lighting materially by varying merely the amount of illumination, we must change the wattage of our lamps, not from 40 to 60, but to a very much greater extent if we were to obtain something which was markedly an improvement.

Mr. E. J. STEWART said that Mr. Waldram had, in the main, neglected footpath lighting, for good reasons, but it was necessary to point out that this was an important matter from the point of view of the motorist. A street might be well lighted from kerb to kerb, but if there were no illumination on the footpath the sudden passage of a pedestrian from the footpath to the roadway would cause motorists great difficulty.

Mr. ERNEST STROUD pointed out that uniformity of illumination did not mean uniformity of brightness, because there was always specular reflection, and so on, but he suggested that if there were a reasonably high minimum illumination, the remainder of the lighting would be good.

### Mr. Waldram's Reply.

Mr. WALDRAM assured Dr. Paterson that it had not been his intention to justify beacon lighting. In expressing agreement with Dr. Walsh that too much diversity was a bad thing, he said that in the case of one of the installations he had seen at Sheffield, the diversity was very high, with the result that some objects on the road, and even the kerb, could be lost sight of in the dark places. In the paper he had merely discussed the merits and de-merits of diversity, in order to see where we stood in regard to it. He was not sure that Mr. Haydn Harrison was right in suggesting that it would be an advantage to have bright objects on the roads, because the curves he had shown had indicated that in the majority of positions an object was seen as a dark and not as a light object, and he believed it would be found that the visibility would be decreased rather than increased. The better way of meeting the difficulty was to keep the road surface bright and thus ensure a good background. He agreed with Mr. Stewart that pedestrians often stepped suddenly from the footpaths into the roadways, and he suggested that the solution in roads where there were buildings was to keep the buildings bright. He did not think Mr. Stroud's suggestion, that if the minimum illumination were good the rest would be good, followed out everybody's experience.

## A SUMMER VISIT.

### I.E.E. South Midland Centre Inspect Accumulator Works.

PERFECT weather favoured the annual summer visit of the South Midland Centre of the I.E.E. on July 10th, when 106 members and friends travelled from Birmingham to the Peak District by road.

The city was left at 9 a.m., and the vehicles passed through Warwickshire, Staffordshire, and Derbyshire amid scenes of hay-making, in real hay-making weather. Sutton Coldfield, Lichfield, and Derby were seen at their best, and the beautiful valley of the Derwent was then followed, with the river continually winding from side to side of its green bed on the left of the road.

The first stop was made at Ambergate, where the river emerges from the dales. Here a typical outdoor sub-station of the Derby and Notts Electric Power Co. was inspected, under the guidance of Mr. A. D. Phillips, the company's engineer and manager.

This company's system joins up with that of the Leicester and Warwick Electric Power Co. to form a combined power area with a total of 523 miles of e.h.t. mains, a local distribution system of 354 miles, and 90 200 kW of generating plant actually working or in process of being installed. The D. and N. Co. employ only 33 and 11 kV for transmission, and the sub-station at Ambergate possesses two outdoor-type transformers for stepping down from the 33 kV lines from the Spondon and Hinckley generating stations to 11 kV for secondary distribution. A small portion is also transformed to 460 V for local consumption.

After the inspection the party resumed their journey among the limestone crags and pinnacles of the dales, and stopped at Matlock Bath for lunch at the Royal Hotel. They then continued to Bakewell, where from 2.30 to 4.45 p.m. they inspected the works of the D.P. Battery Co., Ltd., which is most picturesquely situated beside the Wye just above its confluence with the Derwent. The huge breast-type waterwheel, 25 ft. in diameter by 18 ft. wide, attracted particular interest at the outset, this having been installed just over 100 years ago by the famous Richard Arkwright, who then occupied the site with his spinning factory.

### Efficient Waterwheels.

This wheel and its smaller companion are, however, more than mere curios, for they are still working and supplying the present factory with a large part of the power required for manufacturing processes; moreover, their efficiency has been found to compare favourably with that of the modern turbine.

The party were received by the management and staff of the firm, including Messrs. Waddell, Brown, and Thornhill, and piloted through the works. Attention was specially given to the casting of the grids, the "burning" of the lead components into a solid assembly, the formation of the plates, and the manufacture of the wood separators. The numerous types of product were exhibited and explained, including batteries for telephone exchanges weighing two tons per cell, submarine batteries of 350 cells—each of which weighs 8 cwt.—and, at the other end of the scale, batteries for small house lighting sets, for motor cars, and for wireless sets.

Following the tour of the works, the visitors were entertained at tea in the works restaurant, at the conclusion of which Mr. W. Wilson, the chairman of the Centre, not only thanked the firm for the pleasure and interest of the visit, but congratulated them upon their enterprise and the quality of their work, and upon the fact that so great an amount of industrial activity was being carried out among those beautiful surroundings without any ill effect upon the landscape.

Before returning to Birmingham the party were permitted to inspect the restored Haddon Hall, through the great kindness of the Duke of Rutland, who has recently had a complete electrical installation added; this takes a supply from the mains of the Derby and Notts Power Co. Here members were able to enjoy the sight of a modern electric oven situated alongside a fifteenth-century open grate, before which the old roasting jack and spit once supplied the needs of the household. There is now a sub-station in one of the courtyards, and tasteful and appropriate electric fittings illuminate the old carved oak and stonework.

A selection of photographs taken during the day is reproduced on the opposite page.

## FIFTY YEARS AGO.

**[Extracts from "The Electrician" of July 20th, 1878.]**

A GLANCE through the pages of THE ELECTRICIAN of July 20th, 1878, recalls that:—

Tests were being made with a 20 000 c.p. electric lamp for use by submarine divers.

* * *

There were then eighteen submarine cable companies operating 62 000 miles of cable.

* * *

Mr. Elisha Gray was attempting to show that he was the inventor of the speaking telephone, and not Mr. Graham Bell.

* * *

At the twelfth annual meeting of the Eastern Telegraph Co. a small party of the shareholders ineffectively protested against the re-election of Baron d'Erlanger as a director of the company.

* * *

Recording the rapid development of electric lighting in Paris—many large workshops and other commercial establishments and several of the railway termini having adopted it—we regretted that "in London there is not one such light to be seen."

* * *

Submarine telegraphic tariffs were being discussed in the light of the deliberations at the St. Petersburg conference of the European Telegraphic Congress. Monopoly, and its bearing on tariffs, and other questions very similar to those which are being debated to-day, were receiving attention.

* * *

Attention was drawn to Pulvermacher's single-fluid atmospheric depolarisation battery. A description stated that the positive element was amalgamated zinc contained within a porous cylinder; the negative was silver wire spun helically in the form of a hollow cylinder of very small diameter, and afterwards wound helically around the outside of the porous vessel, which was freely exposed to the air. The electrolyte was dilute sulphuric acid.

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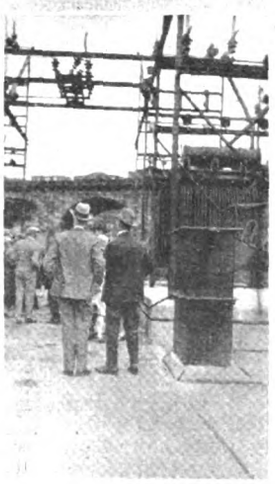

## THE SOUTH MIDLANDS (I.E.E.) SUMMER VISIT.

*THESE photographs, taken during the Summer Visit of the South Midlands Centre of the I.E.E., show :—(1) The great water-wheels at the D.P. Battery Co.'s Works, Bakewell ; (2) the hon. secretary (Capt. H. Hooper) looks after some of the ladies ; (3) a halt in the Peak District ; (4) Another part of the D.P. battery works ; (5) A technical discussion at the works ; (6) Mr. H. Joseph with one of the hosts at Bakewell ; (7) Mr. W. Wilson, chairman of the Centre ; (8) Mr. G. R. J. Parkinson (vice-chairman) restoring his tissues ; (9) Mr. A. D. Phillips (Derby and Notts E.P. Co.) discussing rural distribution with Mr. W. P. Gauvain ; (10) The party arriving at Matlock Bath for lunch ; (11) E.h.t. gear at Ambergate ; (12) The 33/11 kV outdoor sub-station at Ambergate interests Dr. Garrard and others ; (13) In search of refreshments at Whatstandwell.*

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## A General Manager for the Industry.

[To the Editor.]

Sir,—The question raised by Mr. T. R. Martin at the E.C.A. Conference is one of great importance to all concerned in the electrical industry. There undoubtedly is room for co-ordination and co-operation between the various sections of the industry, and the rate of future development will depend largely upon the extent to which this can be brought about.

The necessity for co-ordination, so far as the generation of electricity is concerned, has been recognised by the Government, and the practical outcome of this recognition is evidenced by the establishment of the Central Electricity Board, and the various schemes adopted, and in contemplation, by that body under the provisions of the Electricity (Supply) Act, 1926.

The adoption of some common policy and uniformity of trading methods would, *inter alia*, tend towards reducing the cost of appliances of all descriptions, which is essential if develpment is to be accelerated.

The diversity of the interests concerned is so great that it seems to me to point towards the establishment of a fully representative committee rather than the appointment of any particular individual. No individual, or committee, dealing with the situation is likely to be endowed with powers to enforce decisions, and, recognising this, it is my view that the findings of a representative committee would be more likely to be adopted than those of an individual, however competent.

Such a committee might well be presided over by a picked man who devoted his whole time to its service, and it might be formed under the ægis of the Electrical Development Association, which is the only body in existence to-day that is representative of all interests in the electrical industry.—I am, etc.,

R. P. Sloan.

Newcastle-on-Tyne.

[To the Editor.]

Sir,—Regarding the suggestion made by Mr. T. R. Martin in the discussion on Mr. Marryat's paper, "Trading without Tears," at the E.C.A. Conference, it seems clear that while the electrical trade as a whole is not getting a fair and reasonable profit for the energy and enterprise put into it, the sections which are well organised and comprise a small number of firms, such as the C.M.A., the E.L.M.A. and the A.M.A., are making more profit than the other sections.

In the sections of the industry where the number of firms is large, it is most difficult to control prices, and the cutting in certain sections, such as conduits and accessories has been very severe, although these sections have tried, time after time, to organise themselves and control prices. Even the large firms building generators, etc., are not free from the accusation of taking orders on an unprofitable basis; there is certainly some excuse for these firms as they have to meet severe foreign competition, but wiring contractors, who have not to meet any foreign competition, have no excuse except the anxiety to keep their workmen employed. If, therefore, some scheme can be thought out whereby all sections can get a fair margin of profit for the energy and enterprise put into the business, it will be welcomed with open hands.

I suggest that the E.D.A. might be made a *real* Electrical Development Association, not only to advertise the development of electricity, but to make the trade profitable and to see that all sections get a fair and legitimate profit for their efforts. If this were done, more money would be forthcoming for advertising and development.

My suggestion is to make E.D.A. the parent trade organisation for laying down a code of rules and regulations for fair trading, seeing that each section gets its legitimate profit, and each section deals fairly with the others. It should allow all the various sections to carry on as they are doing now with regard to their negotiations with their operatives, their own research work, their own schemes of training for those entering the various sections, etc., and deal only with trading and advertising matters.

If E.D.A. had an outstanding personality to direct methods of trading and advise on profits, probably an eminent accountant—there are such men in the country, for instance, Sir William Plender, who is called in on so many reconstruction schemes—such a head would be able to say whether current prices for generators, and even for wiring contracts were fair and profitable; unprofitable contracts are to the detriment of the industry generally.

I would even go so far as to suggest that copies of all quotations over a certain figure, and all prices, rates and tariffs for current, and standard prices for standard materials, should be sent to E.D.A., say weekly, by all electrical firms; and firms not agreeing to this procedure, and who were quoting unprofitable prices, would be boycotted by the entire industry after suitable warning had been given to them.

An independent man, one not in the trade, but a clever, capable and experienced accountant, is the type of man required. It might not, of course, be necessary for an individual to give his whole time, but if the type of man I have in mind were procured a very high retaining fee would be necessary. He could have under him, and working to his directions, a competent staff of accountants and electrical assessors who would go into the smaller details and arrange the prices, subject to confirmation by the "Great Man." The money lost each year by the electrical industry in wasteful trading methods at the present time, I contend, would amply cover all the expenses such a scheme would cost.—I am, etc.,

R. E. Robson.

Newcastle-on-Tyne.

[To the Editor.]

Sir,—The suggestion of having a super-general manager for the electrical industry requires to be more clearly formulated before one can express an opinion as to the service that such an appointment would be likely to render to the industry.

In Great Britain I believe we have to keep before us the value of specialist firms. Co-ordination is all very well up to a point, but we must be careful not to lose the birthright of originality. An organiser who would develop this trait of the British character in our electrical industry, and at the same time direct our markets towards stabilisation at fair and reasonable prices, might have a useful field of activity.—I am, etc.,

H. W. Clothier.

Hebburn-on-Tyne.

[To the Editor.]

Sir,—Although I am not accustomed to assume the mantle of prophet, two items in your issue of July 13th seem to demand further emphasis of their effect on the future. Let me take first Mr. T. R. Martin's suggestion at the E.C.A. Conference that the electrical industry needs a general manager. In my article on "The New Electrical Penetration" published on page 153 of your issue of February 10th, 1928, I suggested that some day the Commissioners or the Central Board would seek powers to inspire utilisation of electrical energy, and pointed out that if the chairman of such a council which might be formed were content with less than the salary of a Cabinet Minister he would be the wrong man for the job. I also insisted that if, by the year 1930, such a man had not appeared, much of the work of the Central Electricity Board would have been in vain.

My other point concerns the powerful plea, made by Sir Philip Nash, for the setting up of commercial organisations to sell power. The soundness of the principle he enunciated is obvious to those who have studied the progress of great industries, though it does not seem to be appreciated by many in the electrical industry. In the article referred to, it is pointed out that the speed of power salesmanship regulates the speed of the whole long train of electrical merchandise; that plant and appliance marketing is just as good as bad salesmanship of electrical energy allows it to be.

Throughout the industrial world the big profits are found where the sale of the consumable product is most highly developed. The electrical industry cannot escape the workings of this principle. If I may be allowed to quote from my article, let me prophesy: "It's progress will be hastened or delayed as the salesmen of electrical energy are aggressive or retrogressive. Before the salesmen of current-utilising plant and appliances can go out to magnify the 'Electrical Idea' and multiply again its multiplying applications, the salesmen of electrical energy must first set forth."

All this sounds rather elementary, but when a leader of the calibre of Sir Philip Nash finds it necessary to address a gathering of electrical experts on such a subject, one can only conclude that the industry still has much to learn.—I am, etc.,

Warwick Holmes.

London.

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[Several letters are unavoidably held over.—Ed.]

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# WILKINSON CIRCUIT.

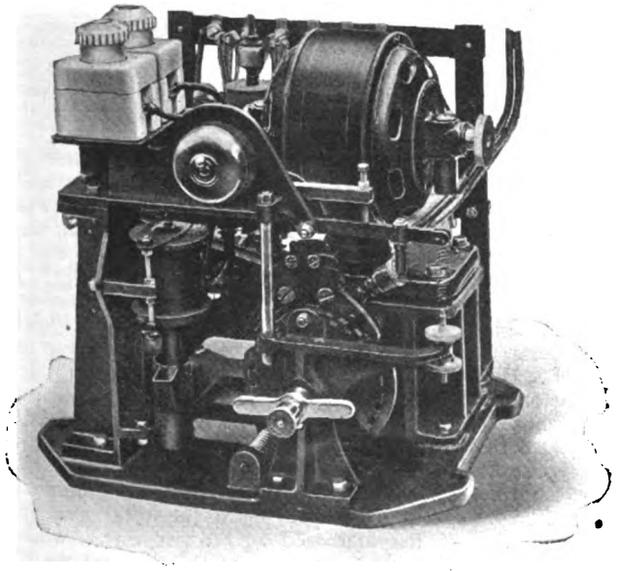
## Practical Demonstration of the "Change-Circuit" at Stafford.

WITH a view to showing the practicability of the Wilkinson "change-circuit," a special demonstration was given on Wednesday, Thursday and Friday of last week at the Stafford works of the English Electric Co., Ltd. Readers will remember that the first details of this circuit were given in THE ELECTRICIAN of June 17th, 1927, and since then a number of developments have taken place.

The "change-circuit" aims at improving the "load factor" of supply undertakings by bringing about a constant load by automatic adjustment of the thermal storage or kindred load according to the variation in the lighting and power load. The essential principle of the scheme is the use of two independent feeders with one common line, one of the feeders being maintained at constant voltage for the customary lighting, domestic or industrial load, whilst the other supplies power at a variable voltage for thermal storage and similar purposes. The voltage on the change-circuit feeder is automatically varied so as to maintain the sum of the loads—i.e., the total load on the sub-station, at approximately full load continuously. By filling up the valleys in the load curve the increased cost of production is very little more than the cost of fuel, and it is estimated that the so-called "out-of-bounds" load from modern generating plant can be supplied at ½d. per kWh.

### Application to Existing Systems.

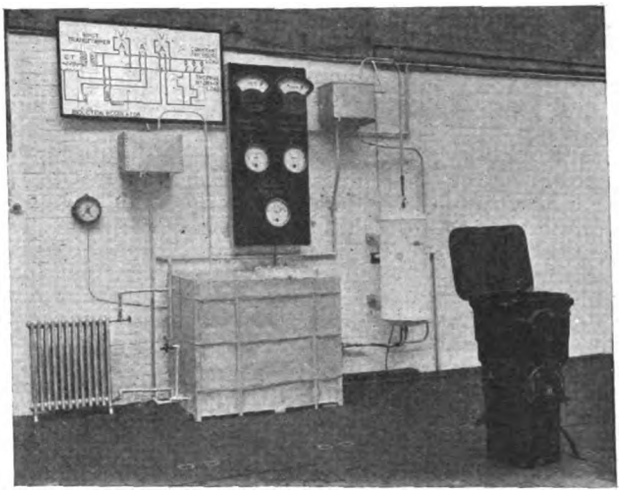
The change-circuit involves the use of variable voltage automatically controlled, and for this purpose an "English Electric" induction regulator is used. The scheme can be applied to existing systems merely by the addition of the induction regulator and the provision of an extra feeder per phase. A three-phase four-wire system would then become a three-phase seven-wire system: similarly, a single-phase three-wire would become a five-wire system. In operation, the normal supply is at constant voltage and serves the ordinary lighting, domestic and industrial load. The induction regulator is auto-connected—i.e., it is designed with a 1/1 ratio and the rotor and stator windings are connected in series. When the tranformer is fully loaded with ordinary load the voltage across the regulator is zero, and no power is supplied



Automatic operating gear for the small induction regulator used in the "change-circuit" system.

to the thermal storage circuit. When the ordinary load falls to its minimum, as in the early morning hours, then the regulator gives maximum volts and the total load on the transformer is maintained constant by the thermal storage supply. In some cases, as in small transformer sub-stations, it may be more economical to utilise a tapping switch arrangement on the secondary of the transformer instead of an induction regulator. In such cases the maximum volts on the change-circuit will be the same as normal volts across lines. This means cables of equal section; but for small feeders the cost of excavation becomes large compared with the total cost of the feeders, and so the heavier section of the change-circuit feeder may not be commercially detrimental.

It is unlikely that the use of direct current for domestic supply will be extended to any appreciable amount. Most of the present d.c. supply is from rotary converters, and it is easily possible to arrange an existing d.c. three-wire system to operate as a five-wire change-circuit system, superimposing an a.c. thermal storage load on the d.c. load in the common neutral. The automatic control gear for feeder voltage regulators which must maintain a voltage within ± 1 per cent.



A general view of the demonstration equipment used at Stafford.

of some predetermined value is found to be an expensive item, and the cost would be prohibitive for change-circuit applications in which a variation of ± 5 per cent. or even more is allowable. A simplified arrangement has therefore been developed.

It is the maintenance of constant current on the input side of the transformer that is aimed at, and therefore the control impulse is initiated from a current transformer in series with the primary supply feeder. The secondary current of this transformer, which is proportional to the line current, heats a thermostatic strip consisting of two different nickel-iron alloys rolled together. This strip is flat at 15° C. and deflects with increase of temperature. The free end of the strip works between two contacts which are adjusted so that no contact is made either way with normal full-load current. If the load varies, the altered temperature of the strip causes contact to be made in one direction or the other, thus closing the contactor circuit for "raise volts" or "lower volts" on the change-circuit regulator. To compensate for changes of atmospheric temperature the contacts themselves are carried on similar bimetal strips designed to ensure uniform spacing of the contacts at all temperatures. This feature is utilised to incorporate another compensation. The amount of surplus load which can be absorbed in thermal storage will vary according to the time of the year. If, therefore, a 100 per cent. load factor will supply the necessary heating during the winter, it will probably be found that a 75 per cent. load factor will satisfy the summer demand. By installing another current transformer in the change-circuit feeder, and causing this current to heat the bimetal strips which carry the relay contacts, the total load which the regulator will maintain constant may be altered in value. Therefore, if this compensating current transformer is shunted with a variable resistance it will be appreciated that the load factor may be adjusted at will.

### A Self-contained Unit.

The induction regulators incorporated in the system are one of the standard machines taken from the extensive range of regulators made by the English Electric Co. A voltage relay coil with laminated plunger and oil dash pot controls a balanced arm by means of which one or other of two triggers is tripped, causing a pawl to engage in a rachet wheel, which, through a worm gear, rotates the rotor. Limit trips and mechanical stops are provided to prevent the gear moving the rotor beyond the allowable limits. The entire automatic operating gear is assembled as a self-contained unit, and contains a continuously running motor, having a consumption of about 35 W for driving the crank through worm reduction gearing.

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# NEWS IN BRIEF.

## E.C.A. and the Factory Lighting Campaign—Porcelain Insulators for the Central Board—An Electrical Depth-Sounding Instrument—A Jury on Qualified Contractors—Big Power Development in Saskatchewan.

THE next A.M.I.E.E. examination will be held on November 28th, 29th and 30th.

Hull Telephones Committee have accepted a tender amounting to £1 360 for extensions at the central exchange premises.

Plans have been passed by Woolwich B.C. for extensions to Siemens Bros. and Co.'s power cable shop in North Street, Woolwich.

The Electrical Contractors' Association is contributing £500 towards the cost of the E.L.M.A.–E.D.A. Factory Lighting Campaign.

Hull Education Committee are to adopt electric lighting in the old portion of the Grammar School, at present lighted by gas, at a cost of £185.

Fulham (London) Borough Council's new electricity showrooms in Fulham Green Broadway are expected to be ready for occupation in September.

Bridport T.C., whose electricity Order has now been approved by Parliament, have decided to hold an electrical exhibition in the near future.

Stoke-on-Trent Corporation have decided to use electricity at the Town Yard and stables, Copeland Street, in view of the storage of large quantities of oil and other materials at these premises.

The income of the Chester electricity showrooms is steadily rising, the total for the last completed year being £4 710—only £232 less than the expenditure, against a deficit of £726 the previous year.

Cheltenham Corporation Electricity Committee have advised electrical contractors and consumers that apparatus installed must be suitable for 50 or 100 cycles supply, and the installation notified to the Corporation.

According to Mr. J. H. Stanhope, engineer-manager of the Jersey Telephone Department, since the service was taken over from the British Post Office in 1923, the number of subscribers has been doubled.

Sir Francis Joseph, president of the North Staffordshire Chamber of Commerce, has been informed by the Central Electricity Board that half the porcelain insulators in a recent contract placed by the Board are from Canada and half from manufacturers in this country.

An electrical depth-sounding instrument which indicates the depth of the sea, and records, by means of different coloured lights, whether the vessel is passing over rocky or sandy ground, was included in the apparatus carried by the French trawler "Wagram" which arrived at Fleetwood last week.

The Loughborough College Governors invite applications for the award of five open scholarships in the faculty of engineering, each of the value of £75 per annum. The entrance examination for the session 1929-30 will take place on April 16th, 17th, and 18th, 1929. All applicants must be not less than 16 years of age on October 1st, 1929.

The Association of Mining Electrical Engineers (South Wales Branch) have been invited by the Colliery Managers' Association to a meeting at the South Wales Institute of Engineers, Park Place, Cardiff, to-morrow (July 21st), at 5.30 p.m., when a paper by Mr. S. W. Richards on "Mine Haulage Signalling Systems" will be read, followed by a discussion.

Contributions to the Royal Berkshire Hospital, Reading, for the first quarter of 1928 include: Reading Electric Supply Co. works, £6 11s. 6d.; Baughan and Co., £2 5s.; J. T. Spencer and Sons, £1 12s. 4d.; Minster Electro Plating Works, 14s. 1d.; Pulsometer Engineering Co., £42 17s. 1d.; Reading Post Office, telegraphs, £5 8s. 7d., telephones, £5 9s. 10d., sectional engineers, £7 14s. 8d; Great Western Railway signals, £44 4s. 5d., telegraph maintenance, £7 12s. 7d.

Recent events in connection with the Electrical Association for Women include an Exhibition of electric cooking and water heating at Whitstable from June 25th to June 30th, visits to Mrs. Godwin's Light Clinic at Ellerker Gardens, Richmond, on June 27th and 28th, visit to Aylesbury Trades Exhibition on July 3rd; while on Saturday last London members joined the Ashford District Branch of the E.A.W. in their visit to Mr. Borlase Matthews's "all-electric" farm. The last of the social afternoons for this session was held in the Club Room, Kensington Court, W.8, on June 21st.

Leeds Electricity Committee have decided to purchase a further 5 000 prepayment meters.

The Reading Electric Supply Co. are among the subscribers to St. Mary's, Reading, clock and tower restoration fund.

The transfer of the Rochdale telephone service to the automatic system took place at midnight on Saturday last.

Stoke-on-Trent Electricity Committee have accepted a tender for the erection of a sub-station at Hem Heath, to cost £980.

Eight furnaces which, by ignition from an electric spark, will break into full blast, are a feature of a new tin smelter now in course of erection at Bootle.

The accounts of the Guernsey States Telephone Department for 1927 show a net profit of £796, compared with £762 for 1926. Subscribers' and public calls numbered 2 504 007, an increase of 110 886.

Statistics on world production and consumption of copper prepared by the American Bureau of Metal Statistics show that Canada last year reached the fourth place among the producing countries.

Preparations are well in hand for the arrival of the King and Queen at Balmoral in August. Among the recent innovations at His Majesty's Deeside home is a new and powerful wireless receiving set.

An electrical humane killer has been invented by an engineer at Munich. The current, which is applied at a pressure between 40 and 50 V, produces unconsciousness in 5 seconds, after which the animal is bled to death.

Among the fire fighting appliances exhibited at the National Fire Fighters' annual camp at Newbury, was an electro-megaphone, by means of which reports, orders and messages can be passed from the top of an escape to the ground, or from a building to an engine below.

At an inquest last week into the death of a boy as the result of seizing a live wire at the public swimming baths at Coventry, the jury expressed the view that the fitting was defective, and that such work in Corporation buildings should be carried out strictly under the supervision of qualified electricians.

Over 80 members of the South Wales branch of the Association of Mining Electrical Engineers paid a visit recently to the generating station of the South Wales Power Co. at Upper Boat on Saturday. After an inspection of the plant the visitors were entertained to tea by Mr. J. W. Beauchamp, chief engineer and general manager.

The annual general meeting of the Yorkshire Centre of the Incorporated Municipal Electrical Association was held at Scarborough Town Hall on Monday. Major Barker was re-elected chairman, and Mr. H. G. Fraser, of Wakefield, was re-elected hon. secretary. Hull's invitation to hold the next annual meeting there was accepted.

Among the successes at the annual camp at Newbury of the National Fire Fighters' Association were the following: Callender's Cable Co., 1st national manual (20 1/5 sec.); B.T.-H., Blackheath, 1st junior hose cart (29 4/5 sec.); 1st national hose cart (29 sec.); B.T.-H., Willesden, 2nd junior hose cart (31 1/5 sec.); B.T.-H., Coventry, 2nd national hose cart (30 1/5 sec.).

A report issued by the Dominion Statistical Department shows continued progress in the telephone development of Canada. During the past ten years the total number of instruments in use has increased by 116 per cent.; while, in addition to the Bell Telephone Co. of Canada and the three provincial systems of Manitoba, Saskatchewan and Alberta, 2 479 smaller systems are worked by private municipal and co-operative companies.

According to an announcement made by the Prime Minister of Saskatchewan, the interests operating the Flin Flon Mines have now definitely decided to develop the necessary electrical energy at Island Falls on the Churchill River. These Falls are situated 15 miles west of the eastern boundary of Saskatchewan, near the point where the Churchill River enters Manitoba. The development will mean an early expenditure in Saskatchewan of several millions of dollars, and the Government has made it a condition that one-sixth of the power developed shall be reserved for public use.

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# OVERSEAS TRADE.

## Electrical Exports for Half Year Nearly 6½ Million Pounds in Excess of Imports.

EXPORTS of electrical machinery, apparatus, and materials shipped from the United Kingdom during June, 1928, amounted to £1 574 951, against £1 585 508 for the same month last year, representing a decline of £10 557. For the six months of this year the total value of British electrical exports stands at £9 377 509, as against £9 342 340 for the same period last year. Electrical imports for the month of June, 1928, amounted to £474 604 representing an increase over the figures for the same month last year of £22 686. For the six months imports amount to £2 965 404, or an increase of £312 289 over the total for the same period of 1927. Exports for the month exceed imports by £100 347, and for the six months of this year the excess of export trade over imports amounts to £6 412 105. Items in the export figures which show increases include railway and tramway motors, increase £8 242; other motors and generators, £6 740; other machinery, £62 673. Other exported goods which have added substantially to the month's trade are rubber insulated cables, other than telegraph and telephone, increase, £5 426; wires other than rubber insulated, not telegraph or telephone, increase £48 036.

Detailed comparative figures are given below.

| | Month of June, | | Six Months, | |
|---|---|---|---|---|
| | 1927. | 1928. | 1927. | 1928. |
| IMPORTS. | £ | £ | £ | £ |
| Electrical Machinery | 139 823 | 134 794 | 820 930 | 876 491 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 7 410 | 10 126 | 62 281 | 75 747 |
| Insulation other than rubber (not being Telegraph or Telephone Wires or Cables) | 53 641 | 59 122 | 295 506 | 278 055 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 12 561 | 4 826 | 43 891 | 46 784 |
| Submarine Telegraph and Telephone Cables | — | — | — | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 35 993 | 45 660 | 210 356 | 291 390 |
| Carbons, Electric | 7 098 | 7 387 | 43 707 | 70 030 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 23 912 | 25 860 | 152 827 | 245 981 |
| Arc Lamps and Electric Searchlights | 460 | 1 648 | 2 461 | 4 155 |
| Parts thereof (except Carbon Rods) | 1 958 | 1 513 | 13 453 | 11 721 |
| Batteries and Accumulators (including parts) | 46 623 | 39 130 | 256 255 | 253 430 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 29 374 | 27 461 | 142 929 | 138 626 |
| Switchboards, other than Telegraph and Telephone | 45 | 323 | 1 040 | 777 |
| Electrical Goods and Apparatus, all other Sorts | 93 020 | 116 454 | 607 479 | 672 217 |
| Total of Electrical Goods and Apparatus | 451 918 | 474 604 | 2 653 115 | 2 965 404 |

| | Month of June. | | Six Months. | |
|---|---|---|---|---|
| | 1927. | 1928. | 1927. | 1928. |
| EXPORTS. | £ | £ | £ | £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 36 706 | 44 948 | 321 616 | 300 059 |
| Other Motors and Generators | 206 914 | 213 654 | 1 150 175 | 1 255 525 |
| All other Sorts | 291 988 | 354 661 | 1 915 550 | 1 901 207 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 117 542 | 122 968 | 726 108 | 706 922 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 111 802 | 159 838 | 810 117 | 773 238 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 108 555 | 59 005 | 412 571 | 503 153 |
| Submarine Telegraph and Telephone Cables | 16 266 | 15 912 | 365 441 | 109 521 |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 278 443 | 215 094 | 1 264 257 | 1 546 931 |
| Carbons, Electric | 1 459 | 340 | 11 746 | 8 802 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 64 510 | 44 557 | 316 766 | 255 644 |
| Arc Lamps and Electric Searchlights | 1 261 | 2 885 | 8 678 | 7 558 |
| Parts thereof (except Carbon Rods) | 174 | 1 989 | 2 519 | 5 227 |
| Batteries and Accumulators (including parts) | 111 474 | 94 025 | 597 467 | 531 138 |
| Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 30 148 | 31 477 | 178 976 | 201 573 |
| Switchboards, other than Telegraph and Telephone | 5 314 | 4 461 | 35 261 | 39 882 |
| Electrical Goods and Apparatus, all other Sorts | 202 622 | 209 137 | 1 225 062 | 1 231 129 |
| Total of Electrical Goods and Apparatus | 1 585 508 | 1 574 951 | 9 342 340 | 9 377 509 |

# PERSONAL.

MR. J. Wetherell, chief assistant at Barnsley, has been appointed borough electrical engineer of Leyton.

Mr. W. H. Walton, who, as previously announced, has this week assumed the presidency of the E.C.A. and its allied associations, has had a long and interesting electrical career. He studied under Prof. Silvanus Thompson at the Finsbury Technical College, and was articled to Mr. A. R. Sennett. In the early days Mr. Walton engaged in a good deal of experimental work with arc lamps of various types, and Dr. Franklin's accumulators. He was actively associated with the Jablochkoff Co., and thereafter served with Verity and Sons in the days when this well-known firm carried out some of the largest installation work of the times in public buildings, country houses and so on. Later Mr. Walton became electrical engineer to the St. George's (London) Board of Guardians, subsequently becoming electrical engineer to the Drapers' Company and operating private plants at the People's Palace and elsewhere. Mr. Walton started business in 1898 under the style of Pinching and Walton, in Cannon Street, London, since when his firm has been responsible for some of the largest installations in the country.

**Mr. W. H. Walton, the new E.C.A. President.**

Mr. W. H. Lynas is a director of British Pilototone, Ltd.

Sir George Sutton, chairman of W. T. Henley's Telegraph Works Co., has been elected chairman of the Royal Society of Arts.

Mr. R. J. Wilder, of R. J. and H. Wilder, electrical engineers, of Wallingford, has been appointed steward of the Provincial Grand Lodge of Berkshire Freemasons.

Mr. G. E. Draycott, Head of the Engineering and Building Trades Department of the Borough Polytechnic, London, is retiring at the close of the current session after thirty one years in South London. Mr. Draycott was formerly for eight years at the People's Palace Technical School in East London, and supervised the training of some thousands of young engineers. The Governors of the Institute have appointed Mr. F. H. Reid, formerly of Northampton Polytechnic, and now Head of the Engineering Department at Sunderland Technical College, to succeed Mr. Draycott.

The Council of the Institution of Electrical Engineers have made the following award of Students' premiums for papers read before the Students' Sections during the session 1927–28: PREMIUMS OF £10 EACH: J. T. Allan, for his paper on "The Education of the Engineer"; R. C. Fox, for a paper on "The Three Electrode Carbon Arc"; C. J. O. Garrard, "Phase-Advancing"; J. W. Gibson, "Control Equipment for Direct Current Trains"; and E. A. Logan, for his paper on "The Economical Transmission of Electrical Power." PREMIUMS OF £5 EACH: L. Burdes, for his paper on "Electric Lifts"; and J. A. H. Lloyd, for a paper on "Carrier Telephone Systems."

### ELECTRICAL ASSOCIATION FOR WOMEN.

The last of the London fixtures of the Electrical Association for Women, for the summer session, took place on Tuesday, July 10th. A party of nearly 40 members left London by motor coach and visited the Ashtead Potteries, where they were received by Major Moore, who gave an interesting outline of the processes in the manufacture of pottery, before the party were conducted round the works. It was interesting to note the adaptations of electricity to one of the oldest industries in the world. The members afterwards visited the Frederick Milner Home at Leatherhead. Here ex-Service men are engaged in electrical work, chiefly making Thermega electric blankets. Electric sewing machines are used, and the workshop is a model of light and airiness. Mr. Nye also showed the party round the beautiful house which is used as a hostel. The party were subsequently entertained at tea by Mrs. M. B. Jackson, a founder member of the E.A.W. A very hearty vote of thanks was accorded Mrs. Jackson, on the motion of Mrs. Ll. B. Atkinson, seconded by Mrs. A. Smith.

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# IN PARLIAMENT.

## Discussion in House of Commons on Votes for Electrical Purposes.

IN Committee of Supply in the House of Commons on July 12th, on a vote of £35 314 000 for salaries and expenses of the Post Office, including telegraph and telephone services, Sir Wm. Mitchell-Thomson said that the deficit on telegraph services was £1 389 000, while the surplus on telephone service was £120 000. In the telegraph service there was a slight increase of £40 000 in the deficit. That was more than accounted for by the change of method in accounting, by which the cost of collection and the proportion due to the B.B.C. for wireless licenses was not now treated as telegraph revenue as it had been in previous years. The decline in the inland telegraph revenue continued, but the position with regard to foreign services was much improved. Owing to the inception of the beam wireless service a new and substantial amount of revenue was beginning to come in. Telegraph revenue on the whole had improved by about £57 000, while operating expenses had increased by about £32 000, leaving a net improvement of about £25 000. But there was still left a substantial deficit of £1 389 000.

### The Telephone Service.

On the telephone side, trunk services did not show the resiliency he had hoped for. No doubt the continuing depression in the heavy industries accounted for that. By ascertaining what was the figure of profit or loss, after providing fully the sums required for operating, maintenance, and depreciation, they could see the real progress that had been made during the last seven years. On that basis the results of 1921 and 1922 were that the telegraph showed, before provision for interest was taken off, a loss of £2 268 771; the telephone showed a profit of £1 095 666.

On the whole the institution of the British Broadcasting Corporation had justified itself. As regarded matters of general responsibility for which he took responsibility, the most important was the regional scheme. After considerable experiments at Daventry, the corporation had made up its mind that it would like to embark on a regional scheme of large twin stations. They applied accordingly last February for authority to begin this system by working a two-wave high-power station at Brooklands Park, near Potter's Bar, in substitution for 2LO. He had authorised them to proceed with the erection of a station. It was expected it would be completed some time next summer. In the first instance single-wave working only would be adopted from that station. On June 14th the corporation applied for general permission to proceed with the preliminary steps for twin-wave high-power stations at Manchester, Glasgow, and Cardiff, and for a single-wave high-power station at Belfast.

As to licences, the total number of wireless receiving licenses in force upon June 30th last was approximately: Paid licenses, 2 506 300, free licenses for the blind, 12 772, making a total of 2 519 072. The number last year was 2 307 678. There was thus an increase of 211 394 in the last twelve months, or over 9 per cent. The number of licenses per 1 000 of the population was—England and Wales 59, Scotland 37, and the North of Ireland 21. The receipts from the licenses were divisible in the following proportions: Receipts £1 253 150, to the B.B.C. £898 804, 12½ per cent. to the Post Office for cost of collection £156 644, balance retained by the Exchequer £197 702.

Last year was a record in telephone development. The increase in the number of telephone stations was 122 405, bringing the total number of stations up to 1 631 191. London stood third among the cities of the world, a long way behind New York, but not so very far behind Chicago. There were now 120 automatic exchanges open in different parts of the country. This year he anticipated that new automatic exchanges would be completed and opened at Bath, Colchester, Middlesbrough and Walsall. London had its peculiar difficulties with regard to bridging the gap between automatic and manual exchanges. It was in regard to that bridging that the difficulty took place in Holborn, but that difficulty had been largely overcome.

### Rating of Electricity Undertakings.

In the course of the debate in the House of Commons on Monday on the Rating and Valuation Bill, an amendment to extend to electricity and gas undertakings the rating relief afforded by the Bill was negatived by 240 votes to 131.

# LEGAL INTELLIGENCE.

## Dispute relating to Copyright in Photographs of Electrical Plant.

MR. Justice Romer in the Chancery Division on July 10th had before him the motion, adjourned from the previous Tuesday, in which the English Electric Co., Ltd., sought an injunction restraining Crompton Parkinson, Ltd., from infringing the copyright in certain of the plaintiffs' photographs of a "Standard specification core type transformer."

Mr. Kenneth Swann, for the plaintiffs, said the allegation was that the defendants had used the photographs in their trade literature as a means of advertising their machinery.

The motion stood over for settlement, but no move had been made by the defendants. They had, however, referred in an affidavit to the correspondence in which an offer was made to pay £5 damages, and costs.

Mr. Trevor Watson, for the defendants, said he was willing now and always had been willing to give an undertaking, but defendants desired to take his lordship's view as to the course taken in this action. This motion was wholly unnecessary, and he submitted, was for the sole purpose of obtaining publicity.

His lordship: I shall accept Mr. Watson's undertaking and make no other order that the costs be reserved.

Mr. Swann said he would be prepared to make an end of the matter that day.

Mr. Watson: I am not prepared to treat this as the trial of the action.

### Fraudulent Diversion Charges.

At Northampton Borough Petty Sessions last week, Harold Austin Bassett Lowke, trading as the Lowke Domestic Engineering Co., Kingswell Street, Northampton, was summoned on a charge of having fraudulently caused to be diverted and consumed electricity supplied by the Northampton Electric Light Co., whereby the company were deprived of the sum of £8 2s. 9d. It was stated by Mr. P. E. Sandlands (for the Electric Light Co.) that defendant was a director of the old company (Lowke and Son, Ltd.), who were electrical engineers and who apparently gave up business towards the end of last year. Defendant asked for the continuation of the supply, so that he was responsible from that time. There were five meters, two supplying heat at 1d., one supplying light at 5d. and 6d., and two supplying power at 2d. per kWh. It was alleged that defendant connected up all the lights with the cheaper system. Evidence was given in support of the charge. A fine of £10 was imposed. Notice of appeal was given.

Arthur James Penn and Francis Leopold Perrin, both of 9, College Street, Northampton, were similarly summoned for depriving the Electric Light Co. of £4 13s. 3d.

Mr. Sandlands, for the prosecution, said Penn applied for a supply for power only, which was granted. Perrin said he tapped batteries for light. Penn was only his workman. The case of Penn was dismissed, but Perrin was fined £5.

### Bosch Magneto Dispute

Mr. Justice Romer last Friday dismissed a motion by Robert Bosch A.G., asking for an injunction to restrain alleged breach of agreement and alleged passing off by R. H. Cook and Co., of Broadway, London, N.W., as Bosch magnetos goods not of plaintiffs' manufacture. Mr. Bray, for plaintiffs, said they applied to register the word "Bosch" as a trade mark and succeeded, but pending the appeal against the decision of the Registrar they found defendants had been selling magnetos under that name which were not made by plaintiffs. At the appeal Mr. Justice Astbury held that the American Bosch Magneto Corporation had concurrent rights to use the word "Bosch," but defendants had advertised for sale "genuine Bosch magnetos" and had sold one which contained parts not made by plaintiffs or the American company. His Lordship said plaintiffs had established no case for interlocutory relief and must wait until the trial to contest the matter.

### Workman's Compensation Case.

The Court of Appeal last week dismissed an appeal by Mr. George Leopold Pragnell and his wife from the verdict and judgment dismissing an action which they brought against W. T. Henley's Telegraph Works Co., Ltd., for compensation for the death of their son, Arthur Pragnell, who on July 5th, 1927, met with his death at Wootton, Isle of Wight, whilst working as driver's mate on a steam tractor. The appeal was dismissed, Lord Justice Scrutton saying it was for the plaintiffs to prove that defendants' servants had been negligent.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

GLASGOW CORPORATION.—Electric light installation in reconstructed depot at Govan. Particulars from the Cleansing Department.

LIVERPOOL HEART HOSPITAL.—Electric passenger lift. Particulars from Messrs. T. Taliesin Rees and O. D. Black, 64, Rodney Street, Liverpool.

WARRINGTON EDUCATION COMMITTEE.—Electric wiring, etc., at the Silver Street Council School. Forms from J. Moore Murray, secretary and director, Education Office, Sankey Street, Warrington.

HULL CORPORATION, July 20th.—Electric lighting installation and fittings for the Mental Hospital, Willerby. Specifications from the Chairman, Mental Hospital Committee. (Deposit £2 2s.)

LIVERPOOL CORPORATION, July 20th.—Supply of 11 100 copper bonds. Specification from City Engineer, Municipal Buildings, Dale Street, Liverpool.

LOUGHBOROUGH TOWN COUNCIL, July 21st.—Supply and erection of one rotary converter complete with switchgear. Specification from Mr. G. J. Hollyer, borough electrical engineer and manager, Bridge Street, Loughborough. (Deposit £2 2s.)

NEWRY URBAN DISTRICT COUNCIL, July 21st.—Two 100 B.H.P. and one 150 B.H.P. heavy oil engines, each direct coupled to l.t. three-phase alternator (contract No. 2); l.t. switchboard for three-phase 4-wire system (contract No. 3); 5-ton overhead crane (contract No. 4); and underground and overhead distributing mains and services, and street lighting installation (contract No. 5). Specifications from Town Clerk; deposit £2 2s. for each.

GRAVESEND CORPORATION, July 23rd.—Re-wiring town hall, police station and markets. Particulars from Mr. C. F. McInnes, electrical engineer; deposit £1 1s.

HODDESDEN URBAN DISTRICT COUNCIL. July 23rd.—Lighting of street lamps from September 1st, 1928, to March 31st, 1929. Particulars can be obtained at the Council Offices, Hoddesden.

LONDON COUNTY COUNCIL, July 23rd.—Wiring and fittings for electric lighting (160 points), bells, and power (2 points) at Weights and Measures Office, Euston Road. Specification, etc., from Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £1 1s.

POPLAR (LONDON) BOARD OF GUARDIANS, July 25th.—Supply and erection at St. Andrew's Hospital two 25 H.P. electric motors, with control panels. Supply and laying of main cable. Forms of tender from Mr. G. D. R. Buller, clerk, 45, Upper North Street, Poplar, E.14.

RUGBY URBAN DISTRICT COUNCIL, July 25th.—Supply of 400 yards of 3 000 V, 0·125 three core, paper insulated, lead covered cable, with copper earth sheath under the lead covering. Further particulars from the Clerk.

ALL HALLOWS' HOSPITAL, DITCHINGHAM, NORFOLK, July 26th.—Installation of electrical plant. Specification, etc., can be obtained at the Hospital.

DUNDEE CORPORATION, July 26th.—Electric light installations in 120 houses. Schedules, etc., from Mr. G. Baxter, director of housing.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 33 000 V overhead transmission line between Brighton and Worthing. Specification (No. S.E.E.-S.L.1) from Sir J. R. Brooke, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, July 28th.—Electric lighting of "Museum Buildings," Green Street, and "Ravenscroft," Columbia Road, Bethnal Green. Specification, etc., from Town Clerk; deposit £2 2s.

BROMSGROVE UNION, July 28th.—Electric lighting installation for the Infirmary, Workhouse and Children's Home. Specifications, etc., from Mr. F. S. Cartwright, clerk, Union Offices, Bromsgrove.

GLASGOW CORPORATION, July 30th.—Installation of electric light, telephones and heating apparatus. Specification can be obtained at the Office of Public Works, 249, George Street, Glasgow.

HALIFAX CORPORATION, July 30th.—Wiring for 94 houses at Moor End Road. Particulars from the Borough Engineer; deposit of £2 2s.

WARRINGTON CORPORATION, July 30th.—(1) Twelve months' supply of e.h.t. and l.t. paper and lead covered cables; (2) e.h.t. sub-station switchgear; (3) twelve months' supply of reinforced concrete cable protector slabs, etc. Specifications from Borough Electrical and Tramways Engineer; deposit £1.

WILLESDEN GUARDIANS, July 30th.—Two 90 kW direct coupled generating sets. Specification from the Clerk, 409, High Road, Brondesbury, London, N.W.6; deposit £5.

ATHERTON URBAN DISTRICT COUNCIL, July 31st.—Supply of 4 720 yards of 0·1 by 0·141 twin concentric e.h.t. cable. Tender forms from the Clerk, Town Hall, Atherton, near Manchester.

BELFAST CORPORATION, August 1st.—Supply of 20 tons B.S.S. No. 7 tramway rails. Specification, etc., from General Manager, Corporation Tramways, Belfast.

BLACKPOOL CORPORATION, August 1st.—Supply and installation of four electrically driven centrifugal pumps. Further particulars from Borough Engineer.

WEST RIDING EDUCATION COMMITTEE, August 1st.—Electric light installation at Armthorpe New School. Specification, etc., from Education Dept., County Hall, Wakefield.

RENFREWSHIRE EDUCATION AUTHORITY, August 3rd.—Electrical installation in proposed school at Lochfield Road, Paisley. Schedules, etc., from Executive Officer, County Education Offices, 16, Glasgow Road, Paisley; deposit £1.

WATERFORD CORPORATION, August 3rd.—Supply and erection of 10 000 V, three-phase switchgear, 400 V three-phase switchgear, and 200 V d.c. switchgear for central station and five sub-stations. Specifications, etc., from Messrs. MacEntee and O'Kelly, 23, Upper O'Connell Street, Dublin.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of one 20 000 kW turbo-generator, with condenser and auxiliaries. Specifications, etc., from City Electrical Engineer; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

INVERCARGILL (N.Z.) TRAMWAYS DEPARTMENT, July 23rd.—Induction voltage regulator. (Reference B.X. 4 473.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, July 23rd.—Shunt reactor for Barren hydro-electric development (Contract 77/28) (Ref. B.X. 4 576).

INDIAN STORES DEPARTMENT, SIMLA, July 24th.—Supply of 8 kW oil engine driven d.c. generator sets, switchboard, and overhead crane.

CAPE TOWN MUNICIPALITY, July 25th.—Supply of a.c. electricity meters. (Reference B.X. 4 527.)

VICTORIAN GOVERNMENT RAILWAYS, July 25th.—Supply and delivery electric train stops. (Reference B.X. 4 544.)

VICTORIAN RAILWAY COMMISSION, July 25th.—Supply of electric train stops.

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply and delivery at East London of two 25-ton, six 10-ton, and two 2-ton electrically driven overhead travelling cranes. (Reference A.X. 6 347.*)

SOUTH AFRICAN RAILWAYS AND HARBOURS, July 26th.—Supply of crude oil engine, generator, and switchboard. (Reference A.X. 6 405.*)

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, July 27th.—Electrical works and supplies in Dublin district for one year. Schedule, etc., from Office of Public Works, Dublin; deposit £1.

DUBLIN BOROUGH COMMISSIONERS, July 28th.—Supply of magazine flame arc lamps. Specification, etc., from City Electrical Engineer.

DUNEDIN CORPORATION, July 30th.—Supply of 6 tons of hard drawn electrolytic copper trolley wire. (Reference A.X. 6 477.)

UITENHAGE MUNICIPALITY, SOUTH AFRICA, July 30th.—Supply and delivery of h.t. and l.t. switchgear, h.t. and l.t.

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cable, motors, fans, meters, transformers, kiosks, feeder pillars, and line material. (Reference B.X. 4 517.)

ECUADOR GOVERNMENT, July 31st.—Supply of two electrically operated portal cranes, of 5 and 10 metric tons capacity, respectively, for Guayaquil. (Reference A.X. 6 387.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 31st.—Motor generator set for Seacliff Mental Hospital. (Reference B.X. 4 571.)

POSTMASTER-GENERAL'S DEPARTMENT, SYDNEY, July 31st.—Supply of 32 900 copper, 75 000 bronze and 16 500 cadmium copper jointing sleeves. (Reference A.X. 6 510.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Supply of armoured telephone cable. (Reference B.X. 4 518.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Electrically driven concrete mixing plant. (Reference A.X. 6 441.*)

VICTORIA ELECTRICITY COMMISSION, August 6th.—Supply of three-phase, 60 cycle, interconnected star, oil insulated, self-cooled, outdoor type neutral earthing compensator. (Reference B.X. 4 519.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 7th.—Supply of 50 kVA transformers and 2 100 V, three-phase, 50 cycles, truck type switchgear. (Reference B.X. 4 526.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 9th.—Supply of six electrically driven overhead travelling cranes. (Reference A.X. 6 409.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4 505.)

BULAWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain grate, turbo-alternator, spray cooling equipment and circulating waterpiping and three-panel switchboard, with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kV switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B.X. 4 477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

CAPE TOWN ELECTRICITY DEPARTMENT, August 15th.—Supply of l.t. switchgear for the new Pavilion, Muizenburg. (Reference B.X. 4 562.)

VICTORIA STATE ELECTRICITY COMMISSION, August 20th.—Supply and delivery 66 000 V transformers and spares. (Ref. B.X. 4 541.)

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, August 22nd.—Supply of metal filament lamps. (Ref. B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

JOHANNESBURG MUNICIPALITY, August 30th.—Street lighting switches. (Reference B.X. 4 584.)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. (Reference A.X. 6538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21.) Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically operated luffing cranes. (Ref. A.X. 6 483.)

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POSTS AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Ref. A.X. 6 545.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, Sept. 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

WELLINGTON PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Ref. B.X. 4 570.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Ref. B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

## Tenders Accepted.

ROCHDALE CORPORATION.—H. Tattersall, electric lighting and power installations to 388 houses on Nook estate.

HAMILTON TOWN COUNCIL.—The Harland Engineering Co., converting plant for adaption to 50 cycles, £1 831 10s.

ACTON CORPORATION.—Crompton Parkinson, Ltd., supply and erection of switchboard at public baths, Salisbury Street, Acton.

HULL CORPORATION.—Worthington-Simpson, Ltd., electric pumping machinery, for East district pumping station, £2 753.

METROPOLITAN WATER BOARD.—English Electric Co., Ltd., Supply of 6 kW, 100 V, steam driven electric lighting set, £123 (recommended).

BLACKPOOL CORPORATION.—The General Electric Co., Ltd., 22 tramcar motors, type W.T. 28.L, rated at 50 H.P., on one-hour rating at 500 V.

RAMSEY (ISLE OF MAN) COMMISSIONERS.—Manx Electric Railway Co., supply of power for lighting South Promenade electrically during summer, £341.

SYNTHETIC AMMONIA AND NITRATES, LTD.—British Electric Transformer Co., Ltd., supply of forty-two 1 500 kVA transformers and a number of smaller transformers.

BURTON-ON-TRENT CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., switchgear required in connection with supply to a new factory, £1 360.

OLDHAM CORPORATION.—Ferguson, Pailin, Ltd., supply of switchboard for boiler house at new power station; Metropolitan-Vickers Electrical Co., Ltd., supply of motor starters.

BARNSLEY CORPORATION.—Babcock and Wilcox, Ltd., water tube boiler, with superheater, economiser, induced draught plant, and automatic stokers, for electricity works, £5 800.

GUILDFORD CORPORATION.—Standard Telephones and Cables, Ltd., supply of cables and accessories, for extension of transmission and distribution system to outer areas, £22 733.

FULHAM (LONDON) BOROUGH COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply of 1 500 kW three-phase Scott-connected transformer for Barclay Road sub-station, £1 060 (recommended.)

WIMBLEDON CORPORATION.—Siemens Brothers and Co., Ltd., supply and laying of 11 000 V main between the generating station and the sub-station at High Street, Wimbledon, £2 864 1s. 4d. (recommended.)

GLASGOW CORPORATION.—Felten and Guilleaume and Thomas Bolton and Sons, Ltd., trolley wire; Joseph Brooks and Co., installation of electric blowing gear, etc., for St. Andrew's Hall grand organ, £250 12s.; A. Reyrolle and Co., ironclad switchgear for three sub-stations, £8 694 2s. 10d.; Metropolitan-Vickers Electrical Co., Ltd., supply of electromagnets.

MELBOURNE PARISH COUNCIL.—Leicestershire and Warwickshire Electric Power Co., provision and connecting up of new standards with 100 or 300 W lamps, £1 9s. 6d. per lamp per annum for not less than 10 years, plus £1 9s. per 100 W lamp and £3 12s. per 300 W lamp per annum for current supplied; annual charge to be reduced by not less than 50 per cent. at the end of 10 years, and to be abolished after a further five years.

CAPE TOWN CORPORATION.—Supply of cables, A. J. G. Simpson, £2 942 10s., and Henley's (S.A.) Telegraph Works Co., Ltd., £462; supply of copper wire, British Insulated Cables (S.A.), Ltd., £1 261 17s. 6d., and Dowson, Dobson and Behr, Ltd., £4 633 10s.; supply of steel electric lighting poles, Dowson, Dobson and Behr, Ltd., 500 at £1 962 10s., and Stewarts and Lloyds, Ltd., 500 at £2 061 9s. 1d.; Davis and Soper, Ltd., switchgear of Reyrolle manufacture, £2 331 15s.

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# BUSINESS ITEMS.

MR. J. E. M. Boyes has been appointed as Midlands representative for B.E.N. Patents, Ltd., in place of Mr. E. A. Sanders, who has left the company.

John W. Murdoch and Co., electrical and wireless engineers, of 19, River Street, Ayr, announce that they are now trading under the style of Murdoch, Anderson and Co.

Mr. S. R. Tamplin has left the London Power Co. to take up duties with Siemens-Schuckert (Great Britain), Ltd., where he will pay special attention to the heat economy and measuring instruments manufactured by this firm.

In the Industrial Designs Competition organised by the Royal Society of Arts, W. T. Henley's Telegraph Works Co., Ltd., are offering a prize of £25 for a design for a showcard advertising the Henley wiring system, and suitable for display in electricity showrooms or windows.

The Mullard Wireless Service Co., Ltd., announce the opening of a new depot at Newcastle-on-Tyne as from July 2nd, at 16, Clayton Street West, Newcastle-on-Tyne. Mr. W. J. Maxwell, recently representative for the Scottish and Northern Counties area, has been appointed as manager.

The Cable Makers' Association announce the production of two new types of standardised rubber insulated cables in which the layer of pure rubber next to the conductor is omitted. They will be sold under the trade marks "Vicma" and "Vinazo." "Vicma" indicates a v.i.r. C.M.A. type cable corresponding in quality with the standard C.M.A. cable, while "Vinazo" indicates a v.i.r. cable corresponding with the "Nonazo" quality.

The Department of Overseas Trade has received from His Majesty's Trade Commissioner at Johannesburg (Mr. J. W. Brigden) a memorandum on the sale of electric heating and cooking appliances in the Durban district. Firms interested in the supply of appliances of United Kingdom manufacture can obtain a copy of the memorandum on application to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference B.X. 4586 should be quoted.

A contract has recently been placed by the Palestine Electric Corporation with the General Electric Co., Ltd., for two vertical spindle 7 500 kVA alternators, providing a three-phase supply at 6 300 6 900 V, 50 cycles. These machines, which are driven by Boving water turbines at a speed of 250 revs. per min., are installed at the Jordan power house, and they will supply power to sub-stations situated at Jaffa and Haifa. In addition to the two generator control equipments, 6 300 V brickwork cubicle auxiliary and l.t. a.c. switchboards, the equipment at the Jordan station also includes a set of 66 000 V outdoor switchgear with indoor control panels, consisting of two 7 500 kVA transformer installations, and two 7 500 kVA outgoing feeder equipments. A similar set of e.h.t. switchgear will be installed at Jaffa sub-station. The equipment for the two sub-stations mentioned includes 22 000 V switchgear with control panels controlling two 3 750 kVA incoming transformers, two 1 000 kVA outgoing transformers, and two 1 000 kVA outgoing feeders. A set of 6 300 V indoor switchgear with remote mechanical control, comprising two 1 000 kVA transformer equipments is also being supplied to both sub-stations.

## G.E.C. Open Plymouth Branch.

With the opening on Monday of a Plymouth branch, the General Electric Co. has now established itself in all the most important strategical business points in Great Britain. The new showrooms have been established with the view of assisting electrical retailers in Devonshire and Cornwall to give the best possible service to their customers by affording them the opportunity, not only of a good selection, but of demonstrations of any electrical appliances they may propose to purchase. The premises are situated in Union Street, at the junction with Summerland Street. The main entrance, in Union Street, is flanked by spacious double-fronted windows, and there are two showrooms on the ground floor, one devoted chiefly to household electric appliances and the other to electric light fittings, fixtures, and accessories. A wide stairway leads from the fittings showroom to the wireless lounge and demonstration room on the first floor. The offices of the manager (Mr. S. Hack), the departmental managers, and the counting house adjoin the wireless lounge. The offices of the clerical staff and main stockrooms are situated on the same floor, while the lamp stores occupy the whole of the third floor, a goods lift from the receiving depot in Summerland Street facilitating the handling of the goods. The entrance to the trade counter is also in Summerland Street.

# TRADE PUBLICATIONS.

INDUCTION Motors (London), Ltd., have sent us their current price list of a.c. motors.

"Charcoal Iron and Steel Made in Sweden" is the title given to a booklet sent to us by Ernst B. Westman, Ltd.

The Jackson Electric Stove Co., Ltd., have issued leaflet No. 720 concerning their boiler fire.

The Dubilier Condenser Co. (1925), Ltd., have published a new folder dealing with condensers for power factor improvement.

The Cadillac portable electric blower and suction unit is dealt with in a special folder published by Metro-Vick Supplies, Ltd.

"Don't count the orders you receive, consider those you lose," is a suggestion made by Aabacas Engineering Co., Ltd., in a special folder dealing with Demag blocks.

A new poster by the Ever-Ready Battery Co., Ltd.

Furse Wholesale, Ltd., have published List 21/28 dealing with general electrical supplies, apparatus and appliances.

Macintosh moulded house-service cut-outs are dealt with in a new issue by the Macintosh Cable Co., Ltd., reference H.S.C.11.

Non-ferrous rolled metals are dealt with in a special publication by J. F. Ratcliff, Ltd. Several tables of technical data are included.

Mr. J. L. Lake has sent us a new catalogue of v.i.r. braided and lead covered cables by the Société Industrielle des Telephones of Paris.

Ferranti, Ltd., have published lists HC450 (electric fires), HC451 (domestic water heaters), HC452 (load levellers), and HA453 (thermostats).

Motor-car flexibles are the subject of a separate and new catalogue just published by Callender's Cable and Construction Co., Ltd. The number of the issue is 17A.

Silvertown cables and wires are dealt with in a new and revised issue of List No. 40, published by the India Rubber, Gutta Percha and Telegraph Works, Co., Ltd.

Johnson and Phillips, Ltd., have sent us a photographic folder which, among other things, contains the test results obtained with cables working at 33 000 V and over.

The Mullard Wireless Service Co., Ltd., have published leaflets W.A.16 illustrating the Permacone transformer and V.R.65 dealing with the P.M.12 and 14 screened grid receiving valves.

Leaflet No. 116 issued by the M.K. Electric, Ltd., deals with self-adjusting spring sockets of their manufacture. The same firm have also issued a new leaflet (No. 115) concerning metal switch plates.

The June issue of "The Viewpoint," published by Volta, Ltd., contains articles dealing with summer business, opportunities in the industrial field, shop windows, staff training, and many other subjects.

A new components catalogue has been issued by the Marconiphone Co., Ltd. Dimensions and, where necessary, weight are given, as also are instructions for fixing. In the final pages there are complete details for building h.t. units for both a.c. and d.c. mains.

The British Thomson-Houston Co., Ltd., have issued a new illustrated leaflet relative to the R.K. loud speaker. The reference number is R.7394. The same company have also published a special pocket edition of the commercial and industrial section of their lighting equipment catalogue. The issue runs into 164 pages and is well illustrated.

The May-June number of the "Benjamin-Reflector," published by the Benjamin Electric, Ltd., contains a photograph, taken at night, measuring 25 in. by 22 in., the subject of the picture being the works of the Enfield Cable Works, Ltd., at Brimsdown. Included in the issue is an illumination data form for the use of inquirers as to the best means of lighting their works.

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# ELECTRICITY SUPPLY.

## Carlisle's New Generating Station—New Plant at Barnes—Oxford T.C. Still Considering Purchase of Electricity Undertaking—Proposed New Plant at Hornsey—Rapid Growth of Preston Undertaking.

ACCOUNTS of the Barnsley Electricity Department show a surplus of £12 088.

Leeds Electricity Committee are considering an application for sanction for a loan of £110 000 for services.

Sanction to borrow £50 586 for the new generating station has been obtained by Carlisle Electricity Committee.

Hull Electricity Committee are seeking loans for feeders, including pillars and switchgear, £91 813, and plant £52 440.

St. Pancras Electricity Committee are to extend mains at a cost of £822.

Glasgow Corporation Electricity Committee are to extend mains at a cost of £4 250.

Lyme Regis T.C. have decided to apply for a Special Order bringing the parish of Uplyme within their area of electricity supply.

East Ham Electricity Committee report in favour of the suggestion of the engineer that the size of the lamps in side streets be increased from 60 to 75 W.

South Shields Electricity Committee have arranged terms with the Sunderland and South Shields Water Co. for the proposed pumping plant at Cleadon water works.

Barnes Lighting Committee are seeking sanction to borrow £35 000 for the installation of a 3 750 kW turbo-alternator, with boiler.

Blackpool Electricity Committee have decided that a two-part tariff be adopted for consumers exceeding 200 000 kWh per annum.

Eston Electricity Committee are to seek sanction for loans of £1 000 for the purchase of meters, and £1 000 for rental wiring installations.

Weymouth Corporation have obtained sanction to borrow £10 000 for mains and services and £41 000 for the extension of plant and buildings.

Huntly T.C. are considering a proposal submitted by W. T. Henley's Telegraph Works Co. for establishing an electricity supply undertaking in the burgh.

Hawarden R.D.C. have included Tryddyn and Pontybodkin in a proposed extension scheme, and it is intended to apply for a Fringe Order to include Leeswood.

Godalming T.C. have decided to take the advice of Mr. H. Tomlinson Lee on the question of the electricity undertaking, as the result of an interview with the Commissioners.

Bangor T.C. have approved mains extensions and a gradual conversion of the system of distribution from d.c. to a.c. The scheme involves a total expenditure of £16 554.

Cape Town Electricity Committee have adopted a scheme of street and beach lighting improvements at Muizenberg, and the substitution of underground cables for the existing overhead mains at a cost of £8 350.

Sanction to borrow £40 000 for the extension of the boiler-house at the electricity works has been received by Burton-on-Trent Electricity Committee. The Committee are to extend mains to Woodville at a cost of £547.

Formby Council are to request the Central Electricity Board to arrange that Formby U.D.C. may be able to take their supply from the Board as an alternative to the L.M.S. Railway Company or the Lancashire Electric Power Co.

The Twickenham and Teddington Electric Supply Co., Ltd., are to renew cables in York Street and Richmond Road, and extend cables in Strawberry Vale and Tower and Radnor Roads.

Sanction to borrow £4 254 for the extension of distributor cables has been obtained by East Ham Electricity Committee. The accounts of the Electricity Department show a surplus of £16 806.

The Wessex Electricity Co., who have taken over the Hungerford Electric Supply Co., are to prepare a new form of contract for submission to the Hungerford P.C. for street lighting.

Birkenhead Corporation Electricity Committee are seeking sanction to borrow £2 200 for mains from Upton to Greasby for a supply of electricity in bulk to the Hoylake and West Kirby U.D.C.

Thornbury R.D.C. no longer object to the application of the Bristol Corporation for a Special Order to supply in the parishes of Almondsbury, Redwick, and Northwick, and part of the parish of Olveston.

Oxford City Council will hold a special meeting on July 23rd to consider a recommendation by the Electricity Committee that the Corporation purchase the electricity undertaking in the city.

Southport Corporation's assisted wiring scheme has been disappointing so far as numbers of applicants are concerned. Apparently the consumers are able and willing to pay outright for their electrical installations.

Sheffield Corporation Finance Committee have approved of the expenditure of £165 000 representing three years' estimated expenditure in connection with the cost of electricity services, hitherto charged to revenue.

Mains extensions at a cost of £800 have been authorised by the Hornsey Corporation Electricity Committee. The borough electrical engineer advises application for an extension of plant, including a 5 000 kW Ljungström turbine set.

Pangbourne P.C. have been informed by Edmundson's Electricity Corporation, who control the Whitchurch and Pangbourne Electric Supply Co., that if an application to the Ministry for a reduction in the charges of 2d. per kWh is made, this will not be opposed.

The Mid-Lancashire Electricity Advisory Board have advised Upholland Council to approach Wigan Corporation and endeavour to obtain from them a scheme as the best means of obtaining a local supply of electricity. The Council have decided to follow this advice.

Erith U.D.C. have applied to the Commissioners for a loan of £4 596 for supplying electricity to the premises of the Thames Milling Co. The Council have also arranged to give a supply to Cannon and Gaze, Ltd., who are completely electrifying their mills, and the cable is to be extended at a cost of £331.

The Electricity Commissioners have approved of an agreement between Southampton Town Council and the West Hants Electricity Co. for a bulk supply of electricity. Terms have been quoted to Winchester City Council for a bulk supply to the city's main sub-station for supplying electricity to the parishes of Twyford and Compton.

Bradford Electricity Committee are to alter the Florence Street transformer chamber, at an estimated cost of £2 063. The Committee have decided that the system of supply to consumers in a portion of Legrams Lane and in Cottam Avenue, Cottam Terrace and Flaxton Place, be changed over from d.c. to a.c., at an estimated cost, including necessary mains extensions, of £1 100.

It was stated by the Chairman of the Electricity Committee at the last meeting of Preston T.C. that the output of the generating station in 1922, when the Council took over the supply, was 3½ millions kWh, and it had increased to 40 millions in 1927–8. The average price obtained in 1922 was 5½d., and this had gradually fallen to 1·2d.—The Corporation are seeking powers to extend their area of supply to the urban district of Kirkham and parts of the rural districts of the Fylde and Garstang.

Mr. J. E. Starkie, engineer and manager of the Burnley electricity department, states, in his annual report, that a review of Government reports reveals importance attached in official quarters to cheap electricity in promoting industrial success. Whilst Burnley's tariffs compare favourably with others, it may be worthy of inquiry as to whether industrial development in the area might not be assisted by the offer of substantially cheaper rates for electric power supplies. Attempts to attract industry are likely to prove futile without the incentive of a cheap supply of electricity from the outset. It is essential in the initial stages of development that electricity for power purposes must be offered either at bare cost or the narrowest margin of profit. Revenue beyond that necessary to meet ordinary working and establishment expenses, etc., unnecessarily increases the price of electricity and retards the growth of output. Large surpluses mean high income tax and rate payments, thus diverting into the coffers of the Government money which might be more usefully expended locally. The development of new industries might be accompanied by such an increased rateable value that the increased yield from the rates resulting therefrom may more than offset the direct loss suffered by reduced contributions from the electricity undertaking.

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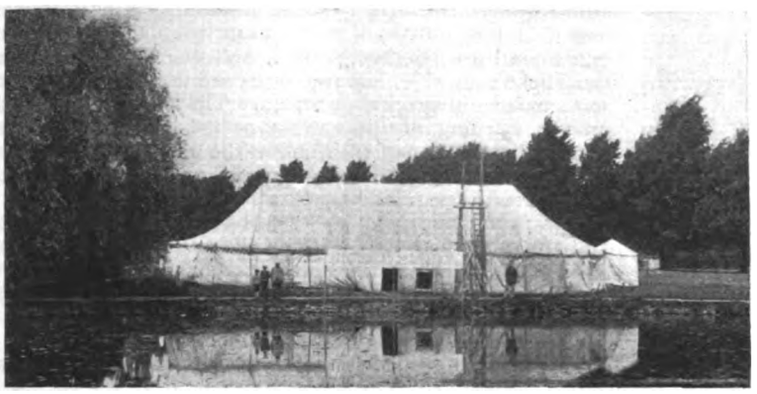
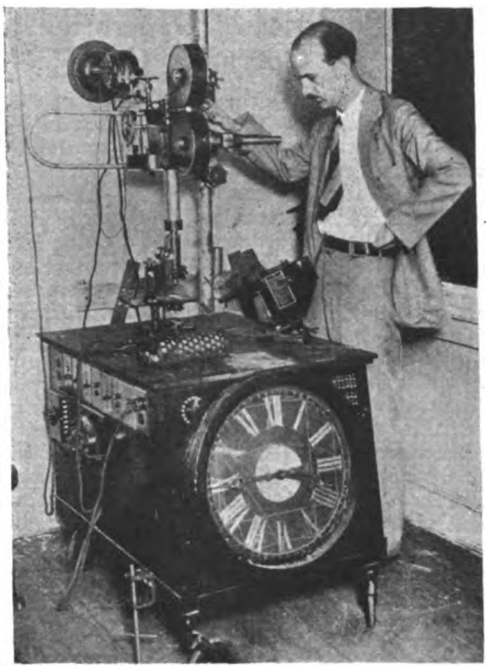
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.



The Bedfordshire County Agricultural Show, held in Bedford Park, attracted visitors from a wide area, most of whom paid a visit to the exhibition of electrical appliances organised by the Corporation Electricity Department. The large marquee occupied a commanding position by the lake and contained a representative array of exhibits which, in addition to the latest domestic appliances, included such details as sheepshearing machines, milkers, incubators, and other things of interest to the farmer.



An electrically-operated machine of American design by means of which the growth of a bird within an egg may be photographed; in addition, the activities of germs, growth of flowers, etc., may be observed. The clock, camera, etc., are all operated by electrical means, the controls being seen on the left.

[*Photo: "News-meter."*

This "electrical happiness" float entered in the Industrial Parade last month was the result of combined efforts of the Advertising and Record Departments of the San Diego Consolidated Gas and Electric Co. The float aroused considerable interest among the many thousands who viewed the parade, while it is reported that it "sold" the electric home idea as no other single advertising medium yet used by the company.

£70 000 is to be borrowed by Douglas (Isle of Man) Corporation, for a new generating station at Pulrose. A Government Commission are to consider the possibility of establishing one station for the whole island, and the utilisation of water power in connection therewith.

Lowestoft Electricity Committee have decided to expend, out of the reserve and renewal fund, £1 000 for the purchase of stoves and radiators for hiring out to consumers and £1 000 for the wiring of houses, the installations to be purchased by instalments or let on a rental basis.

It is proposed by Burton-on-Trent Electricity Committee to supply electricity in bulk at the boundary of Tutbury and Hatton, on the application of the Derbyshire and Nottinghamshire Electric Power Co., on terms agreed upon, for the purpose of providing a supply to Hatton.

Tonbridge U.D.C. are to carry out mains extensions at a cost of £4 316 and to lay a new feeder at a cost of £1 100 in order to give a further supply to the Acme Chemical Co. The Council have also decided to supply the Redcar Services, Ltd., at the reduced charge of 2d. per kWh, with a minimum annual payment of £160, instead of at 2½d. per kWh, with a minimum payment of £200 per annum.

Manchester Electricity Committee recently decided to borrow £10 000 in respect of the West Didsbury transformer station, but on further examination it is found that a larger scheme is needed. The suggested arrangement is to instal at the Stuart Street station a new 15 000 kVA transformer, transferring to West Didsbury one of the existing 8 500 kVA transformers. An additional borrowing power of £6 000 is involved.

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# S.-E. LANCS. BOARD.

## New Statistics of Generating Stations' Operating Costs.

THE annual report of the South East Lancashire Electricity Advisory Board for 1927–8 states that the Board Advisory Committee approved during the year the following proposals in relation to extensions of existing stations :—Altrincham, 1/3 750 kW turbo-alternator and 1/40 000 lb. boiler ; Bury, 1/10 000 kW turbo-alternator ; Buxton, 1/340 kW Diesel oil engine and dynamo ; Macclesfield, 2/1 200 kW Diesel alternators ; Salford, 1/20 000 kW turbo-alternator and 2/65 000 lb. boilers ; Stalybridge, 1/7 500 kW turbo-alternator and relative boiler plant ; Stockport, 1/20 000 kW turbo-alternator and 4/50 000 lb. boilers. In the case of Altrincham the Board's recommendation in favour of the extensions was made conditional upon the inability of the Commissioners to indicate a means whereby a bulk supply could be furnished without prejudice to the company. The Commissioners being unable to indicate any such means, the extensions were sanctioned by them. The Macclesfield case presented difficulties, as the Board were unable to indicate a bulk supply which would not prejudice the company, unless assistance were given by the Electricity Commissioners and/or the Central Electricity Board, and the question is at present before those authorities. The Stalybridge extensions raised an important question as to the continuity of the 40 cycle system of generation at that station. The Board approved the extension, but leaving the Commissioners to deal with any question relating to the frequency of the station. Proposals approved by the Board for the construction of main transmission lines include : Lancashire Electric Power Co., Hill Top to Kirkhall Lane 33 000 V, Padiham (Mid-Lancs) to Rochdale 33 000 V, and Radcliffe to Rochdale 33 000V ; Manchester Corporation, Barton to Oldham Road and Barton to High Street, 33 000 V ; Rochdale Corporation, generating station to Rochdale boundary at Caldershaw, 33 000 V ; and Stretford U.D.C., Barton to Stretford, 33 000 V. The Board have instituted a system of quarterly collection of statistics of operating costs per kWh, relating to all generating stations in the district, and the following statement shows the figures obtained :—For the quarters ended June, September and December, 1925, respectively, the figures were 0·3311d., 0·3198d., and 0·2785d. ; for the four quarters of 1926, 0·2672d., 0·31657d., 0·5976d. and 0·5791d. ; and for the four quarters of 1927, 0·3103d., 0·2893d., 0·2758d., and 0·247d.

# THE NATIONAL REGISTER.

## Further Acceptances Bring Total of Contractors Enrolled to 1068.

RECENT publicity on behalf of the registration of electrical contractors is having a beneficial effect on the number of applications for registration which are now being received by the National Register of Electrical Installation Contractors. At the meeting of the Executive Committee of the Register on May 31st, no fewer than 30 applications were accepted, while at the last meeting, on July 13th, a further 16 acceptances were notified, bringing the total number of contractors on the Register to 1068. At the July meeting six applications were declined.

The names of the successful applicants, and their addresses, are as follow :—The Grove Electrical Co., 201, Grove Lane, Handsworth, Birmingham ; Mutter and Meinert, 58, James Street, Docks, Cardiff ; William W. H. Squire, 31, Sweyne Avenue, Southend-on-Sea ; Yeldon and Gardiner, 4, Reservoir View, Tavistock Road, Plymouth ; Sewell and Varley, Ltd., 23, Lloyd Street, Albert Square, Manchester ; W. H. Matthews, Ltd., Chepstow Road, Chorlton-cum-Hardy, Manchester ; S. Rogers and Co., Ltd., 15, Fitzroy Street, London, W.1. ; W. Dickinson and Co., Graham Road Works, Bexley Heath ; The Forward Electrical Co., 46, Holloway Head, Birmingham ; Werneth Electrical Engineering Co., Ltd., 352, Manchester Street, Oldham ; Charles O. Clark, East Kent Radio and Electricity Works, Mill Road, Deal ; Walter T. Bingham, 3, The Arcade, Woodseats, Sheffield ; Bernard French, Mill Street Electrical Works, Kidderminster ; Plant and Bird, 42, Mount Pleasant Street, Oldham ; H. M. Speirs and Co., 272, St. Vincent Street, Glasgow, C.2 ; and George Gwyther, 78, Tudor Street, Coppice, Oldham.

# ELECTRICITY IN WARFARE.

## Interesting Apparatus at the Duke of York's Headquarters.

A VIEW of a display by the 26th Anti-Aircraft Battalion, R.E. (London Electrical Engineers), T.A., popularly known as the "26th Ack Ack," was recently accorded us. The battalion consists of three companies, and is commanded by Lieut.-Col. M. G. Bland, who in civilian life is one of the principals of a well-known firm of consulting engineers. Members of the battalion are trained not only in the operation of searchlights, but also in the running of engines and dynamos and petrol-electric lorries, the use of sound locating instruments, height finding and track plotting and telephony. The searchlights used are chiefly 120 cm., and one of their features is the Yorke control which moves the arc vertically and laterally so as to keep it properly centred. This control also prevents uneven burning of the carbons which would detract from perfect distribution of the light on the mirror. Sound locators, for detecting the position of aircraft, are always used in connection with searchlight operations. A sound locator has two pairs of "trumpets," one pair for locating sounds laterally, and the other pair for detecting the angle between horizontal and vertical at which the sound travels. A pair of earphones; in the form of a medical stethoscope, is attached to each pair of trumpets, and as the man using one of these pairs finds the intensity of the sound greater in one ear than the other, the trumpets are moved so as to bring them into a direct line with the source of the sound. It is stated that an experienced man can locate sounds by this method to within two or three degrees of accuracy, and, as the searchlight beam spreads over about 2½ degrees, and three searchlights are usually focussed on the same spot, this appears to be a fairly sure method of "spotting" aircraft, apart from the intervention of clouds. As King's Road, Chelsea, is usually too noisy, by reason of the heavy road traffic, for successful work of this kind, a silent chamber in the headquarters has been equipped with an electrical sound locator training instrument. In this the noise is produced in the apparatus itself, and when the man operating the machine gets the two pairs of trumpets on the correct line, this is indicated by the bringing into phase of two pairs of coils.

### Field Work.

There are usually three complete sections spread over a considerable area in actual field work, and these are connected by telephone with each other, and with a room or tent in which are a map showing the position of the sections and a chart upon which the height of aircraft is rapidly found, by the adjustment of two swivelling arms according to the reports received from the field sections, the desired figure being at the intersection of the arms. The crossing by aircraft of the base lines drawn from one section to another renders its detection more simple and certain, and enables its height and speed to be accurately calculated. A simple way of recording the speed of aircraft crossing the ground represented by the map is the placing of coloured counters on the map at time intervals, corresponding with the reports received by telephone. The telephone switching in the office where the map and chart are used is done by means of press buttons on the specially arranged table.

Amongst other equipment used by the battalion are lorries carrying generating sets and cable drums and anti-aircraft Lewis guns.

This battalion, in common with other anti-aircraft territorial units, is required to maintain a very high standard of efficiency, in view of its allotted rôle of immediate readiness in case of emergency.

# RURAL TELEPHONES.

A deputation representative of all parties, appointed at a recent meeting of members of the House of Commons, visited the General Post Office last week to urge the necessity for revision of the regulations relating to guarantees demanded by the Department for the provision of public telephone call offices in rural areas. It was urged that the guarantees demanded were excessive, and resulted in restriction of telephone development, and the Post Office was asked to share the risk, or institute a fund to meet the expenses incurred during the first few years of the installation of telephones in remote districts. Mr. Leeck said the Postmaster-General expected shortly to be in a position to take steps to make it easier for rural communities to become telephone users.

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# WIRELESS NOTES.

## A Review of the Radio Industry in the United States.

FUNDAMENTALLY, the radio industry in the United States is stronger at present than at practically any other time in its history. As the result of heavy losses sustained during 1927 and the opening months of 1928, many poorly-managed and improperly financed manufacturers and dealers have been forced to discontinue operations. Of some 2 500 producers engaged in the trade at this time last year, only about 1 200 remain. The elimination has done much to improve the position of the industry as a whole. In previous years, many weakly situated manufacturers regarded the opening of the spring season as a signal to throw on the market stocks carried over from winter, the inevitable result being a sharp fall in prices. This year, factory unloading has been on a comparatively unimportant scale and prices have remained unusually stable, although competition for business is still very keen.

The industry, generally considered, has recently been benefiting also from a larger public demand for wireless receiving sets and accessories than is usually experienced at this season. The total value of retail radio sales, after expanding from only $60 000 000 in 1922 to slightly more than $500 000 000 in 1926, declined to $446 000 000 last year—a drop, as compared with 1926, of 11 per cent. During the early weeks of 1928, trade continued at a lower rate than in the corresponding period of the preceding year, but afterwards for several months was substantially heavier than in the corresponding portion of 1927.

Moreover, although sales have lately been declining in accordance with seasonal influences, they continue to make a better showing than they did a year ago. Reports from ten of the principal retail markets indicate that although all sections are not participating in the increased buying, the gains are, nevertheless, rather widely distributed. Dealers in seven cities state that business is more active this year than last, while in two centres only is trade falling under its 1927 volume. It is equally significant that retailers view with optimism the prospect for business during the late spring and summer.

The predominating opinion is that, with an unusually large number of important events, including the political conventions, which are scheduled to be broadcast in the ensuing months, sales will be greatly stimulated during what is ordinarily a slack period for the industry. More extensive advertising and general sales campaigns also are expected to prove helpful.

### "Beam" Developments.

A further development in the use of the short wave "beam" system for Imperial communications took place on June 16th, when the stations built for communication between Canada and Australia were officially opened for public service.

At present "beam" messages from England to Australia are transmitted over two routes direct, one eastward over Northern Europe, Russia and China, and the other westward over the northern part of South America and the Pacific. With the opening of the Canada-Australia service a third route by which messages can be relayed through Canada will be added to supplement the other two routes in case of need. The "beam" wireless service to Australia has increased in the amount of traffic carried month by month amounting now to a figure which approximates no less than 9 000 000 words per annum.

Further developments in wireless communication, the outcome of Mr. Marconi's recent experiments, are expected shortly in the simultaneous transmission of wireless telephony and wireless telegraphy over the "beam" system. Tests are now taking place across the Atlantic with apparatus which, it is claimed, will operate two high-speed telegraph circuits simultaneously with one duplex telephone circuit, utilising the same transmitter and aerial and only one wavelength for all three circuits.

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### THE JOHN BENN HOSTEL BALLOT.

Readers are reminded that there is still time to enter for "The Boy's Ballot" and win the saloon motor car or one of the 350 other prizes. Offers of further help in ticket selling will be greatly appreciated. Tickets, prize lists, and all particulars may be had from the Ballot Organiser, c/o Sir Ernest Benn, Bt., Bouverie House, 154, Fleet Street, London, E.C.4.

# THE SOCIAL SIDE.

THERE were 584 entries for events in the Metropolitan Vickers (Sheffield) Sports Association's fifth annual sports and gala on the Sport's Ground, Tinsley, on June 30th, when some excellent races were witnessed by nearly two thousand spectators. Prizes were presented by Mrs. G. E. Bailey.

**An event at the Metro-Vick sports at Manchester.**

The employees of Mr. T. Blackshaw, electrical engineer, of High Cockcroft, Blackburn, recently held their annual picnic A party travelled by motor coach to Huddersfield, where they visited Brook's motor works. Afterwards the journey was continued to Hardcastle Craggs.

The staff and employees of James Bros., electrical engineers, of Chippenham, Devizes and Trowbridge, recently had an outing, when a party, numbering 60, journeyed by road to Windsor. After lunch they had a river trip to Henley-on-Thames.

The employees of A. H. Hunt, Ltd., held their annual outing on June 23rd, when they travelled by motor coaches to Brighton. Luncheon was served at the Royal Pavilion, and Mr. A. H. Hunt and Mr. C. H. Hunt were each presented by the staff with two miniature billiard cues in cases, as tokens of esteem.

The staff of Siemens Lamp Works, Preston, have recently held two golf competitions and a bowling handicap. Each of the events took place at the Dick Kerr Club, Ashton Park, Preston. In the "S.H. Callow" golf competition (18 holes medal play) three competitors tied for first place, and a replay over 18 holes was necessary, Mr. W. T. LeMarechal was the winner, with Mr. W. G. Lochhead and Mr. W. G. Creasy second and third respectively. The "W. O. Smith" competition took the form of two-ball foursomes, the successful pair being Messrs. J. N. Aldington and W. G. Creasy, followed closely by Messrs. P. D. Oakley and A. G. Ogles. The bowling handicap, in which practically all the male employees participated, was won by Mr. C. Parker, Mr. T. Woods being second; the other semi-finalists were Messrs. J. Sharp and F. Barden.

There was a full programme of events at the Metro-Vick sports, held at Manchester on June 30th. It had unfortunately been impossible to run off some of the heats on the Friday evening, as had at first been intended, owing to the heavy rain, consequently Saturday afternoon was a very full one, and many adjournments had to be made to allow heavy showers to blow over. The prize distribution was only completed at 7.30 p.m. The condition of the ground was such that no record times could be expected, but the competitors stuck to it very gamely in spite of numerous falls. The surprise of the day was the victory of the apprentices in the tug-of-war; they must have put in some very strenuous hours in training for this event to win against some of the shop teams, which, judging by appearances, were very much heavier, man for man. Mr. G. E. Bailey acted as judge for this event. A comic touch was given to the proceedings by the introduction of a rugby football match with players in fancy costume. The prizes were presented by Mrs. Tom Beach, the wife of the chairman of the Foreman's Association, who had a word of congratulation and a hearty handshake for every successful competitor. This year the company presented a Silver Challenge Cup, to be held for one year by the department scoring the highest number of points in the various events, after adjustment according to the size of the department. The Motor Department were the first winners, with sixteen and a half points, against the Meter Department's sixteen.

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# COMPANY NEWS.

## Wireless and Cable Securities Weaken—Burndept Wireless Reconstruction—Telephone Rates in Argentina—Marconi Co's Increased Dividend—Aron Meter's Difficulties—Henley's Telegraph Co.'s Satisfactory Year's Trading.

BUSINESS in the electrical share market during the heat wave has been of small dimensions, the only feature being a slight relapse in Marconi's Wireless, which, although recovering to some extent, show a fall on the week of half-a-crown. Cable telegraph stocks have also weakened a little, Eastern shedding three points. Callender's Cable Construction shares are 1s. 3d. down, but Henley's are 1s. 3d. up. In the supply section, St. James' at 28s. are 1s. higher, and Westminster at 27s. 6d. are 6d. to the good. London and Suburban Traction "A" debenture stock is ½ up, at 78.

| Last Annl. Divd. % | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/6 | 38/6 | 68/6 | 14/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/- | 23/- | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) | 26/6* | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1).. .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48/9 | 48/9 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 26/1½ | 26/3 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 28/- | 27/- | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 31/6 | 31/6 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/6 | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6 | 34/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124 | 124 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 125 | 125 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. | 82 | 82 | 86* | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 75½ | 75½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 79 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 78 | 77½ | 89 | 65 |
| 4 | Lon. Un. Trams. 1st Deb. .. | 60½ | 61½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69½ | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 68 | 68 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 75½ | 75½ | 66½ | 12½ |
| 4½ | ,, ,, 4% 1st Pref. .. | 82½ | 82½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 7/6 | 7/6 | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/1½ | 23/1½ | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb... | 106 | 105 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 83/9* | 85/- | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. .. | 25/- | 25/- | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3‡ | 10/- |
| — | English Elec. Ord... .. .. | 8/1½ | 8/1½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/7½ | 20/7½ | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/- | 26/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 39/3* | 40/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 116/3 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 22/6 | 22/6 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 31/10½ | 32/6 | 37/- | 13/1 |
| 8 | ,, ,, 8 C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25* | 25½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½* | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 77½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 242* | 245 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 64½* | 64½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 23½* | 24½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 30 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 63/9 | 60 3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 50/- | 50/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 23½ | 24½ | 23 | 11/3/6 |

(*a*) 1s. 7⅞d. per share. (*b*) £8 8s. 6.66d. per cent. (*c*) 1s. 6.949d. per share. (*d*) 1s. 8.706d. per share. (*e*) 1s. 9.3d. (*f*) 1s. 912d. (*g*) 1s. 7.223d. ‡Including 1s. bonus. *Ex dividend.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Qtrly. intm. divs. of 15 p.c. on ord. stk. and £1 10s. p.c., on pfd. stk. are announced.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Intm. div. at rate of 6 p.c. p.a., less tax, on ord. shs. will be payable on Sept. 15.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Intm. divs. at rate of 6 p.c. p.a., less tax, on 6 p.c. cum. pref. shs., and at rate of 6 p.c. p.a., less tax, on ord. shs. will be payable on Oct. 1 and Sept. 15 respectively.

VICTORIA FALLS AND TRANSVAAL POWER CO.—Net profit £373 445, as against £371 344. Dividend rate maintained at 15 per cent., the preference capital receiving final payment of 1 per cent., making 10 per cent. for year. After allocating £50 000 to reserve, balance brought forward £141 457, compared with £133 006.

EASTERN TELEGRAPH CO., LTD.—Rev. for 1927, £3 306 909; ord. exes £2 358 983. After provisn. for income tax payable in England, mtge. deb. stk. int., and pref. divs., blce. is £669 139, plus £506 625 brt. in. To gen. res., £150 000. Three intm. divs. of 2½ p.c. each and fin. div. of 2½ p.c. have been paid on ord. stk., making 10 p.c., tax free, for year. Blce. to next acct., £525 765.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Gross rev. for 1927, £1 978 409; ord. exes. and res. for ships maintenance, £910 265; blce., £1 068 144; Income tax payable in England, £199 857; mtge. deb. stk. int., £30 096; blce. £838 191, plus £415 431. To gen. res., £200 000. Four divs. of 2½ p.c. each have been paid makg. 10 p.c. tax free, for year. Fwd. £653 622.

BURNDEPT WIRELESS, LTD.—Further details of scheme of reconstructn. have been issued. It is proposed to form a company named Burndept Wireless (1928), Ltd. For each existg. pfd. sh. two 5s. ord. shs. (1s. 9d. paid) will be allotted, and for every 20 dfd. shs. one 5s. ord. sh. (1s. 9d. paid) will be allotted. It is proposed that creditors over £10 shall receive half the amt. due to them in 6 p.c. 10-year notes, and that creditors under £10 shall be paid in cash at the rate of 7s. 6d. in the £.

UNITED RIVER PLATE TELEPHONE CO., LTD.—The board of directors have been advised by the company's local committee in Buenos Aires that the Argentine Government, without reference to the company, have issued a decree cancelling the increase in the company's tariffs authorised in October, 1922, by the previous Government. Representations are being made calling the attention of the Government to the fact that by Argentine law the tariffs can only be varied by the Government in agreement with the company, and failing such agreement the dispute must be submitted to arbitration. The increase granted in 1922 was $5 per line per quarter.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The directors have issued a notice explaining that the delay in issuing the accounts has been due to the fact that the report of the Imperial Wireless and Cables Conference has not yet been published, and their inability to submit to the sh.hldrs. particulars of the merger scheme and proposals as to the allocatn. of shs. in the merger co. until the governments concerned have ratified the recommendatns. of the Imperial Conference. The directors are able to state that the pfts. for 1927, after paymt. of deb. int., are £430 471, and they have decided to make an intm. distributn. of 10 p.c. actual, less tax on the ord. shs., payable on Aug. 13.

## Company Meetings.

ARON ELECTRICITY METER, LTD.—Presiding at the ordinary general meeting on July 11th, Colonel R. E. Crompton said that the profit and loss account did not present a satisfactory picture. Profits on trading at £3 811 were down by £3 748 from last year, and dividends and interest at £4 842 showed a reduction of £366, and in spite of the fact that expenses—£3 364—exclusive of income-tax, were down by £516, a profit of only £5 175 was available for transfer to the balance-sheet, as against £9 040 last year. The company had had many difficulties to contend with during the year under review. Firstly, there had been a certain amount of disorganisation and expense in connection with the transfer from the old to the new premises of certain departments without closing

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down, and in particular the testing plant, which in an electricity meter business was of the most vital importance. He believed he could say that the new testing plant was most efficient and up-to-date. There had been a considerable reduction in the selling price of meters, and there was still a certain state of flux and uncertainty in regard to the new schemes and tariffs to result from the recent legislation. An extraordinary general meeting was subsequently held, at which the proposals set out in a circular to the shareholders for the creation of income debenture stock and the reduction of the preference share capital were, after some discussion, carried. The proposals were also approved at a separate general meeting of the preference shareholders.

PETTERS, LTD.—Sir Ernest W. Petter, presiding at the meeting on July 12th, said the result of the past year's trading, having regard to the prevailing conditions in the engineering trade would, he hoped, be considered satisfactory. In his speech last year he explained the circumstances under which the board considered it desirable to incur the responsibility of acquiring Vickers, Ltd.'s shares and debentures in the Ipswich company, formerly Vickers-Petters, Ltd. They had hoped that, with the undertaking under their sole control, they would have been able to get it on to a profit-earning basis. A few months, however, sufficed to satisfy them that that hope could not be fulfilled under existing conditions. The business was handicapped by contracts of an onerous character entered into before they took control, while the difficulty of managing a business some 200 miles from their base prevented them from securing the economies essential to success. It had, therefore, been decided to close the Ipswich works at the end of the present year, and resume the manufacture of the larger size of Petter engines at Yeovil. The large sum which they had had to borrow from Lloyds Bank to finance the purchase of Vickers' interest in the Ipswich company remained unsatisfied. The decision to close the Ipswich works would, they hoped, put them in funds that would enable them to discharge the greater portion of this liability, although the necessity to resume the manufacture of the larger sizes of the Petter oil engines at Yeovil, mentioned in the report, put a capital burden upon them for new shops and machinery. The net profit, after providing for depreciation, taxation, bad and doubtful debts and making further provision for depreciation of investments, was £25 634. Adding the amount brought forward, less the interim dividend on the preference shares last December, they had a disposable balance of £44 445. The service of interest on the funding certificates and provision for redemption for the year to July 15th required £2 500. The half-year's dividend on the preference shares, due at March 31st, 1928, less tax, and a dividend on the ordinary shares at the rate of 6 per cent. per annum, less tax, were approved.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—At the meeting last Friday, Sir George Sutton, chairman, said the business, year by year, grew more prosperous. The balance sheet showed that £126 416 had been spent on capital account. This expenditure represented the economising and increasing of production, with the exception of £2 585 expended on the new sports ground at Gravesend. The amount standing to the credit of the pension and benevolent funds had now reached £262 000. The trading profit was £342 000, and the net result, if the directors' proposals were adopted, was a balance of £532 930 to carry forward, against £506 202 brought in. How had the result been arrived at? He was disposed to state as the primary cause the ability, experience and unslackened attention which has been devoted to their business by the large staff of employees. From the chiefs of the undertaking to the worker at the machine, satisfactory service had been given. His statistics showed that the output of their factories per hour per head in the cable department had increased by nearly 10 per cent. since 1913, and in one large department the improvement of output per head during these years was 14 per cent. A reason for this satisfactory improvement was that the factories were fully employed—a busy factory always tended to the raising of the output per head of the people employed. Another reason was the expenditure on new machinery and improvements in organisation. The increase in the number of people employed at their Gravesend works was between 300 and 400. The home trade gave them their largest increase, but the overseas trade had increased about 10 per cent. over the previous year. He was excluding from the figures the two large contracts for India and Egypt, which were in course of execution. The overseas trade last year accounted for more than one-third of their total turnover. The new year showed an order book rather larger than they brought in a year ago. He was optimistic as to the future outlook. The consumption of electricity at home had doubled during the past seven years, and was likely to continue to increase. Their cautious financial dispositions enabled them to make provision for increased output of their products without raising money by a new issue of shares. The report and accounts were adopted, and a final dividend of 2s. 6d. per share, less tax, on the ordinary shares and a bonus of 1s. per share, less tax, were approved.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—At the meeting last week, Sir George A. Touche, chairman, said the gross receipts for 1927 were £4 658 617, an increase of £163 217. Car miles run were 69 861 752, agst. 66 759 821 in 1926. The excess of receipts over expenditure was £1 011 639. With £30 841 from interest and minor receipts in London, there was a total of £1 042 481 to meet fixed obligations and dividends on the first and second preference shares. The sum required for these purposes was £1 027 800. The remainder of the amount allotted during the year for debenture stock redemption appeared on the other side of the balance-sheet. At £81 119 it formed the nucleus of the sum which would be accumulated for complete redemption of the outstanding debenture stocks within the established period. The balance of the net revenue account was £15 400, which had been added to the carry-forward. The poverty of this return for their services to the great and growing community of Buenos Aires was in striking contrast to the wealth of experience and endeavour which lay behind a feat of transport repeated every day. The ad-referendum agreement, signed with the Intendente of Buenos Aires nearly three years ago, contained the provisions essential for dealing with the traffic situation. Its adoption, while indispensable to the progress of the company, would be fraught with advantages for the whole community. With each successive year's delay, the case for official sanction became more urgent. Up to the present the agreement had not been put to discussion, or vote, by the Council. Meanwhile the detailed plans for the first of the two additional subways to be provided under their concession had been submitted to the Executive Department of the Council, as a step preparatory to the commencement of construction when that course was made economically possible by granting the company's petition. Much had been written and said in recent years about the comparative merits of tramways and omnibuses. In the larger and older cities of the world, where design and general conditions had lent themselves to the extensive accommodation of the motor-omnibus, it had, without doubt, justified itself. Whether it was superior to the tram as an efficient and desirable means of handling traffic in densely populated areas remained open to question. Generally speaking, the traffic returns in any of the big cities of the world to-day proved the case for the trams. In Buenos Aires, at any rate, after 51 years of operation, they found the public still showing a preference for the tramways over other public vehicles. It seemed not unreasonable to believe that for many decades yet tramways would maintain and even develop their supremacy as the city's safest and most efficient means of communication. The report and accounts were adopted.

## New Companies.

WATSON BROTHERS, LTD.—Cap., £100. Electricians, etc. Reg. office: 5, Sholebroke Place, Leeds.

POSITIVE LOCK WASHER CO., LTD.—Cap., £10 000. Electrical and general engineers, etc. Reg. office: 21, York Street, Glasgow, C.2.

BAYLEM'S, LTD.—Cap., £10 000. Manufacturers of and dealers in wireless and electrical apparatus, etc. Reg. Office: 148, Ashton New Road, Beswick, Manchester.

PHONOPHONES, LTD.—Cap., £500. Manufacturers of and dealers in wireless receivers and loud speakers, etc. Reg. office: 7A, Westminster Buildings, New York Street, Leeds.

ULTRAPHONE SYNDICATE, LTD.—Cap., £100. Manufacturers of and dealers in wireless, automatic, telephony and other instruments, etc. Reg. office: 13, Albemarle Street, London, W.1.

EUROPEAN HYDRO-ELECTRIC CO., LTD.—Cap., £35 000. Hydro-electric, public utility, electric light, heat and power company. Reg. office: 199, Winchester House, London, E.C.2. (Public Company.)

GAMBRELL RADIO, LTD.—Cap., £500. To acquire business of sellers, importers and exporters of and dealers in radio apparatus and parts now carried on by Gambrell Brothers, Ltd., at 76, Victoria Street, London, S.W.1.

DAYSON, LTD.—Cap., £1 000. Manufacturers of or dealers in wireless apparatus, wireless, electrical and mechanical engineers, etc. Solicitors: Wild, Collins and Crosse, Kennan's House, Crown Court, Cheapside, London, E.C.2.

WEST YORKSHIRE ELECTRIC CO., LTD. Cap., £500. Manu-

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facturers of and dealers in electric globes, lamps, shades, fittings, fixtures and accessories, wireless goods, etc. Reg. office: 54, Rosebank Lane, Woodsley Road, Leeds.

CONSOLIDATED ELECTRICAL SUPPLIES, LTD.—Cap., £100 000. Manufacturers, importers, and exporters of and dealers in electrical and mechanical machinery, wireless apparatus, valves and fittings, cables and wires, etc. Solicitor: A. R. Monks, Crown House, Aldwych, London, W.C.

VICKERS (CRAYFORD), LTD.—Cap., £400 000. To acquire from Vickers, Ltd., that part of its undertaking carried on at Crayford, and to carry on the business of mechanical, civil, electrical and general engineers, etc. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, London, E.C.

NATIONAL SUN RAY AND HEALTH CENTRES, LTD.—Cap., £150 000. To adopt agreement with A. Lewis and J. A. Riggal, to carry on business of proprietors of electrical and sun ray treatment establishments, etc. Solicitors: Cohn Seligman and Bax, 52, New Broad Street, London, E.C.2. (Public Company).

HOWARD SNELL AND CO., LTD.—Cap., £1 000. Radiological engineers, merchants, manufacturers and suppliers of X-ray and electro-medical apparatus and accessories, apparatus and accessories for actino therapy, electrical engineering contractors, etc. Reg. office: 6, Broad Street Place, London, E.C.2.

SYMPER AND EVERSHED, LTD.—Cap., £1 000. To acquire the business now carried on at 22, St. Anne's Road, Harrow, Middlesex, as "Symper and Evershed," and to carry on business of electrical, mechanical and general engineers and contractors, etc. Reg. office: 22, St. Anne's Road, Harrow-on-the-Hill, Middlesex.

NORTHERN ELECTRIC SUPPLIES CO., LTD.—Cap., £500. Manufacturers of, agents for and dealers in electrical wires, cables, lamps, fittings, apparatus, appliances and accessories, including radio apparatus, heating, cooking and power apparatus, etc. A subscriber: W. F. Griffiths, 5, Guildhall Street, Lincoln, electrical engineer.

BERRY'S ELECTRIC (1928), LTD.—Cap., £225 000. To acquire assets and undertaking of Berry's Electric, Ltd., and carry on the business of electrical and general engineers, etc. Directors:—H. H. Berry, P. D. Morton, W. J. Markham, A. Skelton, G. J. Berry. Reg. office: 86, Newman Street, London, W.1. (Public company.)

ASSOCIATED ELECTRICAL INDUSTRIES, LTD.—Cap., £100 000. The objects are: To acquire and hold shares, debentures and securities of any British or foreign company, and to carry on business of manufacturers of and dealers in electrical machinery, plant and apparatus, lamps and fittings, wireless apparatus, valves and fittings, cables and wires, etc. Solicitor: A. R. Monks, Crown House, Aldwych, London, W.C.2. (Public company.)

AIRCRAFT AND UNIVERSAL SIGNS, LTD.—Cap., £1 000. To acquire from F. C. Armstrong and E. A. Houchin the benefit of a certain invention relating to advertising, and to carry on the business of designers and manufacturers of and dealers in electric, magnetic, revolving, changeable, moveable, coloured, illuminated and other advertising signs, etc., whether to be used on or in connection with aeroplanes and other aircraft, etc. Reg. office: 2, Clement's Inn, London, W.C.2.

"K. N." ELECTRICAL PRODUCTS, LTD.—Cap., £6 000. To adopt agreement with I. Knowles and F. Knowles, and to develop and turn to account the business of manufacturers of and dealers in electrical goods and appliances formerly carried on by them, including registered design 732 557, and benefit of all pending applications by them for patents in respect of electric soldering irons, to carry on the business of manufacturers of and dealers in radio sets and components, etc. Solicitors: Horner and Horner, Fitzalan House, Arundel Street, Strand, London, W.C.2.

TRIOTONE, LTD.—Cap., £5 250. To carry on business of manufacturers of and dealers in Triotone gramophone radion instruments, portable gramophone radio sets, proprietary gramophone and self-contained radio sets and appliances and devices for recording, reproducing, transmitting, broadcasting and amplifying sound, including gramophones, records, amplifiers, loud-speakers, musical instruments, valves, electrical appliances, manufacturers of and dealers in wireless apparatus, etc. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, London, W.C.2.

## ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* GEE AND CO., *Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

*Opposition to the registration of the following Trade Marks can be lodged up to July 27th.*

TAURUS. (Sign.) 482 436. Class 5. Enamelled wire. Isolierdraht Aktiengesellschaft (a joint stock company organised under the laws of Switzerland), 54, Waengi, Thurgovie, Switzerland; manufacturers. July 15th, 1927. (To be Associated, Sect. 24.) (By Consent.)

NEW TONS. (Sign.) 488 771. Class 6. Electrical machinery and parts thereof. Rotax (Motor Accessories), Ltd., also trading as Newtons of Taunton, Rotax Works, Victoria Road, Willesden Junction, London, N.W.10; and Herbert Street, Rowbarton, Taunton; manufacturers. February 22nd, 1928. (To be Associated, Sect. 24.) Registration of this Trade Mark shall give no right to the exclusive use of the word "Newtons" or of the numerals "1884."

CRABTREE. 484 047. Class 8. Fitted electrical switch and fuse boards. J. A. Crabtree and Co., Ltd., Lincoln Works, Lincoln Road, Walsall; manufacturers. September 16th, 1927. (To be Associated, Sect. 24.) Advertised before acceptance, the applicants alleging distinctiveness.

STORAN. 488 738. Class 8. Wireless telephonic instruments. Storey Bros. and Co., 57, Church Street, Runcorn; manufacturers. February 22nd, 1928.

JACELITE. 489 387. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. J. A. Crabtree and Co., Ltd. March 13th, 1928. (To be Associated, Sect. 24.)

VIBROLDER. 491 702. Class 8. Apparatus for use in wireless telegraphy and telephony. The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17; illuminating engineers. May 22nd, 1928.

CRAB. 478 568. Class 13. Electrical metal goods, namely, switches, couplings, fusible cut-outs, fuse boards and casings, conduit fittings, lamp-holders and accessories for use in electric lighting, electric heating, electric signalling, and electric power installations, but not including cycle and motor-car fittings, pins, or safety pins, and not including any goods of a like kind to any of these excluded goods. J. A. Crabtree and Co., Ltd. March 8th, 1927. (To be Associated, Sect. 24.)

CRABTREE. 484 048. Class 13. Metal goods for use in electric lighting, heating, signalling and power installations, but not including switches, couplings, fusible cut-outs, fuse boards and casings, conduit fittings, lamp-holders, and accessories for electric light fittings. J. A. Crabtree and Co., Ltd. September 16th, 1927. (To be Associated. Sect. 24.) Advertised before acceptance, the applicants alleging distinctiveness.

CRAB TREE. 484 056. Class 13. Metal goods for use in electrical lighting, heating, signalling, and power installations, viz., switches and switchgear; bell-pushes; cut-outs; fuses, plug-and-socket couplings; connectors and adapters; lamp-holders; ceiling roses; wiring conduits and junction boxes and fittings, for use in sunk and surface wiring systems; boxes, covers, pedestals and plates, for use in connection with switches, bell-pushes and couplings; cord-grips; cord-knobs; switch-operating chains; and casings for ironclad switches and cut-outs. J. A. Crabtree and Co., Ltd., Lincoln Works, Lincoln Road, Walsall; manufacturers. September 16th, 1927. (To be Associated, Sect. 24.) (By Consent.)

## METAL AND CHEMICAL PRICES.

TUESDAY, July 17th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 10 0 | — | 5s. |
| Electro Wirebars | ,, | £69 5 0 | 5s. | — |
| H.C. Wires, basis | per lb. | 9 $\frac{15}{16}$d. | $\frac{1}{16}$d. | — |
| Sheet | ,, | 10$\frac{1}{8}$d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. $\frac{15}{16}$d. | $\frac{1}{16}$d. | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8$\frac{1}{4}$d. | — | — |
| Sheet ,, | ,, | 9$\frac{5}{8}$d. | — | — |
| Wire ,, | ,, | 9$\frac{7}{8}$d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | 5s. | — |
| *Lead Pig*— | | | | |
| English | per ton | £21 15 0 | — | — |
| Foreign or Colonial | ,, | £20 7 6 | 2s. 6d. | — |
| *Tin*— | | | | |
| Ingot | per ton | £210 10 0 | £3 12 6 | — |
| Wire, basis | per lb. | 2s. 9d. | $\frac{1}{4}$d. | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 10 0 | — | 12s. 6d. |
| *Mercury* | per bottle | £21 7 6 | — | 2s. 6d. |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2$\frac{1}{2}$d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3$\frac{1}{2}$d.
*Rubber*—Para fine, 11$\frac{1}{2}$d.; plantation 1st latex, 9$\frac{1}{8}$d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

### LEAD MARKET REPORT.

James Forster and Co. report that the downward movements in values were continued at the beginning of last week until, on Tuesday, lead touched £20 2s. 6d., and forward £20 12s. 6d. Since then there has been a small recovery, though the market closes barely steady. The price in New York was marked down on July 9th to 6.20 cents per lb. Quiet conditions prevail in the market. Arrivals up to date this month are rather short. With supply and demand evenly balanced, no great change in prices either way is expected. Closing prices on July 14th were:—£20 8s. 9d. for July, £20 12s. 6d. for August, £20 15s. for September, and £20 17s. 6d. for October.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ADAMS, Mr. L. R., 44, High Street, Shoreham, electrical engineer. £41 18s. 3d. June 6th.

FIFIELD, Mr. F. W., 2, Small Street, Bristol, electrical engineer. £12 4s. 6d. June 6th.

GODDARD, Mr. M. E., 25, Silver Street, Doncaster, radio dealer. £35 13s. 4d. June 7th.

GREEN, W., 3, York Street, Stourport, wireless dealer. £25 19s. 2d. February 7th.

HALL, Mr. C. A., High Street, Towcester, wireless dealer. £2 11s. 4d. June 6th.

HUGHES, Mr. S. C. (trading as HUGHES BROS.), 1090, Bankfoot, Bradford, electrician. £10 17s. 2d. June 7th.

KINGS MILL ART METAL AND ELECTRICAL CO., LTD., 142B, Fulham Road, South Kensington, electricians. £18 1s. 11d. June 5th.

McBRIDE, John, 169, Wallasey Village, Wallesey, electric and radio engineer. £12 18s. June 7th.

MOORLAND, Mr. F. H., 11, Queen's Road, Hull, electrical engineer. £17 15s. 8d. June 7th.

NADIN, B., Thelwall New Road, Grappenhall, wireless dealer. £23 16s. 1d. June 8th.

SIDERMAN, Harry, 174, Holland Road, Kensington, electric lamp dealer. £15 7s. 7d. June 6th.

SMITTEN, Mr. A. E., Garden Cottage, Primethorpe, Broughton Astley, electrical contractor. £14 10s. 6d. June 6th.

STANSBURY, L., AND SONS, 2, Empire Parade, Beckenham, electrical engineers. £11 10s. 7d. June 8th.

VINCER, Mr. E., 94, Marlowes, Hemel Hempstead, wireless agent. £19 5s. 11d. June 8th.

## Receivership.

DARTMOOR ELECTRIC SUPPLY CO., LTD. T. W. W. Melhuish, of 21, St. Leonards Road, Exeter, was appointed Receiver on June 28th, 1928, under powers contained in second debentures dated September 19th, 1919.

## Mortgages.

[NOTE—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

NORTH WALES POWER CO., LTD., London, S.W.—Registered April 18th, Trust Deed dated March 30th, 1928, securing £300 000 debenture stock, etc.; general charge; also registered April 19th, collateral securities (supplemental to Trust Deeds dated May 12th, 1924, March 30th, 1928 and July 29th, 1919, etc., securing £1 700 000, £300 000 and £1 000 000 debenture stocks) being respectively 1st charge, 2nd charge and 3rd charge on all land within the meaning of the definition contained in the Law of Property Act, 1925, sec. 205 (1) (IX.), now belonging to co. or to which it is now in any manner entitled. *£1 975 590. August 11th, 1927.

PORTABLE WIRELESS, LTD., London, W. Registered June 26th, charge, to Bank; charged on leases of properties at Bromley (Kent) and Southsea.

WELWYN GARDEN CITY ELECTRICITY SUPPLY CO., LTD. Registered July 2nd, £20 000 deb. to Bank; general charge (excluding uncalled capital). *£20 000. December 31, 1926.

### Satisfactions.

CRYSELCO, LTD., Bedford, electrical manufacturers. Satisfaction registered June 28th, £10 000 (not ex.), registered June 5th, 1924.

HUNGERFORD AND DISTRICT ELECTRICITY SUPPLY CO., LTD. Satisfaction registered June 29th, £1 550 registered August 18th and December 5th, 1927, and March 26th, 1928.

## London Gazette, etc.

### Bankruptcy Information.

JONES, Edward Denis, Royal Sportsman Hotel, Portmadoc, Carnarvon, electrical engineer. Receiving order, July 12th. Debtor's petition.

RIDLEY, John Donald, trading as THE EASTERN COUNTIES ELECTRICAL CONSTRUCTIONAL CO., 41, Butter Market, Ipswich, Suffolk. Public examination, August 10th, 10.30 a.m., Shire Hall, Ipswich.

WORNSNIP, William, 36, Market Hall, Walham Green, London, wireless dealer. Receiving order, July 12th. Creditor's petition.

### Notices of Dividends.

BARRELL, Frank Herbert, trading as F. H. BARRELL AND CO., 2A, 2B and 2C, Church Street, Staines, electrical and radio engineer. First and final dividend, 2s. 11¾d. per £, payable, July 20th, 1928, Official Receiver's Office, 29, Russell Square, London, W.C.1.

ROSS, William, 35, Bridge Street, Haverfordwest, wireless engineer. First and final dividend, 4s. 2d. per £, payable July 20th, 4, Queen Street, Carmarthen.

### Notices of Intended Dividends.

DIXON, Leslie Arthur Nevett (trading as C. FORGHAM AND CO.), 23A, Princess Street, Shrewsbury, and Old Post Office Yard, Shrewsbury, electrical engineer. Last day for receiving proofs July 28th. Trustee, C. J. Pyke, 22, Swan Hill, Shrewsbury, Official Receiver.

GORDON, John Henry, 21, Leeds Road, Ilkley, Yorks, electrical engineer. Last day for receiving proofs, July 25th. Trustee, H. C Bowling, 24, Lower Bond Street, Leeds (Official Receiver).

### Partnerships Dissolved.

COLLMAN AND SOUTHWOOD (Victor Martin COLLMAN and John Theodorius SOUTHWOOD), electrical engineers, 48, Tavistock Place, Plymouth, by mutual consent, as from July 3rd, 1928. Debts received and paid by J. T. Southwood, who will continue the business.

E. C. JENKINS (Edward Charles JENKINS and Christian Otto MAYER), radio and electrical engineers, 124, Cheltenham Road, Bristol, by mutual consent as from June 21st, 1928. Debts received and paid by E. C. Jenkins, who will continue the business.

NORTHERN ELECTRIC CO. (Carl Thurman RHODES and Clifford Reginald Bernard HARTLEY), electrical engineers, 292, Stretford Road, Manchester, by the retirement of C. T. Rhodes as from March 31st, 1928. Debts received and paid by C. R. B. Hartley, who will continue the business.

MERIDIAN ELECTRIC CO. (G. TERRY and Andrew HEGGIE), 50, Wellington Street, Glasgow, by mutual consent as at June 16th, 1928.

## Bankruptcy Proceedings.

BEATY, William Johnson, 79, Station Road, Ashington, Northumberland, electrical and wireless dealer. The receiving order in this matter was made recently on the debtor's own petition, and at the first meeting of creditors held recently at Official Receiver's Office, 81, St. Mary's Place, Newcastle-upon-Tyne, the matter was left in the hands of the Official Receiver, it being a summary case. According to the statement of affairs returned by the debtor there were liabilities of £1 098, against assets of £41, a deficiency of £1 052 being disclosed.

LACEY, Walter Thomas, 10, George Street, Bath, electrical engineer and contractor. The first meeting of the creditors herein was held recently at Bristol, when the case being a summary one was left in the hands of the Official Receiver as trustee of the estate. The liabilities amounted to £562 gross, of which £537 was expected to rank, with a deficiency of £444. Debtor attributed his failure to loss on contract and bad trade. The Official Receiver stated that the debtor was manager to a firm of electrical engineers until he commenced business on his own account in 1922. He was fairly successful until three years ago, when he lost between two and three hundred pounds on a contract.

PAINTER, James Herbert (trading as VENABLES AND CO.) electrician, 99, The Broadway, Cricklewood, London, N.W. Adjudicated a bankrupt in March, 1925, the debtor applied in the London Bankruptcy Court on Tuesday to Mr. Registrar Mellor for his order of discharge. The Official Receiver said that proofs of debt had been admitted for sums amounting to £1 693, and the free assets which were estimated by the debtor at £580, had, according to the trustee in bankruptcy, realised only £240. A first and final dividend of 1s. 1d. in the £1 had been paid. The debtor began business in partnership under the style of Venables and Co. in 1903 as electricians, but after 1912 he traded alone. He attributed his insolvency to bad trade, to depreciation of certain goods, to loss on contracts, and to his profits having been insufficient to meet his household and personal expenses. The debtor admitted that his drawings had been excessive and that he had been living beyond his means. The Official Receiver opposed the application on the grounds that the debtor's assets were not of a value equal to 10s. in the £; that he had omitted to keep proper books of account; that he had continued to trade with knowledge of insolvency; and that he contributed to his bankruptcy by unjustifiable extravagance in living. His Honour suspended the order of discharge for three years.

The following are creditors:—Bankers, £526; Edison Swan Electric Co., £37; Gledson, J., and Co., £45; General Electric Co., £12; Marconiphone Co., Ltd., £35; Sun Electrical Co., Ltd., £29; Watson's Wholesale Wireless, £11; Towers, Geo., £213.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### June 15th.

17 330 G. Heptonstall, B. L. Myers, and W. Shaw. Metallic conduits for conductors.
17 360 International General Electric Co., Inc. Recording devices. (15/6/27, Germany.)
17 320 A. J. Lightfoot and Son. Wireless receivers.
17 433 A. T. Masterman. Devices for supplying electric power to thermionic valves, etc.
17 427 E. C. Mills and H. S. Hele-Shaw. Reversing rotary motors.

*THIS handsome trophy has been presented for competition in the new Intermediate Division of the West End Amateur Football Association by Mr. L. C. Gamage, chairman of the G.E.C. Football Club.*

17 394 J. H. Pease. Miners' electric lamps.
17 404 Radio Frequency Laboratories, Inc. Electrical amplifier circuit. (20/7/27, U.S.)
17 416 Schmid Patent Corporation. Batteries. (2/7/27, U.S.)
17 438 Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.). Aerial systems.

### June 16th.

17 518 British Insulated and Helsby Cables, Ltd., W. P. Fuller and G. H Nisbett. Electric cables.
17 478 R. von Brockdorff. Electrical heating apparatus.
17 454 Brookhirst Switchgear, Ltd., and J. A. Hirst. Starting and controlling electric motors.
17 491 H. G. Brown and D. P. Battery Co., Ltd. Positive accumulator plates.
17 455 H. R. Charters. Magneto electric machines.
17 510 G. W. Croot, Paragon Rubber and Manufacturing Co., Ltd., and Plessey Co., Ltd. Wireless receiving apparatus and gramophones.
17 496 F. Dworzak. Electric welding. (12/10/27, Austria.)
17 473 General Electric Co., Ltd., and E. L. Randall. Electric lighting apparatus.
17 440 E. A. Glaysher. Automatic ignition timing devices for electric machines.
17 482 International General Electric Co., Inc. Dynamo-electric machines (16/6/27, Germany.)
17 483 International General Electric Co., Inc. Measurement of a.c. voltages. (16/6/27, Germany.)
17 514 K. Kurda, C. Oertel, Siemens-Schuckertwerke Akt. Ges., and W. Wernicke. Regulating switches for step transformers.
17 451 F. W. Lanchester. Sound recording and reproduction.
17 519 C. Lorenz Akt. Ges. Maintenance of constant frequency in high frequency electric circuits. (24/6/27, Germany.)
17 505 Radio Instruments, Ltd. Pin and socket connectors.
17 506 Radio Instruments, Ltd., and W. L. Shaw. Iron cored inductance.
17 489 D. S. S. Steuart. Transmitter devices for telephones, etc.
17 444 V. Stobie. Electrical machinery.
17 459 J. B. Tucker. Plug and socket connections.

### June 18th.

17 582 British Thomson-Houston Co., Ltd., L. J. and S. F. Davies, and H. W H. Warren. Devices for causing intermittent illumination of a surface.
17 585 British Thomson-Houston Co., Ltd. Stators of electrical machines. (20/6/27, U.S.)
17 628 Concordia Elektrizitats Akt.-Ges. and W. Gosmann. Automatic fire extinguishers.
17 626 H. G. C. Fairweather (Allmanna Svenska Elektriska Aktiebolaget). Guide blade rings for turbines.
17 636 Ganz-Fele Villamossagi Reszvenytarsasag. Alternating current supply systems. (28/6/27, Hungary.)
17 602 J. Hall. Devices for carrying wireless aerials, etc.
17 533 A. Horstmann and Horstmann Gear Co., Ltd. Electric time switches, etc.
17 583 International General Electric Co., Inc. Steam turbine plant.
17 584 International General Electric Co., Inc. Electric motor control. (18/6/27, Germany.)
17 669 Electro Metallurgical Co. Thermally decomposing hydrocarbons. (11/10/27, U.S.)
17 613 E. J. Jupe. Adjustment of contact breakers of magnetos.
17 540 S. Loewe. Indirectly heated thermionic cathode. (25/6/27, Germany.)
17 576 Metropolitan-Vickers Electrical Co., Ltd. Contact fingers for electrical apparatus. (18/6/27, U.S.)
17 561 Patent-Treuhand Ges. für Elektrische Glühlampen. Alternating current rectifiers. (2/7/27, Germany.)
17 594 F. D. Pitt. Electric heater.
17 573 H. Rumble. Polarity indicator.
17 598 Siemens und Halske Akt.-Ges. Electric control device for statistical machines. (28/6/27, Germany.)
17 623 Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories, Inc.) Vacuum tube oscillator circuits.
17 579 M. Surjaminoff. Rotating field motors. (18/6/27, Austria.)
17 554 Westinghouse Electric and Manufacturing Co. Apparatus for classifying articles. (16/6/27, U.S.)

### June 19th.

17 742 Akt.-Ges. Brown, Boveri et Cie.. Turbines (20/6/27, Germany.)
17 757 Automatic Telephone Manufacturing Co. and P. N. Roseby. Imitation fires. (16/5/27.)
17 681 E. Boder. Distant control of electrical contact apparatus. (23/6/27, Switzerland.)
17 709 British Thomson-Houston Co., Ltd. Telemetric systems.
17 710 British Thomson-Houston Co., Ltd., and R. D. Parry. Control of motor generators.
17 717 Cie de Produits Chimiques et Electrometallurgiques Alais, Froges et Camargue. Electrolytic apparatus for refining aluminium, etc. (4/7/27, France.)
17 731 C. Coppock. Voltage regulating systems.
17 646 C. W. Cox and C. E. C. Shawfield. Electric fuses, etc.
17 759 G. F. Dandridge and Igranic Electric Co., Ltd. Variable resistance devices.
17 642 W. F. Dunn. Thermionic valves, etc.
17 715 General Electric Co., Ltd., and R. A. Kaula. Electric terminals.
17 683 A. F. Goldbeck. Electrical inspection lamps.
17 758 Igranic Electric Co., Ltd., and D. Sinclair. Transmitters for radio telephony.
17 673 C. C. Leigh. Magnetic table.
17 728 S. J. Leonard. Motor controllers.
17 780, 17 781 Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Vacuum electric tube devices.
17 661 J. Neale. Illumination of light sensitive bridge.
17 662 J. Neale. Railway control system.
17 663 J. Neale. Recording sound.
17 659 Russell, Newbery and Co. Flexible shaft coupling for dynamos, etc.
17 706 H. Shimidzu. Dry cell.
17 716 Siemens-Schuckertwerke Akt.-Ges. Centrifugal washing and drying machines. (20/6/27, Germany.)
17 725 Siemens-Schuckertwerke Akt.-Ges. Circuit connection for electric machine. (21/6/27, Germany.)
17 727 Siemens-Schuckertwerke Akt.-Ges. Electric machines. (29/6/27, Germany.)

### June 20th.

17 909 Akt.-Ges. Brown, Boveri et Cie. Regulator for electric generators. (20/6/27, Germany.)
17 910 Akt.-Ges. Brown, Boverie et Cie. Synchronising selectors in long distance control systems. (20/6/27. Germany.)
17 915 J. L. Baird and Television, Ltd. Television apparatus, etc.
17 841 C. Baty. Holders for electric lamps. (18/7/27, France.)
17 931 British Thomson-Houston Co., Ltd., and A. D. Pollock. Transformers.
17 932 British Thomson-Houston Co., Ltd., and J. C. Read. Mercury arc rectifiers.
17 933, 17 934, 17 935 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Mercury arc rectifiers.
17 843 H. S. Cowx. Luminous electric signalling apparatus, etc.
17 912 S. J. Eintracht and R. May. Low-frequency thermionic amplifiers.
17 838 B. J. Hall. Apparatus employing mercury vapour lamps.
17 886 E. Kieback, Kieback and Peter Messgerate und Reglar, and P. Peter. Automatic circuit controllers.
17 930 Landis and Gyr Soc. Anon. Subtraction electricity meters. (5/7/27, Switzerland.)
17 924 E. von Lepel. Ignition systems.
17 837 H. C. Pride. Holder for incandescent strip lights.
17 892 Ruthsaccumulator Aktiebolaget. Power generating plants. (28/6/27, Germany.)
17 881 Siemens-Schuckertwerke Akt. Ges. Electric control for steering machines. (30/6/27, Germany.)
17 890 Siemens und Halske Akt. Ges. Transmission of messages over telephone lines. (11/7/27, Germany.)
17 842 Standard Telephones and Cables, Ltd., and W. K. Weston. Twisting machines.
17 921 Telefunken Ges. für Drahtlose Telegraphie. Wireless signalling. (20/6/27, Germany.)
17 857 K. Wolinski. Diaphragms for electrolytic cells.

### June 21st.

18 004 Bamag-Meguin Akt. Ges. Electric closing means for vertical ovens. (21/6/27, Germany.)
18 017, 18 018 British Thomson-Houston Co., Ltd., and J. C. Read. Mercury arc rectifiers.
17 952 W. R. Brown and F. E. Evans. Accumulators, and hygrometers for use therewith.
18 048 W. Burstyn. Speed regulators for electromotors. (22/6/27, Germany.)
18 028 C. G. Carrothers and R. O. Kapp. Electric protective arrangements.
17 966 Energos Ges. Electrically-operated massage device. (12/12/27, Germany.)
17 996 English Electric Co., Ltd. and G. Schroeder. Excitation of synchronous dynamo electric machines.
18 005 A. N. Hazlehurst. Storage batteries.
17 955 S. E. Hillman and C. J. Wade. Secondary battery.
17 967 S. L. Hordle and J. S. Owner. Television apparatus.
17 976 J. B. Laidlaw. Means of wireless reception.
17 962 A. Preston. Sunk switches for electric wiring.
18 024 J. V. Ramsden. Electric pumps.
18 052 Siemens-Schuckertwerke Akt. Ges. Arrangements for increasing sensitiveness of a.c. instruments. (5/7/27, Germany.)
17 953 P. Tomnies. Magnetos for internal combustion engines.

## Coming Events.

### Saturday, July 21st.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place, Cardiff. Paper by Mr. S. W. Richards on "Mine Haulage Signalling Systems." 5.30 *p.m.*

### Monday, July 23rd.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

### Tuesday, July 24th.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Café. Ordinary meeting.

### Wednesday, July 25th.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary meeting, 3.30 *p.m.*

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## The Public and Electrical Dangers.

WHILE we of the electrical industry were gravely debating the desirability or otherwise of taking steps to warn the public of possible dangers attending the use in the home of unearthed portable electrical appliances on a.c. 200-250 V supplies, that self-same public was obtaining for itself some first-hand information on the question. First came the two electrocutions; one of a boy in a fish-shop, the other of a housewife using an electric suction cleaner. Next we hear of a narrow escape from a similar fate—again with a vacuum cleaner—by the wife of one of our readers (see our correspondence columns). Finally, to cap it all, comes the warning of the doctors at the B.M.A. Conference at Cardiff against the dangers inherent in ultra-violet and other medico-electrical apparatus, now being sold to the public, when it is not used under proper supervision. Considering, for the moment, the vacuum cleaner cases, we feel that, without any suggestion of scaremongering, the incidents are not the chances in tens of thousands that we would like to believe them to be. In the past, it is true, domestic fatalities from such causes have been remarkably few. On the other hand, with the ever-increasing availability of alternating current supplies at or near the standard voltage, the hazards to consumers with imperfect installations and apparatus are considerably larger. Until the compulsory earthing of all domestic apparatus is enforced—and we hope it will be soon—the question of removing, so far as possible, likely causes of shock, deserves the serious consideration of appliance manufacturers. We know that many of them have spared no trouble to ensure to users the maximum of safety, and on investigation we find this true of most vacuum cleaner manufacturers. Others, however, seem to think that insulating the handle of a cleaner provides all the protection that is needed. Actually, of course, it is quite possible, with an insulated handle, for the other metallic portions to become alive. Furthermore, it is probable that the risk of earths developing in the region of the motor is greater than in the handle. So far as the switch is concerned, consideration of the example illustrated on page 96 suggests that some makers employ switches in which there is no sort of insulation, and though faults in the motor or wiring may cause trouble, even with the best designed switch, the makers in question might pay more attention to this feature. A desirable improvement would be to fit switches of the "dead man's handle" type, which automatically switch off when the pressure of the hand is released. Apart from modifications in the design of some cleaners, the connection of these machines to lampholders is to be deprecated, and we suggest that if certain manufacturers would cease to supply with their cleaners lengths of flex fitted with lampholder plugs they would help to discourage this practice.

## Doctors and Electrical Treatment.

TURNING to the doctors' attitude regarding the indiscriminate use of ultra violet and other electrical treatments by unqualified persons, the layman might be pardoned for the momentary thought that the medical profession disliked the prospect of remedial treatment being provided from sources outside its membership. But if, as they claim, there is actual evidence that quiescent disease has been made active, that existing diseased conditions have been adversely affected, and that positive damage has been inflicted in certain cases where electrical treatment has been given by non-medical men, their warning and the resolution which they passed cannot lightly be passed over. The resolution proposes that those wishing to administer electrical treatment should undergo suitable courses of training, and on proving satisfactory, should have their names entered on a roll, on the understanding that they should abstain from the treatment of any patient except on the responsibility, and under the general supervision of a registered medical practitioner. As no reference was made to the small outfits designed for private use in the home, it may be assumed that there is no medical objection to the use of this type of apparatus.

## Telephone Development.

WE were glad to see, this week, the resumption of large-scale advertising of our national telephone system by the Telephone Development Association. In announcements bearing the slogan, "An £80 000 000 machine which yields a profit," the association proudly asserts that during the last five years the Telephone Department has paid all its own overhead charges, including interest on capital, and has handed over to the Treasury a net profit of some £4 000 000. Yet, as it points out, there are more telephones per thousand of population in Switzerland than in Great Britain. The reason for this has often been sought,

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and though in the past it may have been attributed to lack of propaganda, no such fault can be found to-day so far as newspaper advertising is concerned. But there must be a considerable amount of business lost through failure to follow up potential users in their homes. We have direct knowledge of a case which illustrates this weakness. A tenant, prior to taking possession of a flat noted with satisfaction that a telephone was already installed. On moving in, however, he found the instrument had been removed, as he discovered later, to the new home of the previous tenant of the flat. This, presumably, was done so that the original subscriber could use the telephone service in his new quarters with the minimum of delay. The new occupier naturally expected to receive a visit from some employee of the Telephone Department, who would come armed with a new instrument and plenty of persuasive talk in case his "prospect" should be unconverted and oblivious of the advantages which might be his if only he would allow his caller to connect up the instrument to the wires already existing in his dining room. Our informant refuses to believe that unless he makes formal application in writing for a telephone he may have to wait a very long time. There must be many people who are similarly placed—leaving out of consideration those people in unwired premises who would welcome the telephone if they were approached. Surely it would not be difficult to arrange for calls to be made at houses from which an instrument has been removed to another address. In most cases the incoming tenant would be a certain subscriber.

## Income Tax for Institutions.

As Mr. R. W. Dana has pointed out in a letter to "The Times," recent decisions in the High Courts on the subject of income tax payable by the Geologists' Association and the Midland Counties Institution of Engineers are likely to lead to a far-reaching change in the procedure as regards the income tax liabilities of scientific and other institutions. In the past, exemption has been allowed on funds of scientific institutions and societies under what may have been a wide interpretation of the word "charitable," but though many of these bodies are not literally philanthropic institutions it may be argued that their work is of great value to the nation and that their funds are not used for the financial benefit of their members. Regarding the decision in the appeal which the two above-mentioned organisations are making, there must be uncertainty as to the law in regard to the funds of the I.E.E. and other electrical societies. As, according to Mr. Dana, the Income Tax Commissioners have recently been refusing to admit claims for repayment of tax which for many years previously had been admitted, it would be well if organisations likely to be affected would give some collective attention to this question.

## Women in the Industry.

The electrical industry is fortunate in having attracted to its service many capable and enthusiastic women. It does not ask how they came by the knowledge which has stood them in such good stead in the successful prosecution of their work as demonstrators and saleswomen; it has just accepted them without question. As there has been no definite method of training women for work in the electrical industry those who are in it to-day are mostly self-trained, and many have gained their experience in face of considerable difficulties. With the continued expansion of the industry, however, the demand for properly trained women will naturally increase, and it is desirable that facilities should be afforded to girls wishing to qualify for the work of educating the public in the domestic uses of electricity. For this reason we welcome the scheme that has been put forward by the Electrical Association for Women, which, in collaboration with the Headmistresses' Association, has established Courses in "Electrical Housecraft" at various Polytechnics. The idea is that electrical manufacturing firms should be asked to try out one or more of the girls who have received this training, with a view to giving them showroom experience, and eventually, either retain them on their own staff, if openings exist, or send them to the various electricity supply undertakings who require skilled demonstrators. The school teaching will not only provide a nucleus of trained women for the industry, but it will also give to all the girls passing through the schools some knowledge of the labour-saving electrical methods of housekeeping. We heartily commend the scheme to our manufacturers and supply undertakings.

## Consumption of Electricity.

According to the Electricity Commissioners, the amount of electricity sold to consumers by authorised undertakers in Great Britain during 1927 showed a 9·5 per cent. increase over that for the last seven years, the actual figures being 6 850 million kWh for 1927 and 3 512 million for 1920/21. Taking into consideration the trade difficulties and fluctuating conditions which attended those years, the increase may be taken as being satisfactory. One hears so many remarks to the effect that electricity is too expensive, and that such and such a town has no domestic supply, that until figures such as those given above are made known, it would not be difficult for the man in the street to form the opinion that the electrical industry was still in its infancy. In comparison with its anticipated expansions it may still be a baby, but when during the most difficult of the post-war years it is able to double its consumption, it must at least be regarded as a lusty child. Another point revealed by these figures is that of appreciation of the service that electricity can give, for, if during years when trade in the country has found it hard to keep its workshops open, the domestic and industrial applications of electricity have increased, the only explanation which can meet the case is found in the words—value for money.

## The Cable-Wireless Position.

At the time of writing the long-delayed official pronouncement on the proposed cable-wireless merger has not matured, and, as the matter is still in the hands of the Government, no further information regarding the negotiations can as yet be disclosed beyond the fact—mentioned by Sir John Denison-Pender at the Eastern Telegraph Co.'s meeting on Tuesday—that the members of the Imperial Wireless and Cable Conference reached complete unanimity in putting forward their recommendations. Meanwhile the Eastern group's acquisition of the shares of the Direct West India Cable Co., a purchase carrying with it the control of the Halifax and Bermudas Cable Co., the Cuba Submarine Telegraph Co., and the West India and Panama Telegraph Co., adds interest to, though it will not materially affect, the coming fusion. If, as it is confidently believed, the linking-up will enable the British Empire to maintain the predominant position which she has hitherto occupied in the world's telegraphic communications, the labours and anxieties and concessions of the past few months will have been well worth while.

## Copper Losses in Transformers.

Although rather mathematical, the article which we publish on page 89 of this issue deals with a very important practical problem, viz., the increased copper losses in transformers due to eddy currents in the conductors. This question was considered in the B.E.A.M.A.'s journal some time ago by Prof. Bohle, of Cape Town, but Mr. Grant shows that Prof. Bohle's somewhat complicated result is due to an error in his method, and that the correct method leads to a much simpler result requiring no such list of coefficients as Prof. Bohle gives.

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# SUPPLEMENTARY EDDY CURRENT LOSSES IN TRANSFORMERS.

## Prof. Bohle's Calculations Examined—Corrected Formula Simplifies Final Result.

By R. M. V. GRANT

IN the February, 1926 issue of the B.E.A.M.A. Journal, Prof. Bohle contributed an article under the above title, discussing the eddy current losses in the copper coil of transformer windings. Formulæ were deduced, on various assumptions, whereby the ratio of eddy loss to normal load current loss could be evaluated.

When examining this article recently, the author came to the conclusion that, apart from any defect due to the various assumptions, Prof. Bohle had incorrectly evaluated the ratio referred to. As will be seen later, the error was due to a defect in Prof. Bohle's method of calculation. Bohle finds the value of the ratio for the layer of conductors next to the gap between the windings—this being called the $u^{th}$ layer—the ratio is found as a function of $u$, and Bohle assumes that the loss in any other layer, the $m^{th}$, say, is obtained by substituting $m$ for $u$ in the formula for the value of the ratio for the $u^{th}$ layer. (See the bottom of the first column on the fourth page of the article.)

It is shown below that the formulæ for the ratio for the $m^{th}$ layer is a function of *m and u* together; hence the error in Bohle's formulæ.

### Symbols Employed.

The symbols employed here are the same as in Bohle's article, with a slight difference in method. The writer here uses R.M.S. values for voltage, current, flux, and flux density. The symbols are

$b$ = axial dimension of conductor, cms.
$h$ = radial dimension of conductor, cms.
$H$ = total radial thickness of copper cms. $= uh$.
$u$ = number of layers.
$N$ = turns in the winding.
$I$ = R.M.S. amperes in winding.
$L$ = mean length of leakage line, cms.
$B$ = flux density (R.M.S.).
$\Phi$ = flux (R.M.S.).
$\omega = 2\pi \times$ frequency.
$\rho$ = specific resistance of conductor.

A suffix—1 or 2—denotes a particular winding, i.e., primary or secondary.

Referring to Fig. 1, the maximum flux density occurs in the gap between the windings, and is

$$B_M = \frac{4\pi}{10} \cdot \frac{NI}{L} \text{ c.g.s.},$$

and at a distance $x$, from the outer perimeter of the outer coil or the inner perimeter of the inner coil,

$$B_x = B_M \cdot \frac{x}{H}$$

Following Bohle's method, the flux inducing an e.m.f. in the conducting plane at distance $x$, i.e., the flux shown shaded in the diagram, is

$$\Phi_x = \tfrac{1}{2}B_M H - \tfrac{1}{2}B_x x$$

and the e.m.f. induced is $\omega \times 10^{-8}\Phi_x$ R.M.S. volts. The $m^{th}$ layer extends from $x = (m-1)\,h$ to $x = m\,h$, so that the mean e.m.f. induced due to the leakage flux is

$$E_m = \frac{\omega \times 10^{-8}}{h} \int_{(m-1)\,h}^{m\,h} \Phi_x \, dx$$

$$= \frac{\omega \times 10^{-8}}{h} \cdot \tfrac{1}{2}B_M \int_{(m-1)\,h}^{mh} \left( H - \frac{x^2}{H} \right) dx$$

$$= \omega \times 10^{-8} \cdot \tfrac{1}{2}B_M H \left\{ 1 - \frac{m^3 - (m-1)^3}{3u^2} \right\}$$

The difference in the e.m.f. induced in a strip of conductor at distance $x$ and the mean value is

$$E_x - \bar{E}_m = \omega \times 10^{-8} \cdot \tfrac{1}{2}B_m H \left\{ \frac{m^3 - (m-1)^3}{3u^2} - \frac{x^2}{H^2} \right\}.$$

The eddy currents (Fig. 2) flow along the conductor parallel to its axis on one side, and return down the other; the reactance of this path is neglected and the resistance per cm. is $\frac{\rho \cdot 1}{b\,dx}$, so that the loss in the element at distance $x$ is $\frac{(E_x - \bar{E}_m)^2}{\rho b\,dx}$. The normal loss in the strip is $\frac{\rho}{b\,dx}\left(\frac{I}{b.h.} \times b\,dx\right)^2 = \frac{\rho \cdot dx}{bh^2} I^2$, so that the ratio

$$\frac{\text{Eddy loss}}{\text{Normal loss}} = \frac{h^2 b^2}{\rho^2 I^2} (E_x - E_m)^2$$

$$= \left\{ \omega \times 10^{-8} \times \tfrac{1}{2} \frac{B_M}{I} H \frac{hb}{\rho} \right\}^2 \left\{ \frac{m^3 - (m-1)^3}{3u^2} - \frac{x^2}{H^2} \right\}^2$$

at distance $x$. The mean value of the ratio for the $m^{th}$ strip i.e., from $x = (m-1)\,h$ to $x = m\,h$ is found by taking the mean value of the second double bracketed term.

Put $a = \frac{m^3 - (m-1)^3}{3u^2}$,

$$\frac{1}{h} \int_{(m-1)h}^{m\,h} \left( a^2 - \frac{2a}{H^2} x^2 + \frac{x^4}{H^4} \right) dx$$

$$= \frac{1}{h} \left[ a^2 x - \frac{2}{3} \frac{a}{H^2} x^3 + \frac{1}{5} \cdot \frac{x^5}{H^4} \right]_{(m-1)h}^{m\,h}$$

$$= a^2 - \frac{2}{3} \frac{a\{m^3 - (m-1)^3\}}{u^2} + \frac{1}{5} \frac{m^5 - (m-1)^5}{u^4}$$

$$= a^2 - 2a^2 + \frac{1}{5} \frac{m^5 - (m-1)^5}{u^4}$$

$$= \frac{m^2 - m + \frac{1}{15}}{3u^4}$$

$$\therefore \text{Ratio} = \left( \omega \times 10^{-8} \cdot \tfrac{1}{2} \frac{4\pi}{10} \cdot \frac{N}{L} H \cdot \frac{hb}{\rho} \right)^2 \cdot \left( \frac{m^2 - m + \frac{1}{15}}{3u^4} \right)$$

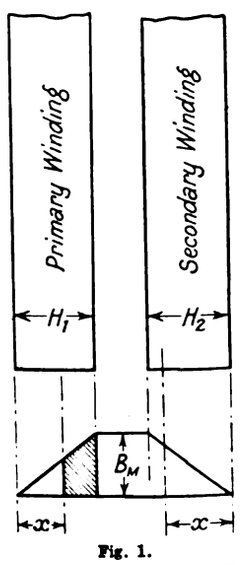

Fig. 1.

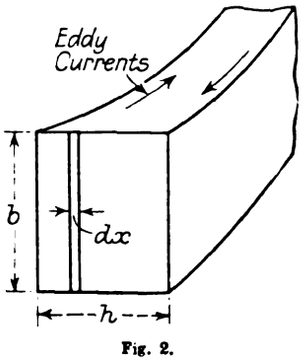

Fig. 2.

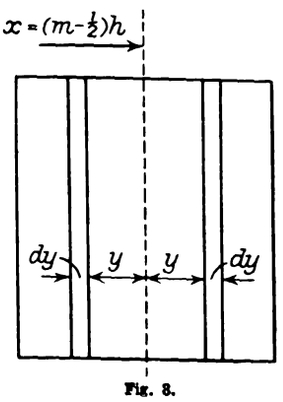

Fig. 3.

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$$= \left(\frac{0{\cdot}4\,\pi^2}{\rho \times 10^8}\right)^2 \frac{f^2 N^2 b^2}{L^2} h^4 \left(\frac{m^2-m+\frac{4}{15}}{3u^2}\right).$$

On comparing this expression with Bohle's equation (7) it is found that they differ only in the right-hand bracketed term, and if $u$ is substituted for $m$, giving the value for the $u^{th}$ layer, Bohle's expression is obtained. It is also seen that putting $m$ in place of $u$ in Bohle's formula does not give the correct expression for the ratio for the $m^{th}$ layer.

## Obtaining the Average Value.

To obtain the average value of the loss ratio for the whole coil we must find the average value of $(m^2-m)$, which is the only variable in the above expression, from $m=1$ to $m=u$.

We have

$$u^3-(u-1)^3 = 3u^2-3u+1$$
$$(u-1)^3-(u-2)^3 = 3(u-1)^2-3(u-1)+1$$
$$2^3-1^3 = 3\cdot 2^2-3\cdot 2+1$$
$$1^3-0^3 = 3\cdot 1^2-3\cdot 1+1.$$

Adding up both sides, we get

$$u^3 = 3\sum_{m=1}^{u} m^2 - 3\sum_{m=1}^{u} u + u,$$

or the average value of $m^2-m$ is

$$\frac{u^3-u}{3u}$$

and the average of $\frac{m^2-m+\frac{4}{15}}{3u^2}$ is

$$\frac{u^3-u}{3u} + \frac{\frac{4}{15}}{3u^2} = \frac{1}{9}\left(1-\frac{1}{5u^2}\right).$$

The average value of the ratio is

$$\left(\frac{0{\cdot}4\pi^2}{\rho \times 10^8}\right)^2 \left(\frac{fNb}{L}\right)^2 h^4 \cdot \frac{1}{9}\left(1-\frac{1}{5u^2}\right).$$

It will be noticed that the correct formula leads to a much simpler final result than does Bohle's incorrect procedure, for it is quite easy to find the average for the $u$ layers, as shown above, and no table of coefficients is necessary.

In the section dealing with circular wires the same mistake is made, and it will be found that the correct value of the loss ratio should be

$$\left(\frac{\pi^3}{30 \times \rho \times 10^8}\right)^2 \left(\frac{fN}{L}\right)^2 d^6 \left(1-\frac{1}{5u^2}\right)$$

where $d$ = diameter of conductor in cms.

In considering Prof. Bohle's method it is seen that the eddy currents are assumed to circulate about the plane of mean e.m.f.; a simpler method, although giving a slightly different result, is more familiar, and consists in taking the eddies as circulating about the plane of mean flux density, i.e., the centre of the conductor, since $B$ varies linearly.

At the centre of the $m^{th}$ strip (Fig. 3) the flux density is

$$B_m = B_M \frac{x}{H} = B\,n\,\frac{(m-\frac{1}{2})\,h}{H} = B_M \frac{m-\frac{1}{2}}{u}$$

and the flux linkage per cm. through the rectangle of width $2y$ cms. is

$$= B_M \frac{m-\frac{1}{2}}{u} \times 2y \times 1,$$

This induces an e.m.f. $= \omega \times 10^{-8} B_M \frac{m-\frac{1}{2}}{u} \cdot 2y$

and causes a loss per cm. of conductor

$$= \left\{\omega \times 10^{-8} B_M \frac{m-\frac{1}{2}}{u} 2y\right\}^2 \div \frac{\rho \times 2}{b.dx} = \left(\omega \times 10^{-8} B_M \frac{m-\frac{1}{2}}{u}\right)^2 \frac{2b}{\rho} \cdot y^2 dy.$$

The total loss in the conductor is

$$= \int_0^{h/2} \left(\omega \times 10^{-8} B_M \frac{m-\frac{1}{2}}{u}\right)^2 \frac{2b}{\rho} y^2 . dy$$

$$= \left(\omega \times 10^{-8} B_M \frac{n-\frac{1}{2}}{u}\right)^2 \frac{2b}{\rho} \cdot \frac{h^3}{3.8}.$$

The ratio of eddy loss to normal loss is therefore

$$= \left(\frac{0{\cdot}4\pi^2}{\rho \times 10^8}\right)^2 \frac{f^2 N^2 b^2}{L^2} h^4 \frac{m^2-m+\frac{1}{2}}{3u^2}$$

The difference between this expression and that obtained by Bohle's method—correctly applied—is simply that $\frac{1}{2}$ replaces $\frac{4}{15}$; the average value for the $u$ layers is also different, and is

$$= \left(\frac{0{\cdot}4\pi^2}{\rho \times 10^8}\right)^2 \left(\frac{fNb}{L}\right)^2 h^4 \cdot \frac{1}{9}\left(1-\frac{1}{4u^2}\right).$$

The difference in the results of the two methods is 7 per cent. when $u=1$, and zero when $u=\infty$.

# TRANSPORTING HEAVY PLANT.

## How Exceptional Loads are Handled by Rail, Road and Sea—Co-operation between Design and Transport Departments—Organising Transit to Remote Destinations.

IN our issue of February 24th last, we published a series of photographs and a number of interesting details in regard to the transportation and exportation of large electrical plant in sections on completion of manufacture in this country. On the opposite page we now present a series of photographs of exceptional loads forwarded from the Newcastle works of C. A. Parsons and Co., Ltd., which further illustrate how transportation problems are solved.

The difficulties met with in transporting and delivering heavy packages are probably only realised by the manufacturers and the shippers. Methods of packing have to be adapted to the method of loading. Problems arise in connection with the equalisation of loads on railway wagons, centre of gravity when loaded, axle loads and concentration, and balance, which are not necessarily parallel to difficulties encountered when the packages have to be conveyed from the port of discharge to the site.

### The Cantilever System.

Heavy and other exceptional out-of-gauge loads always tax the ingenuity of those concerned. In their transportation the British railway companies, handicapped as they are with a century-old gauge, have shown considerable skill in devising means of conveyance. One such is known as the cantilever system. The Americans have carried loads suspended on steel beams hung between wagons, and this method has also been adopted in this country when the load was capable of being so conveyed.

To ensure that there shall be no unsurmountable difficulty in the delivery of heavy and bulky pieces of large machines, it is necessary that there should be close co-operation between the Designing Department and the Traffic Manager. The latter has to take into account lifting facilities at ports and other points *en route*, the loading gauges of the various railways over which the traffic must pass, the carrying capacity of vehicles, etc.

These, however, are not the only limiting factors. In many power stations the lifting arrangements are obsolete and inadequate, the approach to the power station may be difficult, and the unloading space too small.

Fig. 2 (opposite) illustrates a stator for a 15 000 kW 6 600 V, 3 000 r.p.m. alternating current generator being hauled on a specially constructed wagon by a team of horses from a wharf at Melbourne to the rail-head, at which point the body of the vehicle was jacked up, the road wheels removed, and the body placed on railway bogies ready for conveyance to its final destination by rail (Fig. 5). The weight of this stator was 48 tons.

It is of interest to review the difficulties which arose in this case. In this country the railway company had various problems to overcome before they could convey the load, and the cartage contractor was faced with difficulties owing to heavy axle loads passing over bridges, water mains, etc. The shipping companies stated that the depth of water alongside the 70-ton crane at Melbourne was insufficient for ocean liners to berth there, and it was doubtful if the crane jib would reach the load. Finally, the method of delivery from Melbourne wharf to destination had to be solved.

Figs. 1 and 3 illustrate parts of a 50 000 kW, 13 200 V, 1 800 r.p.m. turbo-alternator for the Commonwealth Edison

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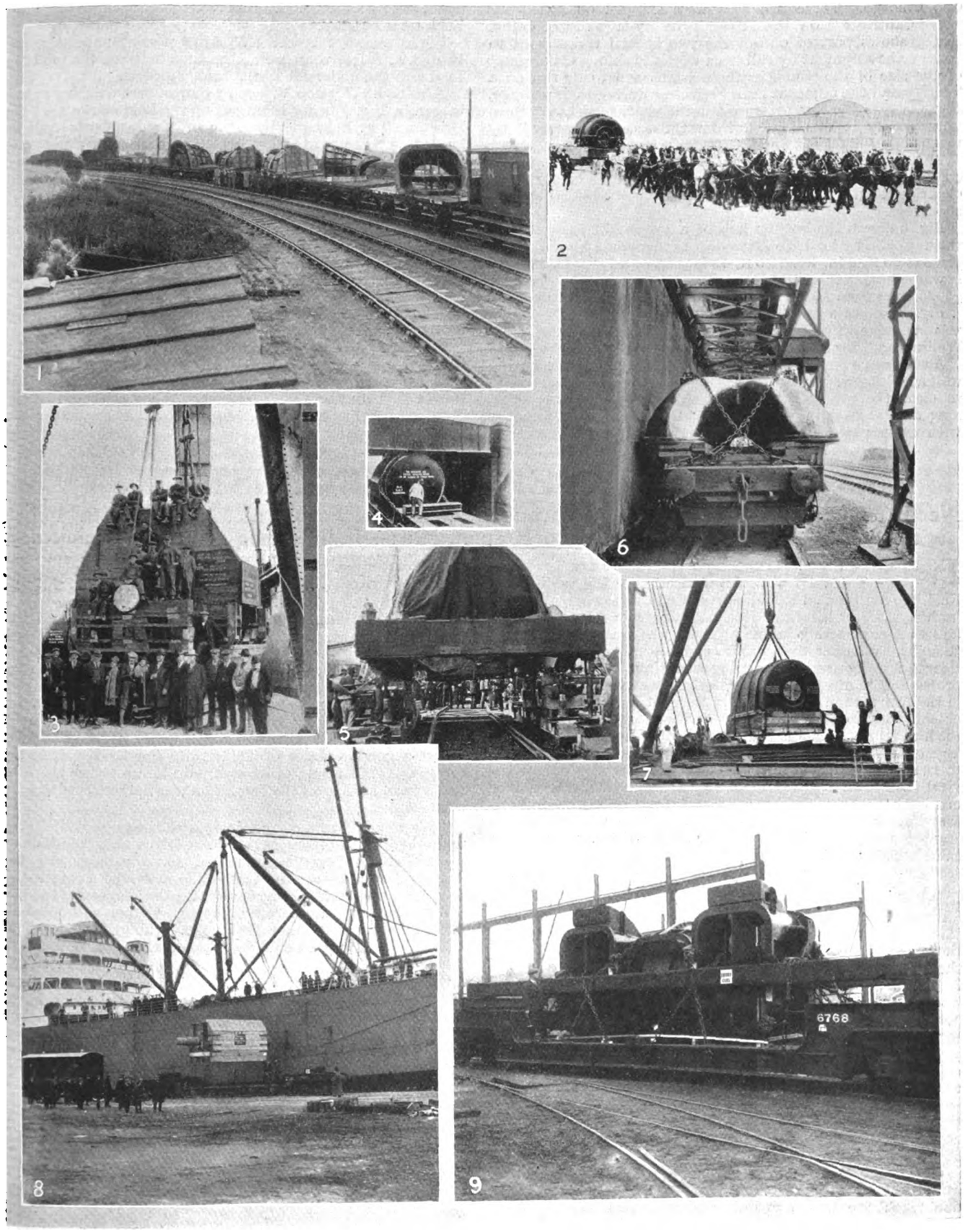


## TRANSPORTING HEAVY ELECTRICAL PLANT.

SOME of the problems which have to be tackled by British electrical manufacturers in the delivery of their products are described in the article on the opposite page, and illustrated in the accompanying pictures. These show :—(1) a heavy train load for Chicago ; (2) Actual and potential horse power at Melbourne ; (3) A 67-ton turbine shaft landed in Canada ; (4) A 20 000 kW stator just clears a bridge ; (5) The stator seen in Fig. 2 jacked up ready to complete its journey by rail ; (6) A turbine cover which had to be jacked over to clear a wall ; (7) Unloading a 49-ton stator at Brisbane ; (8) A turbine shaft being lifted on board for shipment to Sydney ; and (9) Part of a 40 000 kW low pressure turbine cylinder loaded on its side to permit conveyance by ordinary goods train.

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Co., Chicago. These packages were shipped on board the s.s. "Cairntorr" on the River Tyne by a 150-ton crane. Fig. 1 shows part of one of the two special trains used to convey the shipment by rail from works to ship. On account of the size of the packages these trains had to be run on a Sunday and the adjacent lines kept clear during their passage. Fig. 3 shows the low pressure turbine shaft (weight 67 tons) immediately it was landed from the s.s. "Cairntorr" by means of sheer legs at Sorel, Canada.

This shipment was transferred to a lake steamer at Sorel and conveyed by this means to Chicago, where the lake steamer's electrical load was discharged by specially erected temporary sheer legs.

Fig. 9 shows the bottom half of a 40 000 kW low pressure turbine cylinder loaded on its side for conveyance by rail. This piece is 20 ft. 4 in. long, 10 ft. 10 in. high, and weighs 26 tons. It was loaded in this way to enable it to be conveyed by ordinary goods train from Heaton works to Barking power station.

Fig. 8 shows a case containing a turbine shaft weighing 36 tons being lifted by ship's derrick on board the s.s. "Port Wellington" for shipment to Sydney.

A turbine cover is seen in Fig. 6 alongside the power station wall at Glasgow, just prior to being jacked over on the wagon to clear the wall. This cover weighed 27½ tons, was 25 ft. long and 12 ft. 5 in. wide and 6 ft. 2 in. high, and together with other parts, including a stator weighing 68 tons, was conveyed by special train from Newcastle-on-Tyne to Dalmarnock on a Sunday.

Fig. 4 shows a 20 000 kW stator passing under a railway bridge with less than 1 in. clearance between the top of the load and the underside of the bridge girders.

A 12 000 kW 5 200 V, 3 000 r.p.m. stator, weighing 49 tons, is seen in Fig. 7 being lifted out of the hold of the s.s. "Port Brisbane," at Brisbane, by means of a ship's derrick. It was landed on to a private wharf which was specially strengthened for this concentrated load, and conveyed on a bogie a distance of approximately half a mile on a temporary railway to the power station.

Messrs. Parsons have recently forwarded two 25 000 kW 11 000 V, 3 000 r.p.m. stators, each weighing 67½ tons, to the North Metropolitan Electric Supply Co., Ltd., at Brimsdown, and have arrangements in hand to convey a stator weighing approximately 75 tons to the same destination. This stator will generate 25 000 kW at 33 000 V, which is understood to be the highest voltage ever produced direct by any single electric generator in this country.

They are also arranging to forward a stator estimated to weigh 100 tons, for a 25 000 kW 11 000V, 1 500 r.p.m. machine, which they are manufacturing for the South Wales Electrical Power Distribution Co., Treforest. When conveyed this will in all probability be the heaviest stator that has, so far, been sent by rail in this country.

# THE ENGINEER IN INDUSTRY.

## Need for Improving the Social and Economic Status of Technical Men—How to Initiate the Change—Fitness for Executive Responsibility—Indifference to Public Opinion.

IN a paper entitled "The Engineer in Industry," read by Mr. A. J. T. Taylor at a recent meeting of the Institute of Fuel, the author said it had been stated that the engineer was nothing more or less than a scientifically trained business man, and that engineering in the abstract was really a method of thought. Whether that was accepted or not, it was certainly clear that if engineering was going to continue to be an attractive profession, it must be more closely associated with business in the future than it had been in the past. It was one of their objects to help raise the status of the industrial engineer, to set him up in the councils of management, and to bring about a general appreciation of the fact that engineering is entitled to rank with the liberal professions. It was also one of the vital factors in engineering progress to-day that the skilled members of the profession are entitled not only to remuneration that is paid for equal skill in other professions, but that engineers can and should be regarded as deserving of the same social rank as men of worth in other walks of life.

### Limiting the Supply.

British industrial engineers, as a class, were definitely in a lower social rank to-day than lawyers, financiers or doctors. They could all think of glorious exceptions to this rule, but the general rule held good, and had this important significance, that it was limiting the supply of young engineers from the best stock of the country. Parents were commencing to wonder whether it was worth while giving an expensive engineering education to their sons. In increasing numbers they were thinking about the other professions, and engineering, as a vocation, was regarded as having definite limitations.

Engineering in itself was attractive, but not from the social or financial point of view. This was a serious condition, and while it would be idle to attempt to allocate the blame for a state of affairs arising out of a number of causes, they had, nevertheless, rather drifted into the position, and it was clearly their duty to attempt to correct it.

How to initiate the change was a difficult matter, but that it would involve a re-education of public opinion was without doubt. There was a mistaken idea abroad that an engineering training unfits one for executive responsibility. He did not think that this view was held by engineers, but it was definitely in the minds of a considerable section of the public, and dated from the time when the term "engineer" was associated with "someone in overalls."

"Engineers have neglected to inform the public how important they are to members of the community, and what radical changes have taken place during the past fifty years," said Mr. Taylor. "It is, perhaps, not too much to say that engineers have been indifferent to what the public may have been thinking about them; they have certainly neglected the ordinary and legitimate channels of publicity. As a class we are notoriously poor public speakers, and I think I may say, poor writers as well.

"If you ask engineers why they do not write or talk, they will tell you without much diffidence that those of their profession who engage in these two things are, for the most part, indifferent engineers. I admit there is an element of truth in this statement, though I do a good deal of writing and public speaking myself, but is it not absurd that a great profession like ours should leave important matters like writing and speaking to indifferent minds? What would happen in the medical profession if every doctor who failed to get a good practice decided to do free-lance writing and speaking? He would most assuredly be up before the Association and struck off the lists, if he was not extremely careful what he did.

"We should guard our contacts with the public as jealously as do doctors and lawyers. At least let us not reply that our reputations are less vulnerable, or that the public does not matter. Never before has the public mattered as much as it does now, and that is why I reiterate that engineers must, as professional men, do more and better writing and speaking. The public wants to know about us and about our work, but it is far too busy to find out unless the task is made an easy one.

"An engineering training forms an admirable groundwork for the responsibilities of a business executive, but you cannot turn an engineer into a member of the executive unless you provide him with an incentive to cultivate his abilities both as an engineer and as an administrator. Responsibility begets the power to assume increased responsibility. You only get independent, courageous thinking from a man who is given responsibility and the means of finding his own level as an independent thinker."

Continuing, Mr. Taylor said if they looked at the directorate of almost any German industrial company, great or small, engineers would invariably be found on the board of management. An engineering conference on the Continent was as dignified as a conference of lawyers or bankers.

It should be said, in fairness to the public, that they were ever ready to appraise the value of any section of the community, provided that they were given an opportunity of realising what its usefulness really was. To-day, if one were to ask who are the great men of this country, the pillars of society, the invariable answer would include, probably, financiers, at the head, lawyers, scientists, and so on, with the engineer occupying a humble position well down in the list. This was all wrong, and they must apply themselves individually and collectively to raising the status of the engineer, both as a professional worker and as a member of society.

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# LAW OF ELECTRICITY SUPPLY.

## The Position of Unauthorised Suppliers—Definition of a "Supply"—Generation as a Subsidiary Business—An Interesting Possibility.

By W. ERIC JACKSON, LL.B., Barrister-at-Law.

THE recent decision of Mr. Justice Russell in the Chancery Division, in the case of Caerphilly U.D.C. *v.* Griffin (26 L.G.R. 38) came as somewhat of a surprise to those engaged in the supply of electricity for light and power. The decision at first sight seems to run counter to the spirit of the Electric Lighting Act, 1909. This Act virtually conferred upon statutory authorities a complete monopoly of supplying electricity within the area over which their authority extended.

But Mr. Justice Russell has decided (and his decision will most probably be upheld) that *any* person may supply electricity so long as the supply of electricity is not his primary business. On this principle a doctor who runs a dynamo for lighting his surgery may enter into a contract with his next door neighbour to light the neighbour's house. And similarly, an electrical trader whose business primarily is the sale of fittings, and not the sale of electricity, may, so long as he does not let it become his main business, supply light and power to himself and adjoining premises.

The facts of the Caerphilly case are quite simple and interesting. The Urban District Council were authorised by a Special Order under the Act of 1909 to supply electrical energy within their area for all purposes. A certain local draper named Griffin was owner of a business which was carried on in a retail shop adjoining a piece of vacant land. He purchased the vacant land and proceeded to erect there a number of houses and a market with stalls. One of the shops was occupied by Messrs. Woolworth, and Mr. Griffin agreed to supply them with electric light. He had an electric generating plant, and used this to supply his own shop and residence, and this plant he intended to use in supplying Messrs. Woolworth.

The result, of course, was that Woolworths refused to take the Council's electricity, and the Council accordingly brought an action for an injunction to prevent Mr. Griffin from supplying electricity.

Now the point in issue, although it had never previously been decided, had been indirectly dealt with in several previous important cases, and it is useful to refer to these so that we may see exactly what the present position is between traders and others and electricity authorities.

Prior to the passing of the Electric Lighting Act, 1909, there was apparently nothing to prevent any private individuals or company from making and supplying electricity wherever they wished without any need for statutory authority.

The authorised electricity undertakers were, therefore, continually subject to the private competition of such persons; but, of course, the private persons had no statutory powers such as authority to break open streets and purchase land compulsorily, as had the statutory undertakers.

Section 23 of the Act of 1909, however, created a practical monopoly of supply in favour of local authorities who obtained powers to supply electricity within their areas. This section states that where any local authority, person, or company is authorised under Act of Parliament to supply electricity, it shall be unlawful for any other persons to supply electricity within the same area unless those other persons are duly licensed or authorised.

### An Important Proviso.

But the section has the following proviso: "This section shall not prevent any company or person from affording a supply of electrical energy to any other company or person where the business of the company or person affording the supply is not primarily that of the supply of electrical energy to consumers." There is a further proviso permitting private companies to supply electricity to railway companies for incidental purposes.

What it comes down to is this. A person may generate electricity and compete with the authorised supplier so long as the private supplier does not make it the primary feature of his business.

In the Southport Corporation *v.* Attorney-General (1924, A.C. 909) the question as to what was a "supply" of electricity was raised. And it was held that a supply did not only mean the providing of electricity by one person to another—it meant also the provision of electricity by a person for his own consumption. It was held in the case above mentioned that a borough corporation which acquired a generating station for the purpose of supplying electricity to their own tramways had committed a breach of Section 23 of the Act of 1909.

The Court, however, did not specifically deal with the effect of the proviso to the section because it was assumed that the corporation's generating plant ought to be considered a business in itself, and not merely an incidental feature of a larger business.

Hence it follows that a company which owns a factory cannot float a separate company or concern for the purpose of making electricity for the use of the parent company—for the subsidiary company's whole business will be that of supplying electricity, and that will constitute a breach of the Section 23, and the proviso will not apply.

But there seems nothing to prevent a company whose memorandum so permits or a private trader from generating all the electricity he wants for his own use and for the use of others. In the Caerphilly case Mr. Griffin's main business was that of a draper. He extended that business by taking on land development and property owning. The supply of electricity was only a subsidiary feature in his business activities.

Whether it might subsequently happen that his drapery business falling upon hard times, and the land development scheme involving him in heavy liabilities, his chief source of profit might be the supply of electricity, is a point which electrical engineers are best able to imagine.

It would not be lawful for a person, under cover of selling a few fittings, to carry on as a substantial and primary part of his business the supply of electricity. The decision in the Caerphilly case gives to private firms and persons a very useful right, but such a right must not be abused. No doubt the local electricity authorities will see to this and will carefully watch the activities of private suppliers.

## BOOK REVIEW.

**Alternating Current Machinery.** By R. E. BROWN. (London: Chapman and Hall.) Pp. xi+274. 15s. net.

Although this book must be classified as an elementary treatise, it has several features which distinguish it from the rather dead level mediocrity of a large number of elementary books on this subject which have appeared in recent years.

The practical aspect of the subject is much more in evidence than is usual in this type of book, and the author evidently writes with first-hand knowledge.

A large number of carefully selected problems is appended to most of the chapters. The actual performance data of typical machines provide an interesting feature, and well-chosen examples are given of the constructional details of transformers and alternating current machinery. Of special interest in a book of this kind is a good chapter on the parallel running and hunting of alternators in which the expression is deduced for the period of free swing of an alternator.

There are twenty chapters and 270 pages, including one chapter on elementary principles and definitions, three chapters on transformers, three chapters on alternators, and five chapters on induction motors. Further chapters deal with rotary converters, rectifiers, phase balancers and measuring instruments.

The book is well printed on good paper, and is of a refreshing character. It can be recommended to students and others who desire a sound knowledge of the principles of alternating current electrical engineering.

T. F. WALL.

### BOOKS RECEIVED.

"Astronomy and Cosmogony." By J. H. Jeans. (Cambridge University Press.) Pp. x+420. 31s. 6d. net.

"Induction Motor Practice." By A. M. Dudley. (London: McGraw-Hill Publishing Co.) Pp. xi+236. 12s. 6d. net.

"Transmission Line Engineering." By W. W. Lewis. (London: McGraw-Hill Publishing Co.) Pp. vii+361. 20s. net.

"Drafting for Engineers: A Textbook of Engineering Drawing for Colleges and Technical Schools." By Carl Lars Svensen. (London: Blackie and Son.) Pp. xviii+363. 12s. net.

"Alfred Yarrow, His Life and Work." Compiled by Lady Yarrow. (London: Edward Arnold and Co.) Pp. xii+276. 5s. net.

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# DIRECT DRIVE FOR CUTTING TOOLS.

## Standardised Built-in Motors for High Speed Machines for Wood and Metal Working—Special Design of Stator and Rotor Units—Co-operation with Machine Tool Makers—Motor Control Equipments.

OF the many developments which have been effected during recent years in connection with the design of machine tools, one of the most important is that involving direct drive of the cutting tools by electric motors built into the machines. The elements comprising these electric motors have been standardised by the British Thomson-Houston Co., Ltd., in conjunction with leading manufacturers of machine tools, and comprise stator and rotor units of special design, the stators being built into the machine tools and the rotors mounted on the shafts by the machine tool makers, who also provide the bearings, etc., as integral parts of the tools.

### Wide Speed Range.

These units can be supplied for speeds of 750, 1 000, 1 500 and 3 000 revs. per min. synchronous, on a 50-cycle circuit up to 550 V, while any higher speed can be obtained by supplying the motors with current at a suitable frequency.

Besides giving higher cutting speeds machines with built-in motors are entirely self-contained, neater in appearance and occupy less floor space than those using other systems, while, as the drive is direct, the highest possible overall efficiency is obtained.

Examples of machine tools with built-in B.T.-H. electric motors are given in the accompanying illustrations.

Fig. 2 shows a 30-in. Wadkin band saw, with a 3 H.P. motor, running at 750 revs., and mounted in the machine base.

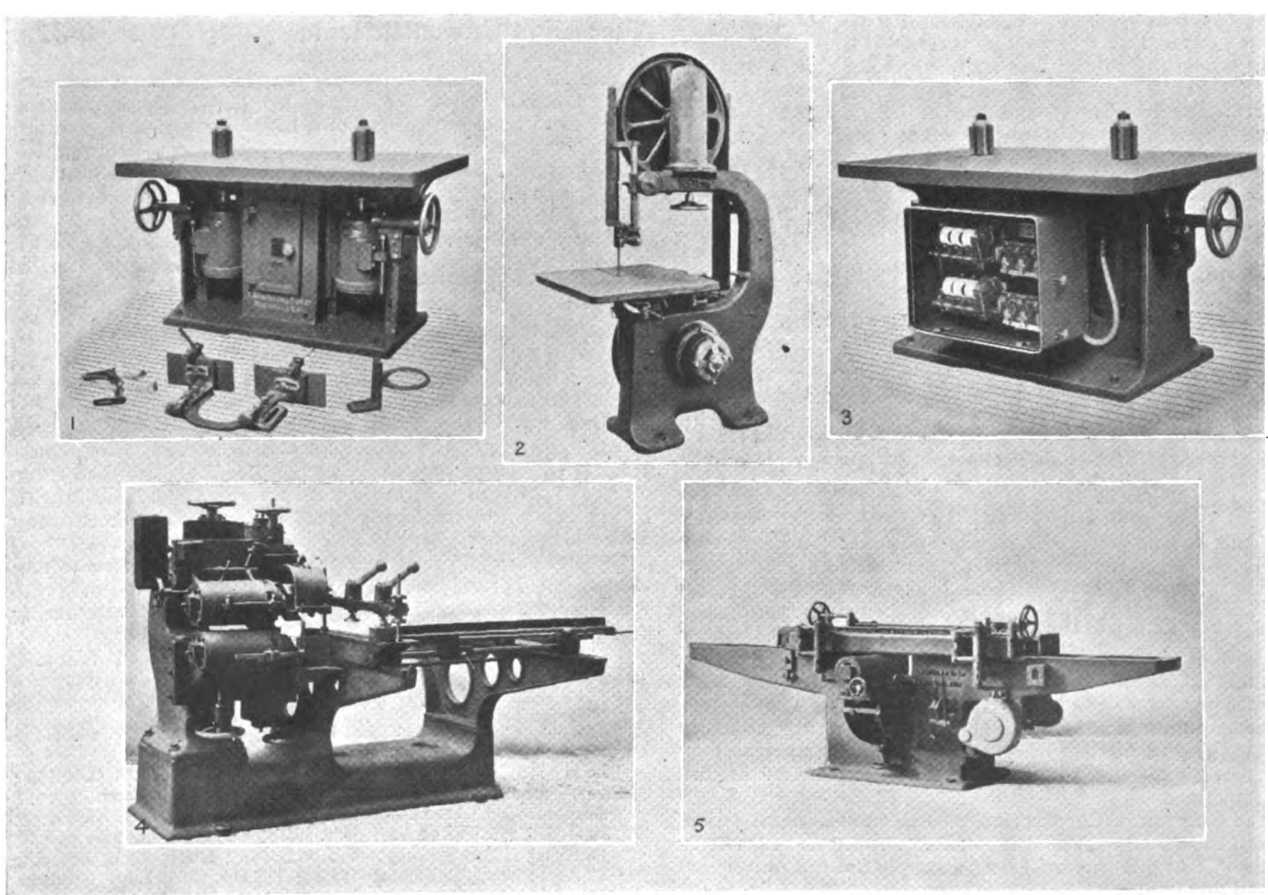
In Fig. 4 is a tenoning machine by J. Sagar and Co., Ltd., in which there are four built-in motors, two for the horizontal tenoning spindles and two for the vertical scribing spindles. The continuous feed automatic jointing machine, illustrated in Fig. 5, is fitted with two similar 3 H.P. built-in motors, one on each side, driving the cutter heads, and a small standard motor of 3 H.P. for driving the feeding arrangement. This machine also is manufactured by J. Sagar and Co., and, like the preceding, is equipped with full push-button control.

An interesting machine, made by T. Robinson and Son, Ltd., is the double vertical spindle moulder with built-in motors, illustrated in Figs. 1 and 3. This machine is of a new design for working curved, irregular and straight mouldings, and is made in different sizes with motors of 3 to 5 H.P., running at 7 000 revs. per min., on a 120 cycle circuit. The control equipment is seen in Fig. 3, the cover of the case being removed. Following standard practice for machines with motors of this size and type, starting is achieved by connecting the motors direct on the line. This is effected through the medium of the triple pole contactors seen on the left, thermal overload protection being given by the thermal relays seen on the right. One of the push button stations for starting and stopping is shown by the control wheel for the right-hand cutter spindle slide in Fig. 3.

### Overload Protection.

The standardised motor control equipments are robust, simple and reliable. A standard ironclad switch-fuse, acting as an isolator, is provided, and ordinarily, for motors up to about 5 H.P., contactors as seen in Fig. 3 are provided for starting and stopping, thermal overload protection being provided for by means of a B.T.-H. thermal overload circuit breaker, unless frequent starting is required, when thermal overload relays are fitted, as in Fig. 3. If occasional reversing is necessary, a lever handle reversing switch mounted underneath the machine table is provided.

For such machines as saw benches and panel planers with larger motors started light, star-delta contactor starters




**Examples of machine tools incorporating built-in electric motors described above, include: (1) A "Robinson" double vertical spindle moulder. (2) A "Wadkin" band saw. (3) The B.T.-H. contactor control equipment on a vertical spindle moulder. (4) A tenoning machine by Sagar. (5) A "Sagar" continuous feed automatic jointing machine, incorporating two built-in motors and one standard motor.**

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with time interlock are usual, thermal protection being given by equipment similar to that already described.

Vertical spindle moulders with a single motor of 3 to 5 H.P., and requiring to be frequently reversed, are provided with a controller having a lever for hand operation, and giving one speed forward and one reverse by connecting the motor direct on the line. If two speeds in either direction are required the motors are of the change-pole type, a change pole switch being incorporated in the equipment.

Planers and moulders with several motors do not need to be reversed, but are usually designed for reverse current braking on the majority of the motors, so as to provide for quick stopping. The control equipment for these is housed in a control pillar for floor mounting, the necessary contactors and relays, including those for overload protection, being mounted on panels in the pillar. As with saw bench motors, pressing the starting button causes a motor to be connected in star to the line, and at the same time starts the time mechanism of the time relay. After a suitable interval the button is released, and, the connections being changed to delta, the motor accelerates to full speed; but should the button be released too quickly the time relay prevents the delta connection being made, and the motor is disconnected from the line. The braking effort to bring a motor quickly to rest is obtained by depressing the motor "stop" push button, the motor connections thereby being changed to star and the connections to the line reversed.

Although all the machines illustrated in this article are for woodworking, the applications of built-in motors are now very numerous, and are made in connection with metal working tools, grinding machines, boot and shoe-making machinery, etc. Moreover, it is anticipated that in the near future the demand for these built-in motors will be still further increased.

# AMERICAN LETTER.

## The N.E.L.A. and Public Relations.

By FRANK C. WELLS, News Editor "The Electrical World."

NEW YORK, July 12th, 1928.

ALTHOUGH attendance at the fifty-first annual convention of the National Electric Light Association fell somewhat short of the hoped-for record-breaking ten thousand, Atlantic City none the less became, in the first week in June, the Mecca of so great a host of light and power men, their wives and friends, that the unconnected visitor to that swarming summer resort was forced to recognise that something greater than the usual daily gatherings was going on. The four and a half days of committee reports, addresses and recreation were, as usual, crammed with profitable exercises, and drew forth the usual expressions of satisfaction from attendants.

### Some Criticisms.

Criticisms, of course, there were. Perhaps the best taken was to the effect that there was an undue number of speeches from men outside the industry, who, however gratifying their praise, could naturally not tell their audiences anything about electricity and its special servants that their audiences did not already know. It is possible that many of the rank and file would rather have heard from their own leaders more about just how the industry is being run, and just what it accomplished in the last and expects to accomplish in the next year or two towards increasing its usefulness and its prestige. Even a "close-up" of the façade of the power house is unsatisfying to men who want to see the rotors revolve and the switches under manipulation, or, in other words, to read the minds of their executives and listen-in at the sessions of their directors' boards.

One thing was very evident. The Association is determined to reply to its newspaper and political critics and not to be deterred by factitious clamour from pursuing any policies that it has, after due consideration and trial, found salutary and wise. Retiring President Sands and President-Elect Arkwright both made this clear, and the Convention itself endorsed an official statement in answer to the charges hurled against the Association, paying especial attention to the accusations of unrighteous propaganda through Press and schools. This statement said, in part:

"The National Electric Light Association has long believed that the success of the electrical industry in the performance of its public functions has been and must be based upon public confidence in its integrity, in its motives, and in the character of its achievements. . . . Recognising that lack of knowledge is as unfair to the public as it is harmful to the industry, the electric utilities consider it their responsibility to place all the facts before the public. . . . In this effort the Association has encouraged the use of all proper channels for the diffusion of information concerning the industry, and has made the facts available to newspapers, magazines, educational institutions and to teachers in public schools. . . .

"The National Electric Light Association, in the interest of the public and its own, will continue to make available to the public the facts on the progress and development of the industry and to review from time to time the information distributed, in order that every assertion of fact, policy or principle shall conform to the highest standards of accuracy."

In this statement there is explicit the resolve of the industry not to be dumb before its would-be shearers. As Mr. Sands put it:

"I have an abiding faith in the integrity and ability of the American public to deal fairly with our industry once it is possessed of the requisite information for the exercise of intelligent action and the formulation of sound judgment. If we, because of adverse criticism, indifference, or for any reason whatsoever, fail to see to it that the public has such information, then we must not blame the public if at times it fails to accord us that measure of justice to which we feel we are entitled."

### The Presidential Election.

Once more the expected has happened, and the Presidential nominees of the national party conventions are Secretary of Commerce Herbert Hoover of California on the Republican ticket and Governor Alfred E. Smith of New York on the Democratic. The Republican platform contains some pious animadversions against putting the Federal Government into business, but no specific references to the electrical industry, Muscle Shoals or Boulder Dam. The Democratic platform is equally reticent on the two projects just mentioned, but has this water-power plank:

"The Federal Government and State Governments respectively now have absolute and exclusive sovereignty and control over enormous water powers, which constitute one of the greatest assets of the nation. This sovereign title and control must be preserved respectively in the State and Federal Governments, to the end that the people may be protected against exploitation of this great resource, and that water power may be expeditiously developed under such regulations as will insure to the people reasonable rates and equitable distribution. . . . We favour appropriations for prompt co-ordinated surveys by the United States to determine the possibilities of general navigation improvements and water-power development on navigable streams and their tributaries and to secure reliable information as to the most economical navigation improvement, in combination with the most efficient and complete development of water power. We favour the strict enforcement of the Federal Water-Power Act, a Democratic Act, and insist that the public interest in water-power sites, ignored by two Republican administrations, be protected."

As to the candidates themselves, neither can be said to be "bone dry," so to speak, on the matter of keeping Governmental hands off the streams, for, as pointed out before in these letters, if Mr. Smith has been for State development of St. Lawrence River power in New York, Secretary Hoover has joined his colleague, Secretary Work of the Interior Department—who is now his campaign manager—in backing Boulder Dam on the Colorado, with its projected features of Federal ownership and operation. There is small doubt, however, that Mr. Hoover's engineering background, departmental accomplishments and far-reaching plans for improving business methods will attract more support among light and power company executives than the doughty Governor of New York can hope to win in that particular quarter, despite his amazing success and compelling personality.

# IMPORTED CABLES AND LAMPS.

### Dates Fixed for Enforcement of Marking Requirements at the Time of Importation.

Merchandise Marks (Imported Goods) No. 2 Order, 1928, requires imported insulated electric cables and wires, and imported electric incandescent lamps to bear indications of origin as from October 13th, 1928, and as from January 13th, 1929, respectively. The marking requirements apply not only on sale and exposure for sale in the United Kingdom, but also at the time of importation.

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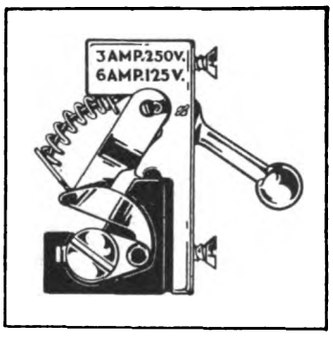
# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Dangerous Vacuum Cleaners.

[To the Editor.]

Sir,—In view of the recent fatality due to a faulty vacuum cleaner, and of the assurance given at the subsequent inquest, I think it would be of interest to draw your attention to a recent experience of mine.




A sketch of the switch referred to in the accompanying letter.

On July 6th I started to test a new vacuum cleaner of the "dust-bag" type when my wife, who was handling the machine, touched the kitchen grate and received a full 240 V shock. Upon investigation I found that this was not due to any accidental fault that "might occur only in one out of 10 000 machines," but was due to the makers failing to provide any form of insulation between the metal handle and the metal switch-knob and the contact-maker in the switch, so that the user had, to all intents and purposes, to grasp the bare supply leads. It follows, therefore, that every machine of the particular design which is in my possession must be capable of injuring the user, and the wonder is that more accidents have not been reported.

I am taking the liberty of submitting for your inspection the switch out of my machine, fitted with its metal screws by which it is secured to the metal handle.

I feel sure that you will agree that the public is entitled to be warned of the danger of using the type of machine in question.—I am, etc.,

B. P. Williams.

6, Jesmond Avenue,
Wembley.
July 18th.

[We refer to this matter under "Current Topics."—Ed.]

[To the Editor.]

Sir,—Regarding the safety of electric vacuum cleaners, we beg to say that during the 17 years the Eureka vacuum cleaner (formerly Imperial) has been on the market, no accident or untoward incident has occurred in its use.

Particular attention has been paid to the switch of this cleaner. There is no neutral point in the switch, and the make-and-break is of high speed, the instant of break of contact being reduced to the thousandth part of a second. Every switch is given an earth test of 900 V before assembly into the handle.

Moreover, the handle used is not in the electric circuit. The windings of the motor are in themselves insulated from the housing and castings; the housing and castings from the handle, and the handle from the switch. The handle is specially treated with a high dielectric insulating enamel (each coat being separately baked) and capable of withstanding a flash test of 2 000 V. After final assembly of transmission cord, switch, etc., three rigid tests are made for open circuits or earths.

We would point out that the field magnet and armature are of paramount importance—greater perhaps, than the switch or handle—for it is in these parts that "earths" develop. Only the best grade of copper wire and efficient insulation should be used (and are used in a high grade electric cleaner) and the coils should be dipped in waterproofing and insulating varnish.

In conclusion, we consider electric cleaners are in no wise dangerous, or, alternatively, if there is the least element of danger, it is infinitesimal when compared with hundreds of other domestic appliances, electrical and non-electrical, in use in the home to-day.—I am, etc.,

pp. The Electric Appliances Co., Ltd.,
E. C. Harkness,
Director.

8, Fisher Street,
London, W.C.1.
July 20th.

## Electrically-Operated Clocks.

[To the Editor.]

Sir,—In his interesting paper at the Conference of the Association of Public Lighting Engineers, Mr. E. E. Sharp gave as a disadvantage of the Warren clock system that the apparatus stopped on an interruption of the public supply of electricity, and that on resumption consumers' clocks were slow by the length of the stoppage. Up to this point he is right, but, if memory serves me rightly, a device has been provided on the consumers' clocks which enables corrections to be made.

On the dials of these clocks is a small window, behind which is a white disc. Any interruption of service causes this disc to turn red, signifying that the clock must be reset to the correct time. On restarting the clock, the disc is restored to white by simply turning the small shaft to which it is attached.

If this can be called a disadvantage it seems to be offset by the fact that so long as the disc shows white the user knows his clock is right. It is, surely, an advantage to have a clock that tells you when it is wrong.—I am, etc.,

Horologist.

Bath.
July 21st.

## Tyne Tube Railway.

[To the Editor.]

Sir,—With reference to your report on the above subject in your issue of June 22nd, the original Kearney High-Speed Railway Company was a small preliminary syndicate with a capital of £11 000. Prior to the commencement of the proceedings in connection with the promotion of the Tyne Tube scheme, this company was put into voluntary liquidation, as it had completed its work and as a necessary step to reorganisation. I was appointed liquidator, and during the process of my winding-up, a firm with whom the company had had no dealings whatever put in a petition for a winding-up by the Board of Trade. To this I readily agreed, as there was no reason to resist or object to it in any way. The interests of the shareholders have been strictly preserved, and these have, almost without exception, become shareholders in the present larger company. Other than Mr. Kearney himself (who was by far the largest creditor) and the said petitioner, who has no legitimate claim on the company, there were only two creditors, and these will be satisfied in full after the matter has passed out of the hands of the Board of Trade, which is expected to take place at an early date. It will be observed, therefore, that there can be no reflection, except one of credit, either on the old or the new company or those connected with them.—I am, etc.,

L. Halliday, F.C.I.S.
Secretary and voluntary liquidator to the original Kearney High-speed Railway Co., Ltd., and secretary of the Kearney High-Speed Tube Railway Co., Ltd.

Vienna.
July 2nd.

[The report referred to appeared under the heading of "In Parliament" and dealt with the rejection of the Tyne Tube Railway Bill by a Select Committee of the House of Commons.—Ed.]

## Developing the E.D.A.

[To the Editor.]

Sir,—From the opinions expressed in your pages during the past two weeks it seems obvious that any improvement of inter-sectional trading problems in the electrical industry depends upon the development of the Electrical Development Association. The Institution of Electrical Engineers is the one body to which all may look in technical matters, but on the commercial side there is at present no such authority. The trade associations, existing, as they do, primarily for the benefit of their own particular sections, can none of them give a lead to the rest without being suspect by the others of working to further their own sectional interests.

The E.D.A., however, is not subject to this disability. It is supported by all branches of activity, comprising all shades of opinion, and it could thus be very easily adapted to function as the governing body of the trading side of the industry. Existing associations would, of course, be continued, and each would continue to be represented upon the E.D.A. Committees.

At the head of the E.D.A. would be the personage who has been referred to as the dictator or general manager of the

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industry. His decisions, reached after consultation with the various interests represented on the E.D.A., would be binding on all sections, and thus we should have that co-ordinated trading policy which so many desire and so few are courageous enough to take unusual steps to promote.

It may be objected that enforcement of decisions would be impossible until the E.D.A. has far greater support than it now enjoys. My contention is that it would receive that further support as soon as it could show that it had a constructive policy which it was determined to carry out. But even supposing that it took some time to obtain a full backing, there is no reason why the trade associations should not, after securing the approval of their own members, undertake on behalf of their entire membership, to abide by E.D.A. decisions.

In the past the E.D.A. has performed very useful spadework, but there is no reason why its work in the future should not far outrange its past achievements. Mr. Robson was right in pleading for a *real* development association. The views expressed above seem to me to suggest a way of realising that ideal.—I am, etc.,

S. T. L.

July 23rd.

## Shoddy Wiring.

[To the Editor.]

Sir,—With reference to shoddy wiring, I would like to draw the attention of your readers to the state of affairs obtaining in a large borough in East London. This borough runs a hire-purchase scheme and contracts the work out. There is a beautiful specification but obviously the price (about 13s. per point) renders this sheer eyewash. The jobs are small, i.e., 6 to 8 points, but owing to their number and possibilities they constitute an important factor.

The Council are actuated by a desire to reduce prices at all costs, and the contractors concerned are meeting this by the shoddiest material and by employing lads on piecework to instal it. The result of this is that such trifles as pipe fittings are often left out, and even tube is given a miss wherever it causes delay in the all-important job of getting the point in. Unfortunately, the inspection is on a par with the rest of it, being simply a stroll on to the job and off again.

I consider this to be a disgraceful state of affairs, and one that will bring the industry into bad odour in the long run, and I suggest that the best way of stopping it would be for some responsible body, such as the E.D.A. to divert some of its advertising expenditure to publishing a series of articles in the daily papers, with the object of educating the people in the simple continuity tests and insulation tests they should insist on,—I am, etc.

H. Castle.

P.S.—I am not an electrical contractor.

London, E.7.

July 18th.

## "A General Manager for the Industry."

[To the Editor.]

Sir,—As a general rule I am not a believer in a super-general manager of a huge undertaking such as the British electrical industry. I think it always better for one concern to adopt the methods of some other concern which have proved successful, and to advance by improvement in the *units* of an industry instead of trying to improve an industry as a whole. The latter can be done by association, and out of association there may arise a man who shows himself capable of formulating and executing a profitable policy. This would be a development, and would be less risky than selecting a man and thrusting him into the responsibility for finding a policy.—I am, etc.,

"Associate."

July 18th.

[To the Editor.]

Sir,—The suggestion initiated by Mr. T. R. Martin, at the E.C.A. Conference, is one long overdue for discussion.

As has been pointed out by Sir Philip Nash, if the consumer is taken away the industry becomes derelict, and it is, therefore, of primary importance that not only should existing consumers be maintained, but others added at the maximum rate possible. At present the work of obtaining and educating the consumers falls chiefly on the distribution engineer and the contractor (in the near future we are going to hear far more about the distribution engineer than we have done in the past). It seems to me that the people on whom this propaganda work devolves are financially the least able to carry it out, and, therefore, if the efficiency of the industry is to be raised it will be necessary for some co-ordination to exist amongst its many branches.

I am afraid that the one general manager as suggested by Mr. Martin would not be a success, as it would not be long before his chief occupation would be attending to Parliamentary, labour and such like questions. But if, say, six representatives from the sections of the industry, together with a representative of the consumers (each at present connected and in touch with the existing Associations dealing with their particular branch) were formed into a body, I think the result could not be other than beneficial to the business, provided they all would be willing to assist in the cost of the education of the consumer, and endeavour to see that each section had a fair profit.

I am not overlooking the excellent work of the E.D.A.; in fact, some extension of this organisation may possibly be the solution—but the linking up of the sections of the industry in my opinion is a great point, and it is almost, if not quite, as necessary as the linking up of the country.—I am, etc.,

H. C. Babb,
General Manager, The Lothians Electric Power Co.

Musselburgh.
July 23rd.

# LOOKING BACKWARD.

## Electrical Happenings Fifty and Twenty-five Years Ago.

In response to numerous requests from readers interested in our peeps into the past published under the heading "Fifty Years Ago," arrangements have been made to add to this feature items taken from a 25-years old issue. Many of these glimpses from the distances of a half and a quarter century respectively, will readily be identified as milestones in the development of the electrical industry. Others, however, will strikingly illustrate the truth of the saying *plus ça change, plus c'est la même chose.*

* * *

Fifty years ago, as recorded in The Electrician of July 27th, 1878:—

We could only boast of one quadruple telegraph circuit, though the U.S.A. had 59 such circuits, comprising 16 157 miles of line.

M. Louis Olivier produced a form of telephone differing from the ordinary Bell apparatus, chiefly in the shape of its diaphragm.

The receipts of the Post Office telegraphs for the year ended March 31st, 1878, were £2 492 less than expenditure.

The dispute over the invention of the microphone proceeded a stage further. Mr. Edison made a detailed reply to Messrs. Preece and Hughes. The matter was discussed in our correspondence columns, and also formed the subject of a leading article.

* * *

Twenty-five years ago, according to The Electrician dated July 31st, 1903:—

Members of the I.E.E. approved a proposal to purchase a site in Tothill Street, Westminster, on which to erect for the Institution a new building of its own.

Mr. E. L. Berry was elected president of the London Electrical Contractors' Association.

Mr. Alfred Baker, the manager of the L.C.C. tramways, was appointed to a similar position at Birmingham, and Mr. H. E. Blain, assistant superintendent of tramways at Liverpool, was made superintendent of tramways at West Ham. Bradford Electricity Committee was considering the appointment of a successor to Mr. Chattock.

Attention was drawn to the King's preference for electric vehicles. The Prince of Wales also showed his interest by ordering an electric brougham.

On March 31st, 1903, the British Thomson-Houston Co. had 1 300 employees, more than double the number employed in the previous year.

Mr. G. Byng, at the annual meeting of the General Electric Co., called attention to the deficit caused through German competition since the establishment by the company of its own carbon works.

The question how far the Institution of Electrical Engineers can represent an individual section of the industry was discussed on the correspondence page by Mr. C. H. Wordingham.

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# LEGAL INTELLIGENCE.

## Application for Compulsory Licence and Reduction of Royalty.

THE hearing of an application by the Brownie Wireless Co. (of Great Britain) for a compulsory licence under certain Marconi patents was commenced by the Comptroller-General of Patents on Tuesday.

Mr. R. Moritz, K.C., for the applicants, said the Marconi licence prohibited importation, and the Marconi Co. sought to justify that by saying that it was for the benefit of the trade that cheap sets from America and other countries should be excluded. He submitted that import restrictions should be limited to patented articles, and that, in regard to exports, restrictions should be limited to countries where the Marconi Co. owned or controlled patents. The present royalty of 12s. 6d. per valve-holder was strangling the trade. He suggested that a royalty of 5 per cent. on the retail selling price would be fair.

Mr. Barber, governing director of the Brownie Co., said he wanted to cater for a strata of the public who could only afford to buy the cheaper articles, and it was here that the royalty hampered him.

In the price of a wireless set, 30 per cent. went to the retailer, 20 per cent. to the factor, and 50 per cent. to the manufacturer. His own profit as a manufacturer was about 20 per cent. The hearing was not concluded when we went to press.

### Extension of Patents.

In the Chancery Division last week Mr. Justice Tomlin granted extensions for four years of patents owned by the following companies and persons, on the grounds of loss of opportunity to exploit the patents during the years of the War, or loss or damage suffered by exploiting them during that period :—

(1) The General Electric Co., Ltd., relating to improvements in electric lampholders (patent granted to Mr. Max John Railing and Mr. John Hilliery Collings, the company being the assignees ; date of patent was November 29th, 1912.) (2) W. T. Glover and Co., Ltd., for improvements relating to waterproof coverings for electric cables, known as the test sheath, which enables one to tell 10 or 20 years ahead of the time when the breakdown of a cable is likely to begin. (3) Alfred Thomas Blackall and Charles Mark Jacob, for improvements in electrical token apparatus for railways.

The petition of the Western Electric Co. for a five-years' extension from July 4th last of four patents for improvements relating to automatic telephony systems. The patents related to one of the systems in regard to all of which the G.P.O. had made arrangements with the different companies concerned. But from just before the war until the end of it the G.P.O. were unable to do anything in the way of installing automatic telephone exchanges.

Mr. Justice Tomlin also heard the petition of Mr. Fredk. Charles Curtis for an extension of the period of his patent for an electrical regulating switch. The invention provides a means for getting better contact by the use of a cross-bar with springs to take up irregularities. A two years' extension was granted.

### Alleged Nuisance at Barton Power Station.

An action for damages and an injunction against Manchester Corporation, in connection with their Barton power station, was tried at Manchester Assizes last week. The plaintiff was Mr. A. Farnworth, of Barton, who alleged that sulphur fumes emitted from the power station had done severe damage to his crops and land, and also to other land in the neighbourhood, and that the station constituted a nuisance.

Mr. E. Atkinson (for the defence) submitted that if the fumes constituted a nuisance, it was a nuisance that was unavoidable, and that no known skill could prevent. As a result of the statutes, they were entitled to be a nuisance.

Mr. H. C. Lamb, the engineer and manager of the electricity undertaking, admitted that, with the increase of generating power at the station, the trouble was likely to get worse rather than better.

Mr. W. M. Selvey said the station had been constructed in accordance with the best modern practice, and Mr. William Bayliss, a member of the firm who supplied the boilers, said nothing could have been done which would reduce the amount of sulphur coming from the chimney.

The judge (Mr. Justice Talbot) in giving his decision said it was clear that it was the intention of Parliament to allow the Corporation to erect, extend, and enlarge the generating station. He found that the defendants were entitled to succeed on the ground that what would have been otherwise an actionable nuisance had been authorised by Parliament. In giving judgment for the defendants he made no order as to costs.

### Petrol-Electric Vehicles.

The Court of Appeal, consisting of the Master of the Rolls and Lords Justices Sankey and Russell, on July 19th delivered judgment allowing an appeal by the Minister of Transport and the Kent County Council from a judgment of Mr. Justice Clauson in favour of Tilling-Stevens Motors, Ltd., in an action brought by the company which raised the question whether its petrol-electric vehicles were electrically propelled. The company brought the action against the Minister of Transport and the Kent County Council for the return of duties which they said they had paid in excess of what was lawfully due upon mechanical vehicles. Electrically-propelled vehicles in general paid only half the duty paid by other vehicles.

Mr. Justice Clauson decided the Messrs. Tilling-Stevens' petrol-electric vehicle was electrically propelled, but the appellants disputed this.

In giving judgment the Master of the Rolls said he thought Mr. Justice Clauson had put too narrow a construction on the statute and that the tax imposed on the respondents was the correct tax. The appeal would be allowed and judgment entered for defendants, with costs.

Lord Justice Sankey concurred, but Lord Justice Russell dissented. In his opinion, the Court in allowing the appeal was looking at the substance and usurping the functions of the legislature. In his opinion the appeal failed and should be dismissed.

By a majority of the Court, the appeal was allowed.

### Action as to Discontinuance of Rentals.

A test action of importance to householders who have electrical installations on the rental system in West Ham was decided by Judge Snagge, in the Bow County Court, last Friday. The Corporation of West Ham sued Timothy Donoghue, of Plaistow, to recover £1 13s. 2d. rental due on an installation and current supplied, and also for a declaration that his contract with the West Ham Corporation should continue. Defendant paid 10s. 6d. into Court.

Mr. Helme, for plaintiffs, said defendant had signed the agreement, which provided for the payment of twelve monthly instalments of 3s. 6d. as rent, and thereafter, 2s. 4d. a month. The only way to discontinue this contract was to give 14 days' notice when the tenant was leaving the premises. It was in perpetuity, but Mr. Helme believed there was something in it that at the end of 15 years the installation was paid for. The defendant had only had his installation for 17 months, and if he were allowed to cancel, it would mean a heavy loss.

Judge Snagge said defendant was clearly liable to make his monthly payments, and gave judgment for the plaintiffs for the amount claimed, and costs.

### Peacehaven Co.'s Losses.

Mr. Justice Maugham, in the Chancery Division, sanctioned the petition of the Peacehaven Electric Light and Power Co., Ltd., for a reduction of its capital from £20 000 to £11 174 8s. The company was formed in April, 1922, by one of the companies interested in Peacehaven, and the latter company guaranteed the interest on the preference shares for five years, which guarantee had just ceased. The company had applied to the Electricity Commissioners for recognition, and that would be granted, he was instructed, on condition that the company took its supplies in bulk from the Newhaven and Seaford Electricity Co.

### A New Confidence Trick.

At Blackburn recently Joseph H. Southworth was charged with obtaining by false pretences at Great Harwood 10s. from Henry Hodkinson, radio engineer, with intent to cheat and defraud. He called at Mr. Hodkinson's shop and asked the price of a radio set " for the Catholic Club." A quotation was given for £52. Southworth accepted, and before leaving got an advance of 10s. for an advertisement in a Catholic periodical. Southworth was sentenced to one month's hard abour, but the sentence was altered to a fine of £5.

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# NEWS IN BRIEF.

## Electrical Exhibitions—Colwyn Bay to Buy British—A Big Electromagnet—Electric Lighthouses—Tyne Electrical Engineers' New Headquarters—No Marking Order for Electric Safety Lamps.

A SHOWROOM manager is wanted for Leicester electricity department.

The Egyptian Ministry of Communications require a deputy inspector-general of telegraphs and telephones.

Battersea (London) B.C. are about to establish a solarium at Southlands, and have voted an estimate of £250 for the provision of equipment, mainly lamps.

The borough electrical engineer is to provide improved lighting at Battersea town hall at a cost of £575.

Bexhill Electricity Committee has decided to organise an electrical exhibition for a week in October next.

Colwyn Bay Lighting Committee have adopted the principle that in purchasing cables and other stores and materials they will deal with British firms.

The Metropolitan Asylums Board is to carry out, at an estimated cost of £170, alterations and additions to the electric lighting installation at Grove Park Hospital.

An exhibition of electrical apparatus arranged by Plymouth Electricity Department was open last week, and demonstrations were given of the use of all kinds of electric household appliances.

Representatives of the Brush Electrical Engineering Co. and Mr. Frank Hodges, a member of the Central Electricity Board, will take part in the sixth summer week-end conference of the Industrial Co-partnership Association which opens at Oxford to-day (Friday).

### *ENGINEERING STAND DESIGN.*

*ON this stand at the Colliery and Mining Exhibition at Manchester a departure from conventional engineering display methods was adopted. The exhibits were enclosed by blue and silver stanchions with chains and nosing to match, while the floor of the platform was covered with blue linoleum. The overhead sign is another original provision, and it deservedly proved a conspicuous feature of the Exhibition.*

Applications are invited for the post of City electrical engineer of Hull.

Electrically operated carriage washing plants are to be installed by the L.N.E.R. at Ilford, Cowlairs and York.

The trustees of the Primitive Methodist and Wesleyan Churches at Crowland, Lincs, have decided to adopt electric lighting.

H.M. the Queen has had the old-fashioned cooking ranges at Sandringham replaced by modern electric cookers.

A fire occurred on July 19th in a workshop at the rear of the premises of Burnley Components, Ltd., in Accrington Road, Burnley. The origin of the fire is unknown.

The largest electromagnet in the world has just been erected at the National Office for Industrial and Scientific Research, at Bellevue, near Paris. Two of its movable parts, which each weigh 25 tons, will be worked by electric motors.

At the last meeting of the Tyne Commissioners it was reported that electric light was substituted for gas at the high and low lighthouses, North Shields, in December last, and had proved satisfactory. The Commissioners approved proposals to substitute electricity for gas as an illuminant at the Groyne and South Pier, and to instal electrically-operated fog signals in the Groyne and South Pier lighthouses, at a cost of £3 200.

The Standing Committee under the Merchandise Marks Act recommend that an Order in Council should be made regarding safety flame lamps and parts thereof, but they consider that there should be excluded from the order the safety lamps which include electric lamps.

The S.W. Midlands Advisory Joint Committee (Electricity Supply) have just made their annual report to the Electricity Commissioners. The total generating plant capacity installed in the stations of supply authorities in the district (1 300 sq. miles) amounts to 243 078 kW. There has been a lower consumption of fuel per kWh of electricity generated—the improvement being no less than 17½ per cent.

The new scheme of floral illumination on the sea-front, upon which Torquay Town Council is spending £2 000, has just been brought into operation. The draecena trees in and around the oval sunken garden in Princess Gardens and the vicinity of the band enclosure are studded with blue, white, red, pink, orange and amber electric lamps. The larger trees and the Rock Walk are also illuminated.

The address of the president will be delivered and the distribution of prizes to members of the Association of Supervising Electrical Engineers will take place at the meeting on October 2nd, at the Junior Institution of Engineers, 39, Victoria Street, London, S.W. Lectures at subsequent meetings, at the same place, will be delivered by Dr. A. P. Thurston, on "Laws of Patents" (November 6th); Mr. W. S. Kennedy, on "Some Aspects of the Electricity Act, 1926" (December 4th); Mr. C. S. Buyers, on "Power Factor Correction" (January 1st); Lt.-Col. C. G. Lee on "Beam Wireless" (February 15th); Mr. G. P. Garbett, on "Modern Electric Signs" (March 5th); and Mr. C. V. Hill, on "Variable Speed Alternating Current Commutator Motors" (April 2nd).

The Municipal Council of Leyden (Holland) have granted 1 900 000 florins for extensions of the electricity supply station. A turbo-generator and two boilers are to be installed.

Mr. A. J. Bridge, of the Wessex Electricity Co., addressed a meeting at Shipton-under-Wychwood, where an interesting exhibition of electrical appliances was staged. Mr. Bridge also addressed a meeting at Bampton.

Further successes of B.T.-H., Blackheath brigade at the Fire Fighters' Camp at Newbury were: 2nd for steamer turnout (35⅘ secs.); 4th for Dewar Steamer (44⅘ secs.); and 5th junior one-man ambulance (72 per cent.).

The Tyne Electrical Engineers' new headquarters at Tynemouth, which were opened last Friday, are situated in Tynemouth Road close to Tynemouth Station. A feature of the main entrance is a large sculpture panel representing the badge of the Tyne E.E. flanked by winged figures of Fame and Glory. (See p. 109.)

The Chief Constable of Swansea reports that he has inspected an electric automatic traffic control at Leeds, and he recommends that a similar control be set up at one of the traffic crossings in the borough, as an experiment. The cost would be approximately £230. The Watch Committee have agreed to adopt the suggestion.

The question of foreign competition in the supply of cable was discussed by Dundee Electricity Committee last week. Offers for five types of cables were submitted. The total foreign offers amounted to £2 067 18s. 4d., while the cheapest British offers totalled £2 491 6s. 9d. It was agreed to accept two foreign offers, which were 20 per cent. and 23 per cent. lower than those of the British manufacturers. In regard to the other three, the British offers were only slightly higher than the foreign ones, and it was decided to accept the former.

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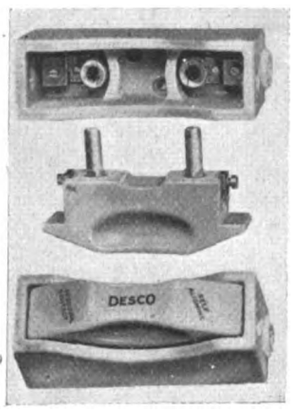
# SELLING LINES.

## Novel Patented Fuse Construction.

IN the " Desco " fuse, manufactured by G. P. Dennis, Ltd., a novel and patented method has been employed. It contains cylindrical contacts, made to gauge limits, and the advantage claimed for it is that a definite pressure contact is exerted throughout the whole of the surfaces by means of garter springs. The plugs are held loosely in the handle, allowing sufficient movement to ensure their proper alignment with the socket. The socket is divided down its entire length, the loose portion being held by steel springs. When the plug is inserted into the socket, the springs yield just sufficiently to enable the bore of the divided socket to assume a cylindrical form which is an exact fit of the plug, giving an even contact between all surface parts and eliminating any point or line contact. A special feature of the handle pointed out by the makers is that the arc is always blown clear of the metal parts and cannot weld the contact screws to the end clips. The box type is made in sizes from 5 to 100 A capacity. The socket portion is made of a hot pressing, the hole being drilled and then reamered with a special reamer to a standard size. The terminal block is of ample capacity, and can be made with front or back connections.



The new " Desco " fuse.

In the " Desco " type fuse, the contact screws are tapped into a substantial piece of extruded brass, and so eliminate to a great extent the possibility of stripping. A full range of fuses, from 5 to 1 000 A are made for switchboard mounting. Up to 100 A the plug is retained in the handle, but for larger sizes the plug is secured to the slate, or other base, and, being round, requires no steady pins. The socket is split in two, after being bored to the same gauge as the plug. It is loosely held in the handle which gives it the special self-aligning features. A simple but effective method of locking the contacts has been patented. A suitable collar having a boss which is tapped to take a set screw is placed around the socket, and the contacts are such a fit that it only requires a turn of the set screw to make it impossible to withdraw the handle. This feature will be appreciated by engineers for feeder pillars, main services, links, etc., carrying heavy currents for long periods. The makers claim that the collar is not necessary, but can be supplied at a small extra where required. The fuses are made up in wood and iron boxes, to any special requirements, for marine and land work.

## Trickle Chargers.

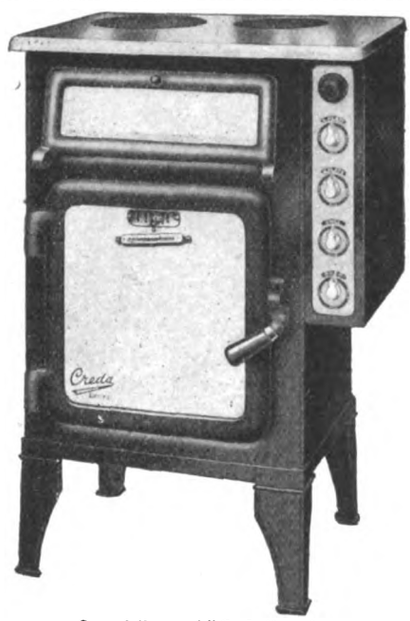
The British Thomson-Houston Co. are now manufacturing a trickle charger built on similar lines to their Tungar battery charger. Hitherto the Tungar has been available in a standard range of sizes to meet the requirements both of the battery charging station and of the individual who charges periodically from the supply mains at home. In so far as home charging is concerned, however, the practice of trickle charging is becoming more popular. In order to meet the demand, this new model of the Tungar, having an output of 0·3 A, has been developed. The Tungar trickle charger is similar in general design to the regular Tungar battery charger and employs valve rectification. The chargers are made in twelve different models to suit various a.c. sources of supply, all of these being arranged so that accumulators of various voltages can be charged.

A " Tungar " trickle charger.

A small circuit breaker, suitable for use on a.c. or d.c. circuits up to 250 V, has just been placed on the market by the General Electric Co., Ltd. The breaker, which is of the single pole type, is suitable for the control of circuits connecting small domestic appliances, cookers, and for protecting testing and charging circuits. A circuit breaker of this type has the advantage over a fuse in that the former may be readily reset by the simple operation of the handle, and what is more important, the breaker cannot be reset if the fault in the circuit still exists. The features of the " Dwarf " type circuit breaker include a vitreous porcelain base with a moulded ebonite cover. The break is fitted with magnetic blow-outs with renewable fixed and moving contacts. Connections are made to screwed stems at the back of the instrument. Four sizes are available, having normal capacities of 2, 4, 6 and 10 A, with an overload calibration of 100 per cent. above the normal capacities. The overall dimensions are 4$\frac{3}{32}$ in. by 2$\frac{7}{16}$ in. by 5$\frac{1}{8}$ in.; and the weight is 1 lb. 5 oz.

## New Cooker Models.

The new range of " Creda " electric cookers referred to in a recent issue of THE ELECTRICIAN are the latest addition to the list of domestic appliances by the Credenda Conduits Co., Ltd. There are five new models available in either standard or de-luxe finish. The cookers are fitted with grey enamelled hobs, enamelled removable oven liners, the walls of the oven being also vitreous enamelled inside and out, and runners for the oven shelves. Other points of interest are that the cookers are made with rounded corners, while a drop door to the hob space is also included. Zed fuses are fitted as standard, and these are arranged in the lap of the switch box on the right of the cooker, and easily accessible when the hob is lifted.



One of the new " Creda " cookers.

A 3-pin socket is provided on the switch box for a self-contained kettle or similar appliance. The cooker is also fitted with a new design of grill pan which is capable of adjustment to the height of the grid without the incorporation of runners.

The boiling plates are of the circular enclosed pattern, 8$\frac{1}{4}$ in. diameter and 7 in. diameter respectively; the grill is 10 in. by 10 in. and the grilling chamber can be used as a hot-cupboard. The loadings of the cooker suitable for 7 to 10 persons are: oven, 2·1 kW.; grill, 1·5 kW; boiling plates, 2 and 1·2 kW respectively.

The latest addition to the range of A.B.C. washers by the Sun Electrical Co., Ltd., is a machine incorporating both washer and spinner for drying. The latter consists of a dryer chamber, conical in shape, with porcelain-enamelled interior. The makers claim that the high speed rotation of this spinner chamber will cause clothes, even after heavy wringing, to yield further quantities of water.

## The " Electricon."

A neat little ebonite-cased device called the " Electricon," which is now being marketed by Sophus Berendsen (London), Ltd., is designed to enable any one to fix, permanently or temporarily, an extra light in one minute from the existing flexibles without interfering with the original installation. It comprises a two-pin socket and plug, the former being hinged and grooved to allow the insertion of the twin wires of an existing fitting. The wires are not bared, contact being secured by screwing down the sockets, which are provided with sharp pointed ends. Connection of the wires of the extension light is similarly effected in the plug portion of the device, and the plug and socket are then connected in the usual way. Simplicity, neatness and light weight are selling points of this fitting, which will retail at 2s. 6d.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

CHADDERTON EDUCATION COMMITTEE.—Electric light installation at Stanley Road and Eustace Street schools. Particulars from Mr. A. W. Cox, surveyor, Town Hall, Chadderton.

CENTRAL ELECTRICITY BOARD, July 27th.—Supply and erection of 33 000 V overhead transmission line between Brighton and Worthing. Specification (No. S.E.E.-S.L.1) from Sir J. R. Brooke, secretary, Central Electricity Board, Trafalgar Buildings, Charing Cross, London, W.C.2; deposit £2 2s.

BAPTIST CHAPEL AND SCHOOL, LATCHFORD, July 28th.—Wiring and electric fittings. Tenders to Mr. J. R. Conway, 3, Beech Road, Stockton Heath.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, July 28th.—Electric lighting of "Museum Buildings," Green Street, and "Ravenscroft," Columbia Road, Bethnal Green. Specification, etc., from Town Clerk; deposit, £2 2s.

BROMSGROVE GUARDIANS, July 28th.—Electric lighting installation for the Infirmary, Workhouse and Children's Home. Specifications, etc., from Mr. F. S. Cartwright, clerk, Union Offices, Bromsgrove.

GLASGOW CORPORATION, July 30th.—Installation of electric light, telephones and heating apparatus. Specification can be obtained at the Office of Public Works, 249, George Street, Glasgow.

HALIFAX CORPORATION, July 30th.—Wiring for 94 houses at Moor End Road. Particulars from the Borough Engineer; deposit £2 2s.

LONDON COUNTY COUNCIL, July 30th.—Wiring and fittings for electric lighting of two blocks of dwellings, comprising some 135 tenements, on Ring Cross estate, Islington. Specification from chief engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1.

WARRINGTON CORPORATION, July 30th.—(1) Twelve months' supply of e.h.t. and l.t. paper and lead covered cables; (2) e.h.t. sub-station switchgear; (3) twelve months' supply of reinforced concrete cable protector slabs, etc. Specifications from Borough Electrical and Tramways Engineer; deposit £1.

WILLESDEN GUARDIANS, July 30th.—Two 90 kW direct coupled generating sets. Specification from the Clerk, 409, High Road, Brondesbury, London, N.W.6; deposit £5.

ATHERTON URBAN DISTRICT COUNCIL, July 31st.—Supply of 4 720 yards of 0·1 by 0·141 twin concentric e.h.t. cable. Tender forms from the Clerk, Town Hall, Atherton, near Manchester.

KENDAL GUARDIANS, July 31st.—Installation of generating plant and wiring for electric lighting at Milnthorpe Institution. Particulars from clerk, Mr. George Cotton, 14, Lowther Street; deposit £2.

WEST RIDING EDUCATION COMMITTEE, July 31st.—Electric lighting installation in Penistone Grammar School. Specification, etc., from Education Department, County Hall, Wakefield.

BELFAST CORPORATION, August 1st.—Supply of 20 tons B.S.S. No. 7 tramway rails. Specification, etc., from General Manager, Corporation Tramways, Belfast.

BLACKPOOL CORPORATION, August 1st.—Supply and installation of four electrically-driven centrifugal pumps. Further particulars from Borough Engineer.

WEST RIDING EDUCATION COMMITTEE, August 1st.—Electric light installation at Armthorpe New School. Specification, etc., from Education Dept., County Hall, Wakefield.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, August 3rd.—Manufacture and erection of switchgear and transformer kiosk. Specification, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

RENFREWSHIRE EDUCATION AUTHORITY, August 3rd.—Electrical installation in proposed school at Lochfield Road, Paisley. Schedules, etc., from Executive Officer, County Education Offices, 16, Glasgow Road, Paisley; deposit £1.

STOURBRIDGE GUARDIANS.—August 8th.—Electric light installation at the institution. Particulars from the master.

DUNDEE CORPORATION, August 13th.—Electric lighting work in administrative block, Ashludie Sanatorium. Particulars and specification from Mr. George Baxter, city engineer, Dundee; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of one 20 000 kW turbo-generator. with condenser and auxiliaries. Specifications, etc., from City Electrical Engineer; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of two water-tube boilers, with stokers, fans, motors, preheaters, grit catchers, coal chutes, ash chutes, and chimneys complete, each with a minimum normal evaporative capacity of 65 000 lb. of water per hour. Specification from City Electrical Engineer; deposit £2 2s.

MANCHESTER CORPORATION, August 14th.—Sand-drying plant, for the tramways department. Specification from General Manager and Engineer, 55, Piccadilly, Manchester; deposit £1 1s.

PORTLAND URBAN DISTRICT COUNCIL, August 15th.—Manufacture, laying and erection of underground mains, overhead mains, transformers and meters. Specifications etc., from Mr. R. A. Colenutt, clerk to the Council; deposit £3 3s.

STRATFORD URBAN DISTRICT COUNCIL, August 16th.—Supply and laying of about 9 200 yards of 33 000 V underground transmission lines. Specifications, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

METROPOLITAN ASYLUMS BOARD, August 22nd.—(1) re-wiring fire alarm system at Caterham Mental Hospital; and (2) electric lighting installation in shore and pier buildings at Long Reach Hospital, Dartford; deposit £1 in respect of each work.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, July 27th.—Electrical works and supplies in Dublin district for one year. Schedule, etc., from Office of Public Works, Dublin; deposit £1.

DUBLIN BOROUGH COMMISSIONERS, July 28th.—Supply of magazine flame arc lamps. Specification, etc., from City Electrical Engineer.

DUNEDIN CORPORATION, July 30th.—Supply of 6 tons of hard drawn electrolytic copper trolley wire. (Reference A.X. 6 477.)

UITENHAGE MUNICIPALITY, SOUTH AFRICA, July 30th.—Supply and delivery of h.t. and l.t. switchgear, h.t. and l.t. cable, motors, fans, meters, transformers, kiosks, feeder pillars, and line material. (Reference B.X. 4 517.)

ECUADOR GOVERNMENT, July 31st.—Supply of two electrically operated portal cranes, of 5 and 10 metric tons capacity, respectively, for Guayaquil. (Reference A.X. 6 387.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 31st.—Motor generator set for Seacliff Mental Hospital. (Reference B.X. 4 571.)

POSTMASTER-GENERAL'S DEPARTMENT, SYDNEY, July 31st.—Supply of 32 900 copper, 75 000 bronze and 16 500 cadmium copper jointing sleeves. (Reference A.X. 6 510.)

CAPE TOWN MUNICIPALITY, August 1st.—Supply of 25 A service cutouts. (Reference B.X. 4 596.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Supply of armoured telephone cable. (Reference B.X. 4 518.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 2nd.—Electrically-driven concrete mixing plant. (Reference A.X. 6 441.*)

WATERFORD CORPORATION, August 3rd.—Supply and erection of 10 000 V, three-phase switchgear, 400 V three-phase switchgear, and 200 V d.c. switchgear for central station and five sub-stations. Specifications, etc., from Messrs. MacEntee and O'Kelly, 23, Upper O'Connell Street, Dublin.

VICTORIAN ELECTRICITY COMMISSION, August 6th.—Supply of three-phase, 60 cycle, interconnected star, oil insulated, self-cooled, outdoor type neutral earthing compensator. (Reference B.X. 4 519.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 7th.—Supply of 50 kVA transformers and 2 100 V, three-phase, 50 cycles, truck pipe switchgear. (Reference B.X. 4 526.)

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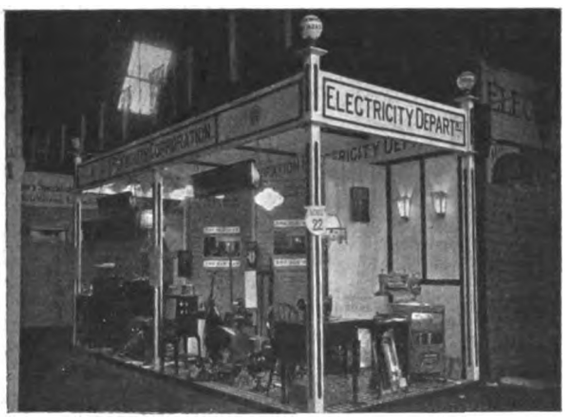
SOUTH AFRICAN RAILWAYS AND HARBOURS, August 9th.—Supply of six electrically-driven overhead travelling cranes. (Reference A.X. 6 409.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4 505.)

BULAWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain grate, turbo-alternator, spray cooling




*THIS display at the Plymouth Health Exhibition, held in conjunction with the Royal Sanitary Institute Congress last week, was awarded a silver medal on account of the hygienic value of its exhibits. The Electricity Department also opened temporary showrooms in Old Town Street during the period of the Congress. In the central portion of the stand are seen two of the graphic panels, contrasting good and bad lighting methods, which were first shown at the I.M.E.A. Exhibition this year by the E.L.M.A. Lighting Service Bureau. These panels can be loaned for local exhibition and demonstration purposes.*

equipment and circulating waterpiping and three-panel switchboard, with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, August 14th.—Supply and erection of overhead and supply and laying of underground distribution mains and services in Blackrock, Booterstown, Monkstown, Sandycove and Dalkey, in the county of Dublin. Specifications, etc., from Secretary, 60–62, Upper Mount Street, Dublin; deposit £5.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 14th.—(1) supply of a.c. motors and starting pillars; (2) paper cables and terminal and joint boxes; and (3) rubber cables. Forms of tender from the Company's Offices, 25, Buckingham Palace Road, London, S.W.1; fee £1 1s. for each specification; not returnable.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kW switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B.X. 4 477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

CAPE TOWN MUNICIPALITY, August 15th.—Supply of l.t. switchgear for the new Pavilion, Muizenburg. (Reference B.X. 4 562.)

VICTORIA STATE ELECTRICITY COMMISSION, August 20th.—Supply and delivery 66 000 V transformers and spares. (Ref. B.X. 4 541.)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 22nd.—Supply of metal filament lamps. (Ref. B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

JOHANNESBURG MUNICIPALITY, August 30th.—Street lighting switches. (Reference B.X. 4 584.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of tramcar tyres and street lighting time switches.

LOURENCO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. (Reference A.X. 6 538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21.) Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (Contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA) MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four five-ton electrically operated luffing cranes.

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

## Tenders Accepted.

PAROCHIAL HALL, ELLAND.—E. Turner, electricians' work. etc.

SHELF URBAN COUNCIL.—Mr. G. Jackson, installing electric light to Council houses.

WAR OFFICE.—Stella Lamp Co., Ltd., one year's supply of Stella electric lamps.

DARTFORD URBAN COUNCIL.—Johnson and Phillips, Ltd. for a feeder pillar at £100 7s. 6d.

DARLINGTON CORPORATION.—Babcock and Wilcox, Ltd., boiler, for electricity works, £13 500.

TIVERTON CORPORATION.—Stenner and Gunn, electric light installation at Town Hall, £103 7s. 6d.

ROYAL YORK HOTEL, TORONTO.—Lancashire Dynamo and Motor Co., Ltd., complete electrical plant.

PORT OF LONDON AUTHORITY.—Metro-Vick Supplies, Ltd., supply of gasfilled lamps, for six months.

PORT OF LONDON AUTHORITY.—Siemens Electric Lamps and Supplies, Ltd., six months supply of vacuum lamps.

PERTH CORPORATION.—Callender's Cable and Construction Co., Ltd., supply, laying, etc., of l.t. feeder and pilot cables, £3 419.

BRIGHTON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., e.h.t. switchgear for Southwick power station, £24 526.

METROPOLITAN WATER BOARD.—General Electric Co., Ltd. and Stella Lamp Co., Ltd., supply of electric lamps for 12 months.

BATH CITY COUNCIL.—Callender's Cable and Construction Co., Ltd., supply of 1 000 yards of three-core 0.3 l.t. cable, £1 015.

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BEDFORD CORPORATION.—Chloride Electrical Storage Co., Ltd., supply of Exide ironclad battery, for electric vehicle, £188 9s. (recommended.)

HOYLAKE AND WEST KIRBY URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., supply and erection of motor generator and switchgear.

SPALDING URBAN COUNCIL.—John Collier and Son, Ltd. h.t. overhead cable, £640; underground cable, £84; l.t. distribution system, £290.

WEYMOUTH CORPORATION.—Johnson and Phillips, Ltd., supply and installation of mains, switchgear and transformers for supply to rural area, £19 339 16s. 7d.

DEWSBURY TOWN COUNCIL.—Connolly (Blackley), Ltd., cables. A German firm also tendered at £120 less, with an offer of a further reduction by 10 per cent.

SOUTHEND CORPORATION.—Pirelli-General Cable Works, Ltd., 330 yards of 0·1 sq. in. and 460 yards of 0·6 sq. in. cable for the rotaries, in connection with linking-up scheme, £578.

WAR OFFICE.—British Thomson-Houston Co., Ltd., supply of vacuum and gasfilled lamps to Southern Command Stations abroad and chief superintendent of ordnance factories.

LONDON COUNTY COUNCIL EDUCATION COMMITTEE.—Alpha Manufacturing and Electrical Co., Ltd., wiring and fittings for electric lighting, power, bells and telephones at school, £1 149.

ECCLES TOWN COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., supply of house service meters during twelve months. English Electric Co., Ltd., one 350 kVA three-phase transformer, £202.

BRADFORD CORPORATION.—J. Carter, electric lighting installation at Wyke District Baths, £90 17s. 9d.; A. Reyrolle and Co., Ltd., supply of armour-clad switchgear for Valley Road power station.

WEYMOUTH CORPORATION.—Johnson and Phillips, Ltd., supply, laying jointings, etc., of 1 500 yards of 0·12 sq. in., four core, l.t. cable, 16s. 2d. per yard; 500 yards of 0·06 sq. in. four core l.t. cable, 11s. 11d. per yard.

SHOREDITCH (LONDON) BOROUGH COUNCIL.—Electrical Installations, Ltd., electric light installations at 60 tenements at Teale Street, £599 10s.; 67 tenements in Haberdasher Street, £530, and 18 tenements at Ware Street, £370.

CHELTENHAM CORPORATION.—British Insulated Cables Ltd., for cables at schedule prices; Electrical Apparatus Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., and Edison Swan Electric Co., for a minimum of 500 meters each; Ferranti, Ltd., transformers, £815 5s.

WANDSWORTH (LONDON) GUARDIANS.—L. J. Godfrey, wiring, etc., of Balham Library, £169; County of London Electric Supply Co., Ltd., wiring, etc., of Clapham Library, £204; Alpha Manufacturing and Electrical Co., Ltd., wiring, etc., of Tooting Library, £61.

LISBURN ELECTRIC SUPPLY CO., LTD.—W. T. Henley's Telegraph Works Co., Ltd., supply and erection of overhead line between Lisburn and Belfast, and supply and installation of switchboard, transformers, feeder pillars, distributors, house services, meters and cut-outs.

HASTINGS CORPORATION. Stirling Boiler Co., Ltd., supply of an electrically driven boiler feed pump, £298; Ferguson, Pailin, Ltd., l.t. switchgear, £149; and switchboard panel, etc., for Grove sub-station, £885 10s. 6d.; Ferranti, Ltd., supply of transformers and l.t. cubicles for extended supply area. (All recommended.)

BIRKENHEAD CORPORATION.—Macintosh Cable Co., Ltd., supply of high tension mains, £470 13s. 6d., and cables, £1 226; Hackbridge Cable Co., Ltd., cables, £299; £1,226; English Electric Co., Ltd., two sheet iron non-interlocked switchgear cubicles, £219 14s.; British Thomson-Houston Co., Ltd., two truck type cubicles, £202 10s.

HACKNEY (LONDON) BOROUGH COUNCIL.—Troughton and Young, Ltd., re-wiring of lighting and bell installations at Town Hall, £465. (Recommended.) Other tenderers: J. H. Golding, £528 15s.; Hackney Electricity Department, £638; W. E. Westwood, £655; Duncan Watson and Co., £658; H. J. Cash and Co., Ltd., £704; Tyler and Freeman, £709; A. Gordemer, £745.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD.—Callender's Cable and Construction Co., Ltd., and South of Ireland Asphalt Co., underground h.t. feeder network for electricity supply in Booterstown, Blackrock, Monkstown, Sandycove and Dalkey, in the county of Dublin; Handley and Robinson, distribution network in Bray; Thomas May, distribution network in Wexford.

DONCASTER EDUCATION COMMITTEE.—Miller Bros., electric lighting installation at Hyde Park Council School, £219. Also tendered: Colston Electrical Co., Ltd., £384; A. Higginbotham and Sons, £328; Building and Colliery Supply Co., Ltd., £253; F. B. Thorpe, £223; Woodhead Partners, £337; W. Skewes and Co., Ltd., £276; T. Wright and Co., £221; Ketley and Taylor, £242; Wilkinson, Bentley and Co., Ltd., £266; J. W. Hanson and Co., £236.

HACKNEY (LONDON) BOROUGH COUNCIL.—C. V. Buchan and Co., condensing water works, in connection with extension of electricity undertaking, £16 512 19s. 6d. (Recommended.) Also tendered: Mears Bros., £17 924 17s. 4d.; Demolition and Construction Co., Ltd., £17 998 17s. 1d.; Edwards Construction Co., Ltd., £18 244 7s. 6d.; W. and C. French, £18 450 9s.; Geo. Bell and Sons, Ltd., £19 604 8s. 1d.; Walter Jones and Sons, Ltd., £20 442 8s. 10d.; Wm. Press and Son, £22 426 2s. 5d.; Wm. Simms, £23 350; Thos. Muirhead and Co., Ltd., £29 983 17s. 6d.

LONDON COUNTY COUNCIL.—John Baker and Co. (Rotherham), Ltd., 500 driving wheel centres; Metropolitan-Vickers Electrical Co., Ltd., steam jet air ejectors, in place of old turbine-driven air pumps, on two turbo-generators at Greenwich power station, £2 049; Hurst, Nelson and Co., Ltd., steel underframe and body frame structure for the "mainly metal" type of experimental equal-wheeled bogie tramcar for hilly routes, £292 10s.; Haggerty, Lawrance and Co., four electric arc welding machines; Quasi-Arc Co., Ltd., electrodes; Crompton Parkinson, Ltd., four portable motor generators mounted on turn-table trucks; Anti-Attrition Metal Co., Ltd., 800 driving wheel axle box bearings, 800 pony wheel axle box bearings, and 200 complete motor axle bearings; R. C. Cutting and Co., provision of lightning conductors at Hornsey Rise estate, £464.

MANCHESTER CORPORATION.—One year's supply of stores and materials: Cables: British Insulated Cables, Ltd.; Johnson and Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; W. T. Glover and Co., Ltd.; Power and Lighting Cables, Ltd. (manufactured at Berlin); Connollys (Blackley), Ltd.; Hackbridge Cable Co., Ltd.; Macintosh Cable Co., Ltd.; Greenwich Cable Works, Ltd.; Callender's Cable and Construction Co., Ltd.; Siemens Bros. and Co., Ltd.; Liverpool Electric Cable Co., Ltd.; Mersey Cable Works, Ltd.; Metropolitan Electric Cable and Construction Co., Ltd.; Edison Swan Cables, Ltd.; Standard Telephones and Cables, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Ward and Goldstone, Ltd. Weldless-steel lamp columns and fittings: British Mannesmann Tube Co., Ltd.; Bromford Tube Co., Ltd. Street lanterns and globes: Revo Electric Co., Ltd. Electric kettles: Premier Electric Heaters, Ltd. Potential and current transformers: Ferranti, Ltd. Time switches: Venner Time Switches, Ltd. Direct current watt-hour meters: Aron Electricity Meters, Ltd. Single-phase a.c meters: Thompson and Co. (manufactured at Geneva); Landis and Gyr, Ltd. Polyphase meters: Metropolitan-Vickers Electrical Co., Ltd.

## BIG "METRO" CONTRACT.

The Metropolitan Rail Co. has placed with the Metropolitan-Vickers Electrical Co. an important contract covering the supply of thirty motor coaches completely equipped, together with a number of driving trailer equipments.

The new stock will be of the compartment type, and the equipment of each coach will include four 275 H.P. motors, axle-mounted and driving through spur gears. The control gear will be of the electro-pneumatic unit-switch type, arranged for automatic acceleration.

A special feature of the arrangment developed by the Metropolitan-Vickers Co. in conjunction with the designer of the coaches, Mr. G. Hally, chief mechanical engineer of the Metropolitan Railway, is that the whole of the control equipment will be mounted in a special equipment compartment in the body of the coach, instead of underneath. This arrangement has great advantages in facilitating maintenance and inspection work. The whole of the equipment can be inspected under comfortable conditions and the operation of any part watched during service running. With a seven-car train, which has two motor coaches, it is possible to isolate two motors and make any desired adjustments while the train is actually in service, without detriment to the schedule.

The whole of the electrical equipment, including the lighting and heating equipment, will be manufactured by the Metropolitan-Vickers Co., who have placed sub-contracts with the Birmingham Railway Carriage and Wagon Co., Ltd., for the coaches, and with the Westinghouse Brake and Saxby Signal Co. for the air-braking equipments and compressors.

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*TWO views of the new Plymouth branch of the General Electric Co., the opening of which was announced in our issue of last week.*

# BUSINESS ITEMS.

MR. W. A. Francis, electrician, of Beckenham, has removed to 21, Kelsey Park Road.

The Nelson Engineering Co., of Slough, have removed their wireless business to 2, Grove Parade, High Street.

The telephone numbers of the General Electric Co. Research Laboratories, at Wembley, have been altered to Wembley 3162/5.

Mr. Charles Jackson, electrician, of Whitby, has removed his business from 7, Hunter Street, to larger premises at 12, Silver Street.

Frank Gale and Sons have acquired Reading Radio Installations, of 17, King's Road, and the business has been transferred to Friar Street.

Messrs. Shilvock and Son, electrical engineers and contractors, of Rugby, have removed their business from 38, Regent Street, to 197, Railway Terrace.

The Wycombe (Borough) Electric Light and Power Co., Ltd., have removed their offices to 2, Frogmoor, High Wycombe, where a well-equipped showroom for fittings and appliances has been opened.

Automatic and Electric Furnaces, Ltd., inform us that an agency arrangement has been concluded with Alfred Herbert, Ltd., for the sale of Wild-Barfield electric furnaces in Chili, Bolivia and Peru.

Messrs. S. G. Allen and Son, electrical engineers, of Harmer Street, Gravesend, have taken premises in Windmill Street, where offices have been opened by the Corporation Electricity Department, and will remove there on the completion of the necessary alterations.

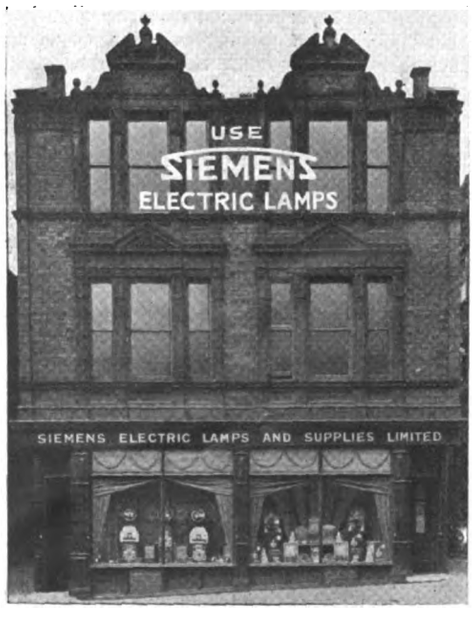
Mr. H. Moss, electrical engineer and contractor, 82, Leeds Road, Bradford, has purchased much larger and more convenient business premises at 178, Manningham Lane, Bradford. We are informed that alterations are now being undertaken to equip the premises as showrooms, offices, stores, and workshops.

The Macintosh Cable Co., Ltd., announce that their Sales and Estimating Departments have been transferred from St. James's House, London, to their works at Ashbourne Road Mills, Derby. Their London sales branch, which is operated by Messrs. Gillespie and Beales, remains at Amberley House, Norfolk Street.

Owing to the extension of their electric power and lighting installation business, Messrs. Gibbs and White, of Southampton, have appointed Mr. H. B. Player as managing director, and the firm have removed their head office to a more central position at 81A, Above Bar. Mr. Player was for nearly 20 years on the staff of Dick, Kerr and Co., Ltd.

The new d.c. switchboard which has been ordered by the Bermondsey Borough Council from Crompton Parkinson, Ltd., is probably one of the largest boards installed in this country of late years. Its function is the control of 10 000 kW of 500 V rotary converter plant for lighting and traction, and, in designing the switchboard, provision has been made for 2 000 kW of extensions. Some new features are being incorporated in the design.

The enterprise of the Porter Patent Safety Seals, Ltd., 7-9, Belfast Road, Stoke Newington, London, N.16, in issuing their catalogues in foreign languages was referred to in these columns some years ago. We now learn that they have just issued a new catalogue of their seals and sealers containing prices in the currencies of the respective countries, in Italian, French, Spanish, Swedish and other languages.




*THE new premises of Siemens Electric Lamps & Supplies, Ltd., in Cateaton Street, Manchester. A general exterior view of the building is given on the left; the other picture shows the trade counter.*

In order to handle more expeditiously the increasing business in the Lancashire, Cheshire and North Wales area, Siemens Electric Lamps and Supplies, Ltd., have moved their branch offices to larger premises at 10 - 12, Cateaton Street, Manchester, where the new telephone numbers are Central 7451 and 7452. The whole of the building is occupied by the company, and comprises well-appointed offices, showroom, trade counter and stores. In addition to Siemens' "Zed" and "Xcel" specialities, all types of B.R.V.M.A. wireless valves will be stocked.

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# IN PARLIAMENT.

## Electricity Supply Bills Passed by Committee and Read a Third Time.

THE Unopposed Committee of the House of Commons has passed the Thetford and District Electricity Bill, which provides for the constitution of the Stretford and District Electricity Board, and proposes to transfer to it the electricity undertakings of Stretford U.D.C. and of the Barton and Urmston Electricity Board. The object of the Bill is to amalgamate the two undertakings. The Bill was read a third time in the House of Commons on July 20th.

The Wessex Electricity Bill has also been approved by the Unopposed Committee of the House of Commons. Its main purposes are to extend the limits of supply of the Wessex Electricity Co. and to increase its capital powers. The companies interested financially in the Wessex Co. are also interested in the companies which hold powers to supply in the areas which are promoting Orders before the Commissioners. The Company has powers to supply for all purposes in areas where there are no authorised distributors. The authorised share capital is £750 000, and it is proposed by the Bill to increase it to £1 200 000. It had already power to borrow to the extent of half the amount of the issued share capital, and, with the consent of the Minister of Transport, to borrow to the extent of a further half of the issued share capital. The Bill was read a third time in the House of Commons on July 20th.

## Replies to Questions.

The following are points from answers to questions in the House of Commons :—

The Minister of Transport will take into consideration the views of the Air Ministry and private flying clubs with regard to the danger that electric transmission poles may present to aviation.

The number of Post Office telephone call boxes on December 31st, 1926, was 21 493, and on March 31st, 1928, 24 054. Receipts from call offices in the year ended March last were £953 400, compared with £881 100 in the year ended December, 1926.

The Minister of Transport has received one complaint relative to the charges made by Electricity Distribution of North Wales and District, Ltd., in the Haslingden area. He has no power to entertain applications for the revision of the maximum charges until December, 1929.

Replies have not yet been received from the Dominions respecting the report of the Committee of the Imperial Conference on Empire Wireless and Cable Communications. The Prime Minister is desirous of having a debate in the House before the House rises, and such a debate will take place.

Some delays, the Minister of Transport understands, have occurred in connection with the initiation of the new signalling and intensive service conditions at London Bridge, but such delays, so far as they are due to electrical faults, are now diminishing. The faults are not likely to be a source of danger.

During the last three years, 268 new guarantees, amounting to £4 994, have been entered into for public telephone call offices in rural districts, and since the respective call offices were opened, the guarantors have been called upon to pay £2 827. The Post Office cannot share the risk, as it is under an obligation to run the service at a profit.

The Central Electricity Board have considered the question of underground cables, and are satisfied that in the present state of knowledge it would be impracticable, on technical grounds, to employ underground cables for main transmission lines of the grid. The Government, in promoting the 1926 Act, were animated with a desire to organise electrical production on the most economic lines.

**£1,500 WORTH OF PRIZES.**

If you will spare one shilling towards the best of charitable causes—the John Benn Hostel for East End Working Boys in Stepney—there is still time for you to win one of the 350 prizes in the Boys' Ballot, organised to raise much-needed funds. A saloon motor car, valuable furniture, trips abroad, gramophones, and a host of other attractive gifts are offered as prizes in this fascinating competition. Tickets 1s. each (book of 11, 10s.), and all particulars may be obtained from the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, 154, Fleet Street, London, E.C.4.

# PERSONAL.

MR. M. S. Mason, of Buxton, has been appointed electrical engineer to Worksop U.D.C.

The Prince of Wales honoured Sir Ernest Benn with his presence on Tuesday night at a private dinner to Colonel House, at Whitehall Court.

Wolverhampton Town Council have increased the salary of the borough electrical engineer, Mr. E. Morgan, from £1 000 to £1 250 per annum, as from August 5th.

Cardiff Electricity Committee has refused an application by Mr. C. G. Morley New, city electrical engineer, for an increase of his salary, which is now £1 250 per annum.

Mr. Robert Burnham, only son of Sir Harry Renwick and the late Lady Renwick, is engaged to Miss Dorothy Mary Parkes, elder daughter of Major and Mrs. Harold Parkes.

London County Council have decided to recognise the special services of Mr. J. K. Bruce and Mr. F. W. Mackinney to the tramways undertaking by grants of £2 000 and £500 respectively.

Mr. T. Rowland, chief assistant at Peterborough Corporation electricity works, who has completed 25 years' service, has also celebrated his silver wedding, and has received a presentation from the staff.

Mr. George J. Rackham has been appointed chief engineer of the Associated Equipment Co., Ltd., as from August 1st next, and will be responsible for the designing, experimental, and research departments.

St. Pancras (London) Electricity Committee recommend that the title of Mr. T. W. Merry, station superintendent, be altered to that of resident station engineer, and that his salary be increased to £650 per annum.

Stoke Newington (London) Electricity Committee recommends the appointment of Mr. W. Forster, district mains engineer in the employ of Hackney Borough Council, as deputy borough electrical engineer of Stoke Newington.

The marriage was solemnised on July 9th at Trinity Presbyterian Church, Birkenhead, of Mr. Arthur James Leyland, electrical engineer, of Winstanley, and Miss Margaret Livingstone Clark, eldest daughter of Mr. J. Clark, of Claughton.

Mr. J. F. S. Ross, head of the engineering department at the Stockport Technical College, has been appointed principal of the Wigan and District Mining and Technical College, in succession to Mr. J. F. Harlow, who has become principal of the Chelsea Polytechnic, London.

Mr. J. C. Thompson, assistant electrical engineer at Sheerness Dockyard, who is leaving to take up a position at Malta Dockyard, has been presented by the staff and employees of the electrical engineering department with a portable gramophone. Mr. Thompson is succeeded at Sheerness by Mr. R. Baillie.

On the occasion of the opening of the Meadow-Head tramway extension recently, Councillor T. Garnett said Mr. A. R. Fearnley, general manager of the Sheffield Corporation tramway and motor undertakings, had received and refused a very tempting offer elsewhere at a much higher salary than his present one.

The special committee on the reorganisation of the Glasgow electricity department, recommend that the new manager, Major H. Bell, although he is over age for participation in the Corporation's superannuation scheme, be accorded the same benefits as he would receive under the scheme. Major Bell has offered to transfer to Glasgow his deposit in the Hull superannuation scheme.

# OBITUARY.

MR. THOMAS CLIFFORD POTTER, draughtsman in Southport Corporation Electricity Department, aged 38 years. He fractured his skull when diving into the sea bathing lake on the previous evening.

MR. LESLIE JAMES DIX, electrical engineer, of Langton Green, near Tunbridge Wells, from injuries received while motor cycling. He was on the staff of the Crowborough Electricity Co.

MR. WILFRED SPENCER GODDARD, European commercial manager of the Western Union Telegraph Co., on Monday, July 16th, aged 39 years. Mr. Goddard, who had been in the company's service about 20 years, had been ill, at recurring intervals, for three or four years, and appeared to have recovered, but, unfortunately, he was recently again seized by illness which terminated in his death.

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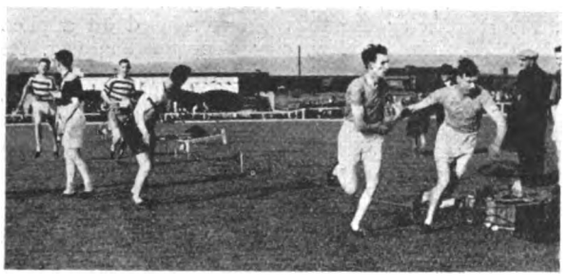
# THE SOCIAL SIDE.

THE Institute of Transport announces that its ninth dinner will take place at the Savoy Hotel, London, W.C.2, on Thursday, March 14th, 1929.

Reading Corporation Tramways defeated Stratfield Mortimer at cricket, the scores being : Stratfield Mortimer, 60 ; Reading Tramways, 88 for six wickets.



**The relay race at the Metro-Vickers, Sheffield, sports, referred to in last week's issue.**

The annual outing of the head office, fitting shop and warehouse staffs of the Welsbach Light Co. was held on July 14th at Hindhead, where lunch was presided over by the general manager, Mr. H. Talbot.

S. Rogers and Co., Ltd., electrical contractors, 15, Fitzroy Street, London, W.1, held their summer outing on July 14th, when a party of twenty-six employees and guests visited Brighton by motor coach. Luncheon and tea were provided at the New Ship Hotel, where surprise gifts, sent by the Union Cable Co., Ltd., were distributed.

The annual sports and children's outing organised by the Yorkshire Electric Power Co., was held on July 7th, at the Thornhill Rectory Grounds. There were 1 200 persons present, and the event, primarily arranged as an outing for the children of the company's staff, also afforded an excellent opportunity for the staff to meet under sociable conditions.

Brookhirst Switchgear Co.'s Athletic Club now has a new sports pavilion, which was opened on the occasion of the annual sports. Mr. J. F. Edwards, president of the club, expressed the thanks of the members to the directors, Mr. Hirst, Mr. Humphreys and Mr. Livesey, for the gift. The various speeches at the opening ceremony were transmitted to the company by wireless.

J. G. Statter and Co.'s annual sports were held on July 14th, at Garden Reach, the residence of Major G. S. Marston. Among many amusing events perhaps the obstacle race—which included the catching of buns suspended from strings—caused the greatest excitement from the spectator's point of view, though it is doubtful if the final competitors were able, with entire comfort, to devour a third bun, since the event followed a substantial tea. Prizes were presented by Mrs. Marston,

**A happy group at S. Rogers and Co.'s Outing.**

after which Mr. Statter proposed a vote of thanks to Mr. and Mrs. Addenbrooke, the donors of a large silver cup to commemorate the birth of their grandson, P. G. A. Marston. The cup is to be held each year by the competitor obtaining the greatest number of points. The holder this year is R. Honour.

# TRADE PUBLICATIONS.

THE June price list has been received from Baxter and Caunter, Ltd.

A new leaflet describing bakelite gears and pinions has been received from Bakelite, Ltd.

Special B filament automobile lamps are the subject of a special leaflet by Philips Lamps, Ltd.

List No. 195, dealing with electric fans, has been issued by Siemens Electric Lamps and Supplies, Ltd.

Pamphlets L/711, L7/22, L/723, and Leaflets G.B./943 and 944 have been issued by Marelli and Co., Ltd. These deal with domestic and industrial fans for a.c. and d.c.supply.

The Mullard Wireless Service Co., Ltd., have published Leaflet V.T.29, describing type S.W.7 silica transmitting valve and V.T.28, dealing with type S.W.6. of the same special series.

A. P. Lundberg and Sons, Ltd., have issued leaflets E1.49, describing 5A, 500 V machine switches, and E1.57, dealing with two per earth and three per earth watertight plug connectors.

The current issue of " Houghton's Radio News," published by Houghton-Butcher (Gt. Britain), Ltd., has been received. One of the special contributions is an article entitled " The Why of the H.T. Battery."

The April issue of the " Kandean Quarterly Review " is now published, and contains a special article on street-lighting. Details of the new Mirrorlite lantern have been published with list No. 1328.

The July issue of the " Volta Viewpoint " contains a good deal of valuable information for retailers on sales methods, window dressing, etc. A feature of this little magazine, which is issued by the Volta Co., at Kern House, 36-38, Kingsway, London, W.C.2, is that it deals with sales problems in a general way, and not merely in connection with the firm's own product.

Bulletin No. 83, published by Oerlikon, Ltd., is mainly devoted to traction apparatus. Particulars are given therein of a new high-speed circuit breaker for locomotives, while oscillograms are reproduced showing the actual switching off process. The same issue also contains results of regenerative braking tests carried out on the trial locomotive, type 2 Bo Bo 2, supplied to the P.L.M. Railway. Two short notices deal with rectifier plant for railway work and centrifugal fans.

The Marconiphone Co., Ltd., have sent us a copy of the 15th edition of the Sterling Telephone Catalogue. The general arrangements have been overhauled and improved and the diagrams brought into line with modern practice and design. It is impossible within the limited space available to quote the numerous new lines and the many price alterations, but mention may be made of the domestic inter-phone Type U.424, tradesmen's service telephones, " Phonopore " telephone and many others.

## ELECTRICAL GOLFERS.

THE annual Golf Competition organised by the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers was held at Woolton on July 18th, when a large entry competed for the G. P. Dennis Trophy and replica, and other prizes which had been presented for competition.

Mr. J. H. Collie, Mr. W. Kirkham, and Mr. P. J. Robinson tied for the G. P. Dennis Trophy with scores of 5 down against bogey. The visitor's prize was won by Mr. A. F. Aaron, with a score of 1 up on bogey. In the first division, handicaps of 13 and under, the first place was tied for by Mr. W. Kerfoot. 78—4=74 ; Mr. J. Mee. 87—13=74 ; and Ald. F. C. Wilson. 85—11=74. In the second division, handicaps of 14 or over, Mr. A. G. Barnard was the winner with a score of 90—14=76. The two-ball foursome was won by Mr. T. S. Boot and Mr. W. Kerfoot with 77—3=74. A putting competition prize was won by Mr. A. S. Owen with a score of 39.

Prof. F. J. Teago, D.Sc., chairman of the Centre, presided at the dinner which was held at the Club House, and proposed the toast of the " Woolton Golf Club " which was responded to by Mr. P. Priestley, Captain of the Club. Ald. F. C. Wilson proposed the toast of " The Institution," and Mr. P. J. Robinson, city electrical engineer, thanked the contractors who had presented the various prizes. Mr. P. N. Rand, on behalf of the contractors, responded to the toast. Mr. G. P. Dennis and Mr. P. V. Hunter brought to the notice of those present the needs of the Benevolent Fund, and pressed for greater support. Their eloquence evidently had the desired effect, for one or two very substantial donations were handed in at the close of the proceedings.

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# ELECTRIC TRACTION.

IN licences recently issued by Edinburgh Corporation to motor 'bus proprietors plying for hire in Edinburgh, and serving the surrounding district, a clause has been inserted to the effect that the licensees shall charge on any of their omnibuses which run alongside or parallel to any tramway route within the city a fare which shall exceed the corresponding fare on the tramways by not less than one penny, and shall not, as regard such tramway route, compete with the tramways by means of the issue of return tickets or of the issue of contract tickets which would have the effect of making passenger conveyance on the omnibuses as cheap or cheaper than passenger conveyance on the tramways.

Birmingham Tramways Committee are not in favour of the introduction of single deck cars, as they consider them likely to increase traffic congestion.

King Haakon recently opened the first underground electric railway in Norway. The underground section, from the National Theatre at Oslo to Majorstuen is 1½ miles in length, and the line extends above ground to Holmenkollen and Frogner-Saeteren.

The L.M. and S. Railway Company announce that large sums are now being spent on improvements at Tilbury station, on the purchase of additional electric rolling stock and on the automatic signalling equipment of the line between Barking and Bow.

"The Financial Times" reports that a scheme for the electrification of a further 682 miles of the Midi railway has been discussed by the railway officials with the French Minister of Public Works. The cost is estimated at 500 million francs, and it is proposed that 190 million should be found by German industry in the form of reparations in kind.

Oldham Tramways Committee have obtained sanction to borrow £1 000 for a new negative feeder in Yorkshire Street.

A special committee has been appointed to inquire into the position of Lytham St. Annes tramway undertaking.

The new electric trains which were brought into use a few weeks ago on the Berlin suburban railways, while attractive in appearance, have not recommended themselves to the Berliners. It is said that the compartments, seats and luggage racks are too small and that the ventilation is not sufficient (see p. 109).

Dundee Tramways Committee have authorised the purchase of 10 new tramcars at a cost of £13 500.

London County Council tramway accounts for the year 1927-8 show a deficiency of £226 211. Charges for interest on and repayment of debt were £251 678 higher than in 1926-7.

Bradford Corporation is purchasing 14 railless trolley vehicles from the English Electric Co. at £1 430 each.

## ELECTRICITY SUPPLY IN WALES.

At a meeting of the North Wales and South Cheshire Electricity Authority last week there were applications for supplies of electricity to the county of Merioneth, Barmouth and district. The appeals for electricity extended from the Menai Straits as far south as Newtown, and as far east as Bickerton, in Cheshire. In each case the Authority decided that the rural areas must await the receipt of the Electricity Commissioners' reply to the Authority's report on the special problem of rural supply. The Authority have recommended to the Commissioners that the supply of electricity to rural areas be pressed forward without delay, that financial assistance on the lines of that allowed for housing and road improvements be granted for the construction of main transmission lines within the rural areas, and that the financial assistance should only be given where developments are likely to become self-supporting within a reasonable period. They have also asked the Commissioners to consider the relaxation and modification of certain onerous regulations in connection with the construction of transmission lines, with a view to cheapening that construction. Mr. Arthur Hewitt, who presided, said Col. C. Leigh and he had interviewed the Commissioners, who promised to try and formulate a scheme of issuing licences on the lines suggested; but in the main, the issue remained in abeyance till a definite reply was available. Mr. Paton, general manager of the North Wales Power Co., said it was the policy of the Company to give unauthorised distributors first option as distributors. With regard to the opposition by Rhyl to the company's proposed overhead lines, Mr. P. Jones, of Rhyl, said the objection was purely on the æsthetic ground. It was agreed that Gen. Legge, representing the Distribution Co., and Mr. Jones should discuss the matter privately.

# WIRELESS NOTES.

## Wireless Beacon Stations in and around the British Isles.

THE installation of wireless beacon stations at suitable places round the coasts of the British Isles is proceeding rapidly. The Marconi Co. have already erected six stations which are now in operation, and work is proceeding on seven

A wireless window specially appropriate for the holiday season.

more. Among those stations now in operation, the Mersey Bar, Coningbeg, and Spurn are on lightships, while those at Skerries, Round Island, and Casquets are on land. The next seven stations to be erected, and for which apparatus is now being constructed, are at Start Point, Lundy Island, Sule Skerry, Dungeness, South Bishop, Kinnaird Head, and Cromer. Beacon transmitters are projected also for Tory Island and Mizen Head. One of the great advantages of the system of position finding in which a beacon station is used in conjunction with a direction finder on board ship, is that the beacon can be installed in any position, as it does not require a fixed zero point. This makes it particularly suitable for lightship installations, and allows navigators to lay off their wireless bearings on familiar points on the chart. Another advantage is that the determination of bearings is under the direct control and supervision of the navigating officer, who otherwise has to be satisfied with his position as given by a shore direction-finding station on request.

Major and Mrs. Court-Treatt, the explorers, who have gone out to one of the least known parts of the Western Sudan, to make two instructional films, have with them a specially designed Marconi transmitting set, the power for which is supplied by a hand generator. Starting in about a fortnight's time, Major Court-Treatt will transmit every Sunday evening between the hours of 6 p.m. and 8.30 p.m. (G.M.T.). His call will be FXCT, and the wavelength 30 metres (approximately).

## Wireless News in Brief.

A wireless telephone service has been opened between Switzerland and North America.

The Maidenhead Radio Co. supplied the Marconi public address outfit which was used at the Berkshire Constabulary athletic sports last week.

Members of the Foreign Press Association in Holland had a conversation by wireless telephone with foreign journalists in Batavia, Java, last Sunday.

A Canadian Commission is to be appointed to inquire into the question of broadcasting. The Commission will visit Great Britain and France to inquire into the working of the national system.

The president of the Victor Talking Machine Co., who returned to New York in the "Olympic" last week, states that a merger of his company with the Radio Corporation is very likely, but it will probably be several months before the plans for the amalgamation are completed.

Wireless broadcast receiving equipment for passengers will be one of the features of the "Lady Nelson," the twin-screw steamer which was launched at Birkenhead last week, for the Canadian National Steamships' Canada-West Indies service. Leads will be provided in all public rooms of the ship, and it will be possible to plug in loud speakers as desired. Similar equipment is to be installed in four more ships which are being built at Birkenhead for the Canada-West Indies service.

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# ELECTRICITY SUPPLY.

## Barmouth's Proposed Electricity Undertaking—Progress of Bridport Scheme—By-Pass Canal to Kirkstall Power Station—Bulk Supply for Gainsborough—Report of South-West Midlands Electricity Board.

BARMOUTH U.D.C. intend to apply for authority to establish an electricity supply undertaking.

Boston Board of Guardians have under consideration the lighting of the infirmary and chapel by electricity.

Sanction to borrow £23 891 and £17 109 for plant has been obtained by the Bermondsey (London) Borough Council.

Oxford Housing Committee have not approved the suggestion that the new Council houses shall be wired for heating by electricity.

Walton-on-Thames T.C. have asked for sanction to borrow £20 000 for electrical development work. Negotiations regarding the supply to Weybridge have taken place.

The agreement for the purchase by Cape Town Corporation of the Simonstown electricity undertaking and the supply to consumers within that municipality by the Council has now been signed.

Battersea (London) Electricity Committee are to provide electricity services to 38 premises at a cost of £352 5s., and to extend mains for private services at a cost of £1 178, and for public lighting, £319.

Annan T.C. have consented to the inclusion of the burgh in the area of supply specified in the application of Dumfries County Council for an Order to supply electricity in the county outside the burgh of Dumfries.

The Bridport Electricity Order has now passed both Houses of Parliament, and the Electricity Committee have instructed Mr. Hood to prepare specifications and invite tenders for the necessary plant and works.

Stratford-on-Avon T.C. have decided to ask the Stratford-on-Avon Electricity Co. to reduce their charges for electricity by 2d. per kWh, and, in case of refusal, the Council will apply to the Ministry of Transport regarding the matter.

A resident in Chalk has asked Gravesend Electricity Committee if the electricity supply area will be extended so as to include the parish. The Committee have replied that they will not consider any further extension until powers are obtained to supply Denton.

Exmouth Council recently decided to write to the Minister of Transport asking him to use his influence to secure a reduction of the Electric Supply Corporation's charges in the town to the prices in force before 1923, viz., 7d. for lighting and 3d. for power.

Oxford Electricity Committee recommend the City Council to exercise its right to purchase the undertaking of the Oxford Electric Co. and that application be made to the Electricity Commissioners for their consent to the purchase and the service of the necessary notice on the company.

Eston U.D.C. Electricity Committee have fixed the following terms for hire purchase of electrical appliances:—2 pint kettles, price £1 10s., deposit 5s., balance, 2s. 1d. per month; 3 pint kettles, price £2, deposit 5s., balance, 2s. 11d. per month; 5½ lb. electric irons, price 17s. 6d., deposit, 2s. 6d., balance, 1s. 3d. per month.

At a meeting on July 19th, the Mid-Lancashire Electricity Advisory Board confirmed a resolution that the South-East Lancashire and Mid-Lancashire Electricity Boards be requested to call a conference of representatives of owners of selected stations to consider whether there is a *prima facie* case to form an association of owners of such stations.

Mr. F. Gordon Tucker has held an inquiry, on behalf of the Ministry of Transport, into the application by the North Somerset Electric Supply Co. for compulsory wayleaves for erection of poles across private land in the parish of Worle. A visit was paid to the land in question, and the inspector announced that the owners, Messrs. G. and H. King, had agreed to settle the matter.

The new electricity works of Oldham Corporation at Chadderton will be finished and ready for generating energy by about the end of October. Nearly all the machinery is now in position, including the three 12 500 kW alternators, the major portion of the switchgear has been erected and is being connected up, four boilers are ready for pressure testing, and good progress is being made with the erection of the remaining four.

Ald. Lupton, chairman of the Kirkstall Generating Station Sub-Committee of Leeds Corporation, formally opened, on Monday, a new loop from the Leeds and Liverpool Canal which will enable barges to unload coal at the generating station and afterwards pass round the loop back to the canal. The by-pass canal is 300 ft. in length and 50 ft. in width, and accommodation is provided for the unloading of 15 barges at one time. (See p. 109).

London County Council have had under consideration an application by Marylebone B.C. for consent to the adoption of an a.c. distribution system at 240 and 415 V. In view of the desirability of the pressure of electricity supply becoming uniform over the whole of London, the County Council have asked that the application be amended so as to provide for pressures of 230 and 400 V, the pressures recommended by the Electricity Commissioners.

Mr. Turner, in moving adoption of the Electricity Committee's minutes, at a recent meeting of Whitehaven T.C., said they had received a communication from the Electricity Commissioners with regard to the North-West England electricity scheme. Whitehaven, he said, was one of the few places where electricity was generated at less cost than that at which the Board could offer it. The electrical engineer and town clerk were to interview the Electricity Commissioners.

Gainsborough U.D.C. have approved of an agreement between the Yorkshire Electric Power Co. and the Council, providing for a bulk supply of electricity. The Council will continue to operate their own generating station, but will purchase from the company, with the sanction of the Electricity Commissioners, electricity required over the output of the Gainsborough station. The terms agreed are such as the Council cannot hope to improve upon by adding further plant to their own station.

Swansea Electricity Committee are to extend mains, at a cost of £4 000.—The borough electrical engineer has reported that he will be laying public lighting mains at St. Thomas, and the Electricity Committee have agreed to his recommendation that, at the same time, an additional feeder duct to meet future requirements shall be laid, at an estimated cost of £300.—The Amman Anthracite Collieries, Ltd., have applied for a supply of electricity in bulk to the Amman Colliery, and it has been decided to give a supply, the capital cost being £2 625.

Stoke Newington (London) have decided that £1 344, the profit on the electricity undertaking for the past year, be appropriated towards expenditure on meters, free wiring installations, and house services.—The Electricity Committee have decided to extend mains at a cost of £446, to replace feeder pillars at a cost of £270, and to instal free wiring in 53 cases, to cost £533.—The terms of the agreement with Hackney Council for the supply of electricity in bulk to Stoke Newington have received the approval of the Electricity Commissioners and the London and Home Counties J.E.A.

In regard to the transfer of the Birchills generating station from Walsall Corporation to the West Midlands J.E.A., the Electric Supply and Finance Committees report that the purchase price of the undertaking was fixed at £154 191, of which a balance of £4 191 is still outstanding. Out of the purchase consideration £57 920 is to be placed to the consolidated loans fund, £90 228 to the electricity loans sinking fund, and £6 041 applied to reimbursement of overdraft at bank in respect of capital expenditure. The surplus received above the amount required to liquidate the outstanding debt on the assets transferred is £28 860, and that sum has been utilised to reduce the outstanding debt on other assets of the undertaking.

The Advisory Joint Committee of the South-West Midlands Electricity Board state, in their annual report, that the district over which the Committee exercises jurisdiction comprises an area of upwards of 1 300 square miles. The total generating plant capacity installed in the power stations of supply authorities in the district amounts to 243 078 kW. There has been a much lower consumption of fuel per kWh generated, the improvement being 17½ per cent. Some 20 small towns and villages in Worcestershire and Warwickshire have been afforded supplies during the year where previously supplies were not available. There has been an increase of 21 per cent. in the number of consumers, and a 20 per cent. increase in the quantity of current sold. Electricity sold was equal to 228 kWh per head of the population, compared with 191 in the previous year.

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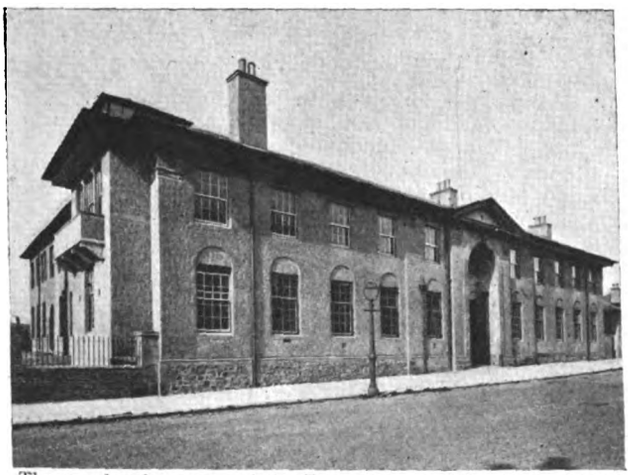
# NEWS IN PICTURES.

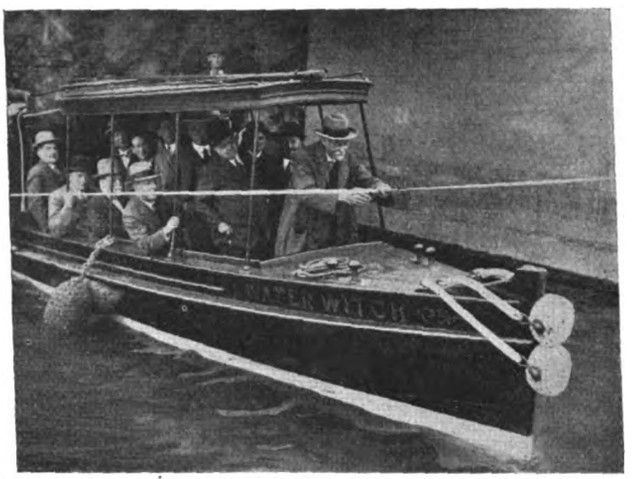
This new-type instrument, with receiver and transmitter in one unit, is proving popular with American telephone subscribers.

Effective lighting from recessed units is a feature of the new Holland tunnel connecting New York and New Jersey.

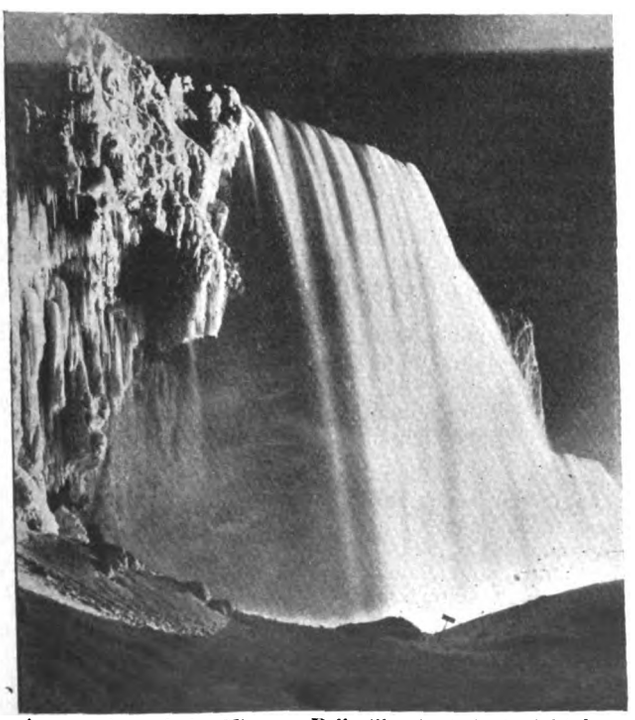
A train on Berlin's newly electrified railway. Passengers complain of insufficient ventilation and space in these vehicles.



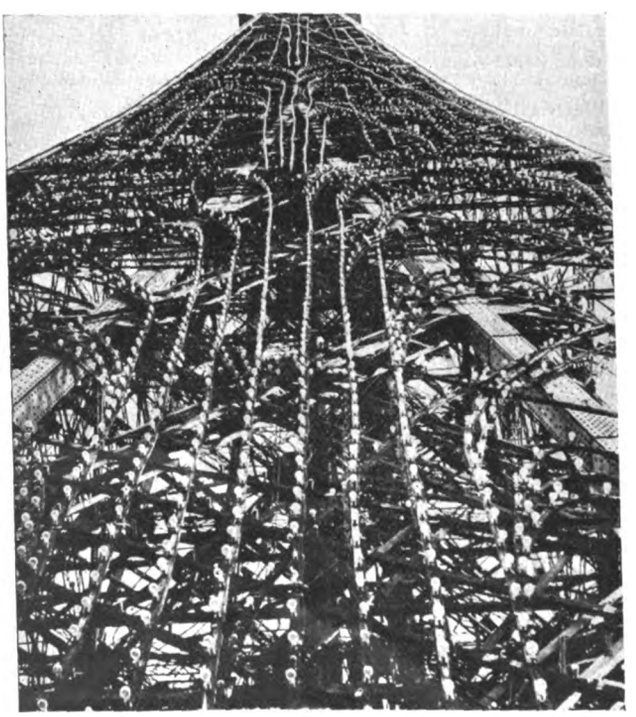
The new headquarters of the Tyne Electrical Engineers (R.E.), opened last Saturday by Major-General C. A. Ker.



Ald. Hugh Lupton formally opening a loop canal to Leeds Corporation's Kirkstall Generating Station.



A new view of the Niagara Falls illuminated at night by a battery of twenty-four 36 in. medium intensity arc searchlights. The Falls will be visited by delegates to the International Illumination Congress in September.



A remarkable picture taken from a position towards the base of the Eiffel Tower in Paris, showing some of the many thousands of electric lamps which are used to illuminate the famous Tower at night.

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# COMPANY NEWS.

## Wireless and Cable Securities Still Rising—New Electrical Finance Corporation in Holland—Progress of Telephone Manufacturing Co.—Eastern Telegraph Group and West Indies Cables.

WIRELESS and cable securities have been a stronger market. Marconi's have regained the half-crown shed last week, and Eastern Telegraph ordinary stock is up to 250. In the manufacturing section, British Insulated Cables are 2s. 6d. higher at 85s., and Ever Ready shares have improved 1s. 6d. to 27s. 6d. Metropolitan Vickers ordinary shares have weakened. London and Suburban Traction "A" debenture stock at 81 is 3 points up., and Central London Railway 4 per cent debenture stock is 2 down. West Riding of Yorkshire Tramways ordinary shares have fallen from 7s. 6d. to 5s

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/- | 38/6 | 68/6 | 14/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/- | 23/- | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1).. .. | 27/- | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 47/6 | 48/9 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 25/7½ | 26/1½ | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23 - | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 28/- | 28/- | 62/- | 22/- |
| 1/4½ | Shrops,Worcs&Staffs PowerB.Ord. | 31/6 | 31/6 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/6 | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6 | 34/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 124 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 126 | 125 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. | 80 | 82 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 75½ | 75½ | 84 2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 79 | 79 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 81 | 78 | 89 | 65 |
| 4 | Lon. Un. Trams. 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69½ | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 68 | 68 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 75½ | 75½ | 66½ | 12½ |
| 4½ | ,, ,, 4% 1st Pref. .. | 82½ | 82½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 140/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/- | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5 - | 7/6 | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18 1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 85/- | 82/6 | 80/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/1½ | 23/1½ | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/3 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb... | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 83/9 | 83/9 | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. .. | 25/- | 25/- | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 10/- |
| — | English Elec. Ord... .. .. | 8/1½ | 8/1½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/7½ | 20/7½ | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/6 | 26/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 10/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 30/3 | 30/3 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 22/6 | 22/6 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 30/7½ | 31/10½ | 37/- | 13/1 |
| 8 | ,, ,, 8 C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 50/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½* | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 77½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 250 | 242 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 64½ | 64½* | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25 | 23½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 66 3 | 63/9 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 50 - | 50/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25 | 23½ | 23 | 11/3/0 |

(*a*) 1s. 7$\frac{7}{8}$d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 9·12d. (*g*) 1s. 7·223d. ‡Including 1s. bonus. *Ex dividend.

MATHER AND PLATT, LTD.—Intm. div. 5 p.c. actual, tax free, (last year same).

CHELSEA ELECTRICITY SUPPLY CO., LTD.—Intm. div. 4⅛ p.c. (same as last year).

ELECTRICAL FINANCE AND SECURITIES CO., LTD.—Intm. div. 4 p.c., less tax (agst. 5 p.c.) declared.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Intm. div. 4⅛ p.c. (same as last year).

TORQUAY TRAMWAYS CO., LTD.—Intm. div. 4 p.c., tax free, on ord. shs. (same rate as last year) will be payable on Aug. 15.

HERBERT MORRIS, LTD.—Div. for half year to July 31, 1928, has been declared on 6 p.c., less tax, and 5 p.c., tax free, cum. pref. shs.

TOTTENHAM DISTRICT LIGHT, HEAT AND POWER CO.—Divs. on pref. stks. at 8 p.c. p.a. on A stk., and 6½ p.c. p.a. on B stk., for half yr. to June 30th, 1928, payable less tax, Aug. 10.

EDMUNDSON'S ELECTRICITY CORPORATION, LTD.—Net pft. for year ended March 31, 1928, £125 083, plus £24 305 brt. in. Fin. div. on ord. shs., 6 p.c. To res., £40 000. Fwd., £39 388.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Div. at rate 6 p.c. p.a. for 6 mos. to June 30th, 1928 (= 3s. p. sh.), less tax, on pref. and intm. at rate 8 p.c. p.a. (=9·6d. p. sh.), less tax, on ord. shs. announced.

FINANCE CORPORATION FOR ELECTRICAL ENTERPRISES.—This co. has been formed in Amsterdam, for the purpose of financg.controllg and participatg in electrical enterprises. The cap. is 10 000 000 florins (about £834 000). Amongst the cos. participatg is the Electrical Co. Lahmeyer, of Frankfort.

WESTERN UNION TELEGRAPH CO.—Gross rev. for six months ended June 28, 1928, $67 066 225, agst. $65 961 326 for correspondg. six months of 1927. Blce., after provision for total exes., $9 080 950, agst. $9 115 734. Deductg. int. on bonded debt, $1 802 245, agst. $1 793 648, net income is $7 278 705, agst. $7 322 086.

AUTO ELECTRIC DEVICES, LTD.—Announcement published to conform with Stock Exchange regns. state that co. has been formed to acquire buss. of J. and C. Manufacturing Co., Ltd., Brighton, and to develop an automatic self-winding electric motor for use on gramophones and of type used for many domestic and industrial purposes.

BURNDEPT WIRELESS, LTD.—Further circular issued by co. states one of condns. of reconstruction scheme is that entire 600 014 ord. shs. proposed to be issued shall be underwritten. Colegrave and Co. have agreed this. Capt. Horridge, the largest shldr. has agreed to support the scheme, and is willing to join board of new co. If scheme does not go through and there is consequent forced liquidation, no prospect of sh. hldrs. receiv. any distribution.

DELHI ELECTRIC SUPPLY AND TRACTION CO., LTD.—The scheme for consolidating the sh. cap., referred to at last annual mtg., has been carried into effect, and appears to have proved of advantage to both classes of shhldrs. Rpt. for 1927 states that ltg. and tramway undertakgs. show net rev. £49 639, compared with £49 540; and pft. for year, includg. int., etc., was £50 583, agst. £49 707. To gen. res., £15 000, to depreciatn. and renewals, £7 000; res. for taxatn., £8 000, employees providt. fd. and bonuses £1 000, blce. £19 583. Div. of 12 p.c., less tax, for year recommended; fwd. £1 583.

EASTERN AND WEST INDIES CABLES.—The Eastern group of cable companies have acquired the shares of the Direct West India Cable Co., which controls the Halifax and Bermudas Cable Co., the Cuba Submarine Telegraph Co., and the West India and Panama Telegraph Co. These companies have an aggregate issued capital of £1 723 303. They own numerous cables connecting a number of islands in the West Indies with Canada, Cuba, British Guiana and Panama, and they have agreements for interchange of traffic with the Commercial Union and Western Telegraph systems. Wireless stations at Bermuda and Jamaica have been established by them recently.

NEW GENERAL TRACTION CO., LTD.—Rev. for year ended March 31, 1928, £13 595 (agst. £12 705). Pft., £11 695 agst. £10 616, plus £872 brt. fwd. After applying £2 000 to writing down investmts., div. of 4½ p.c. is recommended. Fwd.,

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£1 136. Douglas Southern Electric Tramways went into vol. liquidatn. on May 23. A first and final div. in respect of assets, amtg. to 3s. 2½d. for each pref., and each ord. sh. has been received by New General Co. Since date of balance-sheet Co.'s hldg. of shrs. of Darby Media and Chester Street Railway Co., Philadelphia, has been reduced to $520 000 by sale of 3 500 shs. of $50 each nom. Directors have prepared scheme for transformg. business of co. into that of an investmt. trust. This embodies reductn. of the existg. sh. cap. from £262 000 to £163 750 and subsequent increase of nom. cap. to £600,000, of which £136 250 will be offered to shldrs. in shs. of 12s. 6d. each, to be subscribed for at 13s.

## Company Meetings.

KALGOORLIE ELECTRIC TRAMWAYS, LTD.—Mr. C. C. Baker, presiding at the recent meeting, said the net profit for the past year, before charging depreciation, was £4 300, compared with £4 223 in 1926. A new company was being formed to take over the Golden Horseshoe mine, and working capital to the extent of £100 000 was to be provided. The chairman of, North Kalgurli, Ltd., which had acquired the mining properties of the Oroya Links, Ltd., was also visiting Kalgoorlie in order to make arrangements for work on a large scale to be commenced in the near future. Such excellent news was likely to alter the whole outlook of the district. The pastoral industry, indirectly interested them, inasmuch as it brought a certain number of people to Kalgoorlie. The sheep owners had had good seasons and were obtaining good prices for their wool, and they were still improving their estates and importing more sheep. The report and accounts were adopted.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Mr. Miller Lash, presiding at the meeting in Toronto last week, called attention to the satisfactory results from operation for the first six months of the present year and to the general expansion of the business through the acquisition of additional electrical enterprises. The Palmeiras automatic telephone exchange in Sao Paulo, he said, was opened on July 13th, and an order had been placed for the equipment of the third unit for the Parahyba development. Business conditions in Brazil showed signs of improvement. Owing to the issue of new capital at the commencement of the present year, the number of shareholders had considerably increased.

TELEPHONE MANUFACTURING CO., LTD.—Mr. F. T. Jackson, presiding at the meeting last week, said the British Installation Companies had made good progress in the face of considerable competition. The company's gross profit increased during the past year from £70 029 to £77 563, and the disposable balance of net profit was £41 473, compared with £33 028 at December, 1926. The capital of their Australian subsidiary had been increased to £150 000, of which £100 000 was in ordinary and £50 000 in 8 per cent. cumulative preference shares. It was their intention eventually to dispose of the preference shares to investors in Australia and to retain control of the company through the ordinary share capital. In this way they would be able to turn some of their investments into cash when so desired without losing the benefit of the connections they had established there. In view of the profits now being earned by the Australian company and the sound security behind the preference shares, they should form a very sound investment and appeal readily to local investors. The company had had a successful year, having made a profit of £10 929 before charging income tax and local managers' commission. Their Australian business acted as a very useful link between themselves and the Australian Post Office for the supply of telephone apparatus. They had taken in hand the reorganisation of the capital of the companies in Paris and Brussels, as the currencies were now stabilised. It seemed to him that the policy of the Government in not granting some form of protection for all manufactured goods a very short-sighted one. Applications for protection under the Safeguarding of Industries Act would be useless and waste of time, as the experience seems to be that the Board of Trade almost go out of their way to find excused for turning these applications down. New work was scarce during 1927, and they found it very difficult to secure additional manufacturing contracts during the last six months of the year. This was due to curtailment of the Government programme for financial reasons. The business secured during the first six months of this year showed a great increase over orders secured during the first six months of 1927. In spite of cut prices, they were able to manufacture most articles at a lower cost than their competitors, and this reduction in prices had been made while they were still using raw material of British or Imperial origin.

SUNGEI BESI MINES.—At the annual general meeting held in London on July 11th, Mr. C. V. Thomas, chairman, said with regard to the hydro-electric scheme being developed by the company, that the machinery in the lower power station has been completed, and it is expected that the current will soon be brought to the mine. Before, however, the lower station can be put in full operation, the upper station must be completed, which it is anticipated will be by the end of this year. When completed the power station is expected to develop about 1 400 kW, about one-half of which will be required for mining purposes and the balance of power will be available for sale. If, as is anticipated, there are demands for all the surplus power, a revenue should be received from the sale to give a fair interest on the whole capital expended on the power station, and, if so, then the power available at the mine will cost practically nothing. It is hardly possible to overestimate the importance of Sungei Besi of cheap power from the hydro-electric station, especially as the company have extended mining operations to the Sungei Besi village area, in no part of which have they yet undertaken any mining. The profit for the year was £35 628 11s. 9d., and the balance brought forward £36 136 10s. 1d., making a total credit of £71 765 1s. 10d. The report and accounts were adopted.

## New Companies.

BRITISH MILLER HYDRO CO., LTD.—Cap., £5 000. Refrigerating, electrical and general engineers, etc. A director: L. H. Wise, 10, Great Tower Street, London, E.C.3.

SHEPPERTONS, LTD.—Cap., £1 000. Agents for and dealers in electrical fittings, wireless cases, etc. Reg. office: 28, Shepperton Road, New North Road, London, N.1.

BRITISH BATH CO., LTD.—Cap., £60 000. Metal founders, electrical and general engineers, electricians, etc. Reg. office: Corporation Road, Audenshaw, near Manchester.

MARTINDALE ELECTRIC CO., LTD.—Cap., £200. Manufacturers of or dealers in electric motors, electric motor maintenance, accessories, etc. Solicitor: L. F. Crane, Bush House, Aldwych, London, W.C.2.

JONES AND SPENCER, LTD.—Cap., £3 000. To acquire business of "Jones and Spencer," and to carry on business of electrical and general engineers, etc. Reg. office: Wilton Road, Erdington, Birmingham.

AUTO ELECTRIC DEVICES, LTD.—Cap., £50 000. Manufacturers and exporters of and dealers in dynamos, generators, accumulators, batteries, etc. Solicitors: Herbert Smith and Co., 62, London Wall, London, E.C. (Public Co.).

"S.X." COIL WINDING CO., LTD.—Cap., £500. To acquire electrical and wireless repairs business carrried on by L. J. Davis at Leigh-on-Sea. Reg. office: R. H. P. Garage, Fleming Avenue, London Road, Leigh-on-Sea.

BELGIAN FINANCE CO., LTD.—Cap., £500 000. Issuing house for shares and other securities of companies, manufacturers of electricity for light and power, etc. Reg. office: 3, London Wall Buildings, London, E.C.2. (Public Co.).

BRITISH ELECTRICAL REPRODUCTION CO., LTD.—Cap., £600. To acquire from A. B. Calkin and C. Berrage-Moulton, certain patent rights, electrical reproducers and stock, and to carry on business of manufacturers of and dealers in electrical and other mechanical reproducers of sound, etc. Solicitors: F. P. Woodcock, 5, Holborn, London, E.C.1.

DAVIS BENNETT AND CO., LTD.—Cap., £3 500. To acquire business carried on at Westminster Sanitary Works, Horseferry Road, Westminster, S.W.1 as Davis Bennett and Co.; to carry on business of electrical and general engineers, manufacturers of and dealers in electrical fittings, etc. Reg. office: 10A, Newman Street, Oxford Street, London, W.

LONDON CLINIC AND NURSING HOME, LTD.—Cap., £250 000. To build, equip and manage a modern medical clinic and nursing home, between Harley Street and Devonshire Place, London, with 175 beds, accommodation for radium, X-ray, artificial sunlight, and other treatment, baths and research work is contemplated. Reg. office: 411–19, Salisbury House, London, E.C.

ELEKTRA PORCELAIN CO., LTD.—Cap., £3 500. To acquire business of electrical porcelain, china and earthenware manufacturer carried on by W. T. Baxter at Edensor Works, Edensor Road, Longton, Staffs, as "Elektra Porcelain Co." C. L. Baxter, "Glengarry," Blythe Bridge, Staffs, earthenware and porcelain manufacturer. Qualification: £100 shares. Remuneration: as fixed.

ELECTRAMONIC (FOREIGN RIGHTS) LTD.—Cap., £100 000. To acquire exclusive licence for the whole world, except the British Isles, to use, exploit and develop all inventions owned by the Electramonic Co., Ltd., to carry on business of manufacturers of and dealers in television apparatus, electrical and wireless apparatus and accessories, etc., and to adopt an agreement with Walden Syndicate, Ltd. Reg. office: 1, Budge Row, London, E.C. (Public co.)

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# EASTERN TELEGRAPH CO., LTD.

## Regenerator now in Use on all Main Circuits—The Wireless and Cable Merger—Purchase of Controlling Interest in Direct West India Cable Co.

THE 97th ordinary general meeting of the Eastern Telegraph Co., Ltd., was held on Tuesday, at Electra House, Moorgate, London, Sir John Denison-Pender, G.B.E., K.C.M.G., chairman of the company, presiding.

The chairman said: The gross revenue for the year under review amounted to £3 306 909, against £3 436 690 in 1926, or a decrease of £129 781. The year's working resulted in a profit of £947 926, against £1 097 961 in 1926, showing a reduction of £150 035. We have placed £150 000 to the credit of the general reserve fund, and, for the ninth year in succession, have paid a dividend on our ordinary stock of 10 per cent., free of income tax, while the amount now carried forward is increased by over £19 000, and amounts to the substantial sum of £525 765.

During the period under review, the company's system has been maintained in a high state of efficiency, and the installation of the regenerator, to which I referred last year, has been completed on all main line circuits. A device by means of which an automatic watch is kept at the relay stations has been patented and put into use, enabling us further to reduce staff previously employed on this duty.

To-day we reach the 97th milestone on the road of progress in connection with this company, it being our 97th ordinary general meeting. It was in 1872 that the Eastern Company was incorporated by the amalgamation of four small companies: The Anglo-Mediterranean, The Marseilles-Algiers and Malta, the Falmouth-Gibraltar and Malta, and the British Indian Submarine. This was the origin of our present company, and the inception of British submarine cable enterprise throughout the Empire and the world. The road has been marked by continued progress and consistent policy, to the advantage of the Empire and of all concerned; difficulties, of course, have been encountered, and there have, indeed, also been many periods of anxiety, but the vast web of submarine cables which is now spread over the world, and particularly within the Empire, is due in no small measure to the enterprise and foresight of those connected with the inception of this undertaking, whose wise administration and prudent financial policy has been, and is still being, consistently carried out.

It was in 1902 that the Governments first entered into active competition with these companies by laying a cable across the Pacific, and last year in April, July, and September respectively, further competition with us was established by beam systems of wireless between this country and Australia, the Cape and India, the fields of our larger sources of business. These beam services, working at lower rates, attracted a considerable amount of traffic of certain classes from our system; but I repeat what I said at a recent meeting of the Globe Telegraph and Trust Co., that "The Eastern and Associated Cable Companies still continue to carry both a much larger volume and value of traffic than the Government wireless services between the respective countries where they are in competition, and this in spite of the materially lower wireless rate. It is clear, therefore, that the cable still holds a definite and important part in the communications of the world; at the same time we cannot afford to lose the traffic which the wireless at the lower rate takes away from our system."

The chairman next referred to the negotiations with the Government and the merger with the Marconi Co.: This matter, he said, is still in the hands of the Government, but I have every hope that in the near future we may be able to announce a satisfactory conclusion to these negotiations. In anticipation of this, and in order to complete the scheme, we have purchased the controlling interest in the Direct West India Cable Co., which company in turn controls the Cuba Submarine Telegraph Co., the Halifax and Bermuda Cable Co., and the West India and Panama Telegraph Co. This group of companies owns 8 000 miles of cable, has twenty-two cable stations operating throughout the British West Indies, and owns wireless stations in addition at Bermuda and Jamaica, which have recently been installed. These companies will eventually be brought in under the merger, and so complete the whole system of cables and wireless in the West Indies, both owned or controlled either by the British Government or British companies.

If the anxious time through which we have passed—and it has been an anxious one—results in the formation of a large merger company, comprising the whole of the overseas telegraphic communications of the Empire, whilst maintaining our connection with foreign countries, with suitable protection for the public in the matter of rates, and a reasonable return on the invested money, coupled with a mobility and efficiency of service unsurpassed, one of the greatest advances in British commercial enterprise will have been achieved. Moreover, the compromises which may have been made on the part of all those interested and connected with this merger in order to bring it to a successful conclusion, will have been worth while if they enable the great British Commonwealth to maintain the predominant position which she has hitherto occupied in the world's telegraphic communications, and which, in the future, can only be maintained by the joining up of interests as now proposed.

The accounts were adopted, and the dividends approved.

## ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* GEE AND CO., *Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

*Opposition to the registration of the following Trade Marks can be lodged up to July 27th.*

JACELITE. 480 370. Class 50. Condensation products of formaldehyde or casein, and thermo-plastic and thermo-setting products, sold in slabs and sheets, and articles made from such products, or from wood, or from mica, or from other non-electrical conducting materials, viz., non-current conducting or insulating parts and accessories of switches, cut-outs, fuses, plug-and-socket couplings, connectors and adapters, bell-pushes, cord-grips, wiring conduits, wall-boxes, fuse-boxes, ceiling-roses, lamp-holders, and cord-knobs, such as used in electric lighting, heating, signalling, and power installations; and packing boxes and cartons made of paper, cardboard or wood. J. A. Crabtree and Co., Ltd. May 6th, 1927. (To be Associated, Sect. 24.)

CRABTREE. 484 050. Class 50. Articles (not included in other classes) made from condensation products of formaldehyde or casein, or from thermo-plastic or thermo-setting products, or from wood, or from mica, or from other non-electrical conducting materials, namely, non-current conducting or insulating parts and accessories of switches, cut-outs, fuses, plug-and-socket couplings, connectors and adapters, bell-pushes, cord-grips, wiring conduits, wall-boxes, fuse-boxes, ceiling-roses, lamp-holders, and cord-knobs, for use in electric lighting, heating, signalling, and power installations; and packing boxes and cartons made of paper, cardboard or wood. J. A. Crabtree and Co., Ltd. September 16th, 1927. (To be Associated, Sect. 24.) Advertised before acceptance, the applicants alleging distinctiveness.

## METAL AND CHEMICAL PRICES.

TUESDAY, July 24th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 10 0 | — | — |
| Electro Wirebars | ,, | £69 5 0 | — | — |
| H.C. Wires, basis | per lb. | 9 15/16 d. | — | — |
| Sheet | ,, | 10 1/4 d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0 15/16 d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2 d. | — | — |
| Sheet ,, | ,, | 9 5/8 d. | — | — |
| Wire ,, | ,, | 9 7/8 d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £22 0 0 | 5s. | — |
| Foreign or Colonial | ,, | £20 17 6 | 10s. | — |
| *Tin*— | | | | |
| Ingot | per ton | £216 2 6 | £5 12 6 | — |
| Wire, basis | per lb. | 2s. 10d. | 1d. | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 12 6 | 2s. 6d. | — |
| *Mercury* | per bottle | £21 0 0 | — | 7s. 6d. |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2 1/2 d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3 1/4 d.
*Rubber*—Para fine, 11 1/2 d.; plantation 1st latex, 9 1/8 d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALPHIAN WIRELESS, LTD., 99, Mortimer Street, W. £12 17s. 5d. June 19th.

BARNETT, Mr. T., 622, Mansfield Road, Sherwood, electrical contractor. £23 17s. 3d. June 14th.

BRIDGE SERVICE DEPOT, 217, Easton Road, Bristol, electricians. £27 11s. 3d. June 19th.

BURVILL, —, Cheriton, radio engineer. £13 0s. 8d. May 23rd.

CARTER, Horace S., 14, St. Alban's Road, Colchester, wireless dealer. £17 3s. 8d. June 12th.

EDWARDS, Mr. G. J., 236, Central Market, Cardiff, wireless dealer. £11 2s. 10d. June 11th.

GARDINER, Mr. W. E., Gwydir Chambers, 104, High Holborn, electrical engineer. £26 11s. 6d. June 18th.

HAYLING, W. J., 72, Bute Street, Aberdare, electrical contractor. £28 19s. 10d. June 19th.

NICHOLLS, Mr. A. S., 5, Railway Approach, Worthing, radio dealer. £15 13s. 6d. June 15th.

PERSEVERANCE ELECTRICAL CO., Vecqueray Street, Coventry, electrical engineers. £21 0s. 6d. June 5th.

POOK, Mr. B. E. M., 53A, Albert Road, Southsea, wireless dealer. £20 11s. 11d. June 7th.

ROBERTS, R. C., 29, Jewry Street, Winchester, wireless dealer. £10 4s. 10d. June 7th.

STEVENS, Mr. T. J., 85, Hoe Street, Walthamstow, wireless dealer. £12 8s. 11d. June 7th.

YOUNG, Edward, 116, Corporation Road, Grange, Cardiff, wireless dealer. £20 3s. 2d. June 12th.

## Bill of Sale.

HUNT, Jonathan William (and Elsie Amelia HUNT, his wife), 220, Wells Road, Knowle, Bristol, electrical engineer and contractor, Dated July 20th, filed July 21st. £150.

## Receiverships.

HOWARD (R. A.), LTD. C. S. Steel, of 34/36, Gresham Street, E.C., was appointed receiver and manager on July 12th, 1928, under powers contained in debentures dated December 18th, 1925.

MIDLAND ELECTRIC LAMP CO., LTD. H. Harris, c/o E. G. Chesworth and Son, 17, Brazennose Street, Manchester, was appointed receiver on June 28th, 1928, under powers contained in debentures dated March 31st, 1926.

PATTON (DAVID J.), LTD. H. J. Reed Harding, of 10, Ouseley Road, Wandsworth Common, S.W., was appointed receiver on July 6th, 1928, under powers contained in debentures dated April 29th, 1926.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

FORBES (P. N.), LTD., London, N., electricians. Registered June 28th, £100 debenture, to J. A. Longley, 4, Draycott Place, S.W.; general charge.

HASTINGS AND DISTRICT ELECTRIC TRAMWAYS CO., LTD. Registered July 3rd, £130 000 and premium of 15 per cent., notes, secured by Trust Deed dated June 15th, 1928; charged on £260 000 debenture stock secured by Trust Deeds dated January 20th, 1905, and March 20th, 1928. *£450 000 4½ per cent. debenture stock. May 29th, 1928.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD. (Sussex). Registered July 2nd, £600 2nd debentures part of £5 000; general charge. *£13 800. April 20th, 1928.

ZONE WIRELESS CO., LTD., London, S.W.—Registered July 14th, £1 000 1st debenture, to W. McElroy, Iddesleigh House, Caxton Street, S.W., coal factor; general charge.

### Satisfactions.

BAXENDALE BROTHERS, LTD., Liverpool, dealers in electric supplies.—Satisfactions registered July 14th, £1 000 part of amount registered May 29th, 1916, and £945 registered November 15th, 1916.

GENERAL CABLE MANUFACTURING CO., LTD., London, W.C.—Satisfaction registered July 12th, £11 000 registered March 21st, 1927.

PORTABLE WIRELESS, LTD., London, W. Satisfaction registered July 6th, £100 registered December 21st, 1927.

RADIO SERVICE (LONDON), LTD. Satisfaction registered June 30th, £125, part of amount registered July 26th, 1927.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

JACKSON'S OF CROYDON, LTD.—By reason of its liabilities, July 4th. C. J. North, associated accountant, 8, High Street. Croydon, appointed as liquidator.

QUICKFIX ELECTRICAL FITTINGS CO., LTD.—First dividend at the rate of 2s. 6d. per £, payable July 27th at the office of the liquidator, Peter G. Ritchie, 38, Bath Street, Glasgow, 18th July, 1928.

### Bankruptcy Information.

KELLY, Stanley Sherzell, 59, North Road, Durham, electrical contractor. Receiving order, July 19th. Creditor's petition.

LITTLER, John, lately 9, Hoghton Street, Southport, electrical and radio engineer. Receiving order, July 19th. Creditor's petition. First meeting, August 2nd, 11 a.m., Official Receiver's office, Government Buildings, Victoria Street, Liverpool. Public examination, October 2nd, 10.30 a.m., Court House, Government Buildings, Victoria Street, Liverpool.

### Notices of Intended Dividends.

JONES, Sidney Ernest, and SHORT, George William Albert Edward (described in the Receiving Order as George Short), Elsecar, near Barnsley, trading as S. E. JONES AND CO., dry battery manufacturers. Last day for receiving proofs, August 8th. Trustee, B. S. Briggs, County Chambers, King Street, Wakefield.

LINDOP, Cuthbert Fenton, lately 62, Dale Street, Liverpool, trading as C. F. LINDOP AND CO., electrician. Last day for receiving proofs, August 8th. Trustee, J. Allcorn, Government, Buildings, Victoria Street, Liverpool, Official Receiver.

### Partnerships Dissolved.

ELECTRICAL MAINTENANCE CO. (Mrs. Teresa SINCLAIR or HARVEY and William Shields HERD) electrical contractors, 16–18, Braid Street and 80, Crossburn Street, Glasgow, by mutual consent as at June 20th, 1928, by the retiral of Mrs. Harvey. The business will be carried on by W. S. Herd on his own account under the old name.

PARA-MOTOR RELAY CO (George BULLOCK, Harry James OSBORN and Alan WRIGHT), electrical appliance manufacturers, 11, Blackfriars Street, Manchester, and 124, Chancery Lane, London, W.C.2, by mutual consent, as from March 31st, 1928.

SHEPPARD, JARVIS AND EVERED (Edward SHEPPARD, William John JARVIS, and Frederick Langdon EVERED), Victoria Gate, Taunton, Somerset, electrical and mechanical engineers, by mutual consent, June 18th, 1928. The business will be carried on by W. J. Jarvis and F. L. Evered, under the style of Jarvis and Evered.

## Bankruptcy Proceedings.

HARTIGAN, James Aloysius, and HARTIGAN, George Joseph Dominick (trading as THE LONDON FAN AND MOTOR CO.), electrical engineers, 81, Charlotte Street, London, W. The public examination of these debtors was held in the London Bankruptcy Court on Friday, the joint statement of their affairs showing liabilities £2 122, of which £2 083 are unsecured, and estimated assets £990. It appeared that the debtors began business in May, 1923, in partnership with two other persons, as electrical engineers, in Grape Street, W.C., where they traded under the above mentioned style. The debtors each provided £25 capital and their partners found £100 jointly. But in September, 1923, the latter retired and received £174 in respect of their interest in the business. The debtors continued trading together, removing the business in October, 1923, to 81, Charlotte Street, W. In January last, however, in consequence of their financial difficulties they were compelled to execute a deed of assignment of their property in favour of a trustee on behalf of their creditors in general. The trustee sold the stock, etc., for £200, and collected sundry book debts which were the subject of an agreement which the debtors had executed in September, 1924, by virtue of which they had charged all book debts due or to become due in favour of a cash creditor for £500. The proceeds were, however, returned as an asset, the agreement having been declared by the Court void as against the trustee in bankruptcy as regarded any book debts which had not been paid at the beginning of the bankruptcy. The examination was ordered to be concluded. The alleged causes of insolvency being lack of capital, trade depression, and inclement weather during the summer season of 1926 and 1927 which affected the demand for electrical fans.

HILL, Clement Sanderson, trading as SANDERSON HILL AND CO., Waltham Chambers, Waltham Street, Kingston-upon-Hull, electrical factor. The receiving order herein was made recently on the debtor's own petition, and the first meeting of creditors was held on July 17th at the Official Receiver's office, 37, Scale Lane, Hull. The debtor returned a statement of affairs showing liabilities of £2 138 against assets of £801.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### June 22nd.

18 113 J. B. Battson and J. R. Whincap. Electric heaters, etc.
18 125 British Thomson-Houston Co., Ltd. Electron discharge devices. (22/6/27, U.S.)
18 135 H. Busse. Transformers for thermionic tubes, etc.
18 141 A. B. Calkin. Thermionic amplifiers.
18 066 E. H. Chapman. Coupled inductance coils.
18 174 Chloride Electrical Storage Co., Ltd., B. Heap. Accumulators.
18 161 H. W. Cron, and General Electric Co., Ltd. Fastenings for cables, etc.
18 057 W. H. F. Griffiths, and H. W. Sullivan, Ltd. Variable condensers.
18 158 F. W. Hall. Apparatus for registering telephone calls.
18 139 M. Hentschel, F. Müller, and Porzellanfabrik Hentschel and Müller. Electric suspension insulators.
18 122 A. T. M. Johnson. Means for producing electric impulses, etc.
18 144 C. Lorenz Akt. Ges. Wireless communication and remote control systems. (25/6/27, Germany.)
18 114 O. D. Lucas. Wireless receivers.
18 061 W. T. Richardson. Electric circuit dividing and junction box.
18 171 C. E. C. Roberts. Television apparatus, etc.
18 130 Siemens und Halske Akt. Ges. Telephone switching cabinets. (12/8/27, Germany.)
18 170 Soc. de Paris et du Rhone. Electric cleaner. (10/9/27, France.)
18 136 Soc. Nouvelle de Constructions Telephoniques Brevets Tchonbritch-Derval. Electromagnetic relays. (20/7/27, France.)
18 181 U. F. L. Steindorff. Portable electric lamp.
18 196 E. O. Symonds. Apparatus for amplifying telegraphic signals, etc.
18 195 C. Tourne. Incandescent electric lamps, etc. (23/6/27, France.)

### June 23rd.

18 256 Carborundum Co., Ltd. (Carborundum Co.). Crystal detector units for wireless receivers.
18 222 Coventry Automatic Telephones, Ltd., and H. G. Menage. Impulse senders for automatic telephone systems.
18 289 L. Dernier and Hamlyn, Ltd., and S. W. Hamlyn. Electric light fittings, etc.
18 237 G. Fowles. Electromedical apparatus.
18 290 P. N. Hegarty. Electric traction transmission lines.
18 286 International General Electric Co., Inc. Electric switches. (23/6/27, Germany.)
18 206 T. D. Kelly. Generating energy from water, etc.
18 266 G. Manzuoli. Electromagnetic relays.
18 250 H. Pender. Resistance devices. (24/6/27, U.S.)
18 212 C. J. Porter. Moving coil loud speaker.
18 244 Rhymos Electrical Engineers. Dog racing apparatus, etc.
18 287 Siemens und Halske Akt. Ges. Electron tube modulation circuit. (24/6/27, Germany.)
18 234 M. Urbinati. Apparatus for transforming alternating into direct currents. (23/6/27, Italy)
18 273 P. S. Woolf. Electrically-heated brooders.

### June 25th.

18 411 L. Bonnet. Simultaneous tuning of circuits. (27/6/27, France.)
18 338, 18 339 Brandes, Ltd. Sound reproducers. (30/7/27, U.S.)
18 337 Brandes, Ltd. (Federal Telegraph Co.). Loud speaker system.
18 442 Carborundum Co., Ltd. (Carborundum Co.). Electrical resisting bodies.
18 317 N. Cooke, H. Leben, and A. Reyrolle and Co., Ltd. Protective relays.
18 330 Deutsche Telephonewerke und Kabelindustrie Akt.-Ges. Tune sheets for key instruments. (25/6/27, Germany.)
18 428 G. Douglass, A. Goddard, Igranic Electric Co., Ltd., J. Lyons and Co., Ltd., and S. R. Wright. Electric signalling apparatus.
18 421 T. J. Heskett. Transforming static force into continuous rotary motion.
18 369 International General Electric Co., Inc. Electric fluid turbines. (30/6/27, Germany.)
18 375 Koch and Sterzel Akt.-Ges. Transformers. (4/8/27, Germany.)
18 399 J. E. G. Lahousse. Insulating material for electrical condensers, etc. (1/8/27, U.S.)
18 420 Medway's Safety Lift Co., Ltd., and B. A. Siden. Electric control apparatus for lifts.
18 358 Metropolitan-Vickers Electrical Co., Ltd. Circuit controlling apparatus. (24/6/27, U.S.)
18 359, 18 360 Metropolitan-Vickers Electrical Co., Ltd. Circuit controlling apparatus. (25/6/27, U.S.)
18 325 L. F. Moon. Apparatus for electrical transmission of pictures.
18 390 Siemens-Schuckertwerke Akt.-Ges. Distance relay, etc. (25/6/27, Germany.)
18 396 I. Silberstein. Resistances. (2/7/27, Germany.)

### June 26th.

18 510 R. D. Ball, and English Electric Co., Ltd. Cascade connected inductance motor sets.
18 553 W. Bleloch. Converting mechanical vibrations into electrical oscillations.
18 500 British Thomson-Houston Co., Ltd. Automatic reclosing circuit-breakers system.
18 536 J. H. Buchanan and Metropolitan-Vickers Electrical Co., Ltd. Protective gear for a.c. systems.
18 497 R. J. Carruthers. Electric motors, etc.
18 511 English Electric Co., Ltd., and G. Schroeder. Synchronous machines.
18 447 Evershed and Vignoles, Ltd., and C. Midworth. Index locking devices for electrical instruments.
18 481 J. and W. H. Grant. Grip for removing electric lamps, etc.
18 612 B. Hesketh. Controlling variable condensers, etc.
18 535 Igranic Electric Co., Ltd., and D. Sinclair. Direction finding radio receivers.
18 501 International General Electric Co., Inc. Manufacture of commutators.
18 585 R. W. Keay. Means for remote control of wireless receivers, etc.
18 556 Koch and Sterzel Akt.-Ges. Transformers. (23/1/28, Germany.)
18 537 Metropolitan-Vickers Electrical Co., Ltd., and H. Pearce. Power distribution systems.
18 566 J. Neale. Light sensitive bridge.
18 568 J. Neale. Illumination of light sensitive bridges.
18 467 E. E. Peace and Peace and Co. Mains current supply units for wireless receiving tests.
18 543 Siemens-Schuckertwerke Akt.-Ges. Laminated core body for electric machines, etc. (6/7/27, Germany.)
18 587 E. E. Smith. Electrode for electromedical application.
18 492 H. J. Thomson. Transmission and variable control of power.
18 493 P. D. Tyers. Electrical reproduction of gramophone records, etc.
18 455 E. Williams. Electric switches.

### June 27th.

18 694 Automatic Telephone Manufacturing Co., Ltd., C. E. Beale, and R. Taylor. Telephone systems.
18 626 J. H. E. Baker, A. H. Cameron, Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic, etc., telephone systems.
18 657 British Thomson-Houston Co., Ltd. Automatic reclosing circuit breaker systems. (27/6/27, U.S.)
18 658 British Thomson-Houston Co., Ltd. Sheathed multiple conductor cables. (28/6/27, U.S.)
18 695 Bullers, Ltd. Clamp for holding cables, etc.
18 692 S. G. S. Dicker (N. V. Philips Gloeilampenfabrieken). Determining altitude of aircraft.
18 609 General Electric Co., Ltd. Incandescent lamps. (13/7/27, Germany.)
18 686 C. H. R. Gower and S. O' Brien and Partners, Ltd. Electrodes for electrolytic processes.
18 684 J. Hendry, J. Horn (England), Ltd., and J.F. Horn. Cartons for lamp bulbs, etc.
18 660 F. Lamberg and B. Quast. Electrically-driven rollways. (25/1/28, Germany.)
18 610 H. Panzetta. Circuit controlling apparatus.
18 640 R. J. Petersen. Electric cables.
18 624 G. Simonis. Interrupters for electric ignition apparatus. (1/7/27, Germany.)
18 625 Standard Telephones and Cables, Ltd. (Western Electric Co.). Compensation for phase variations.
18 644 Stanfield Radio Co., Ltd. Non-radiating contact breaker.
18 654 A. G. Swift and A. V. Podmore. Apparatus for artificial sunlight treatment.
18 676 M. Trouton and Wireless Music, Ltd. Electrically-operated vibratory devices.
18 663 Westinghouse Electric and Manufacturing Co. Radio coupling devices, etc. (15/7/27, U.S.)

### June 28th.

18 721 British Brass Fittings, Ltd., and A. Logan. Immersion heater.
18 833 A. C. Brown. Electric bells.
18 829 S. G. Brown. Sound reproducing instruments.
18 834 A. S. Cachemaille (Westinghouse Lamp Co.). Vacuum electric tube devices.
18 765 English Electric Co., Ltd., and G. Schroeder. Excitation of synchronous machines.
18 819 J. H. Hewitt and Wilkins and Wright, Ltd. Operating mechanism for electric condensers, etc.
18 820 J. H. Hewitt and Wilkins and Wright, Ltd. Electric switches.
18 795 E. J. Muller. Electric flashing signs. (16/9/27, Germany.)
18 724 Radiofrequenz Ges. and W. Kunze. Loud speaker system. (30/7/27, Germany.)
18 727 C. T. Rhodes. Storage batteries, etc.
18 801 T. A. W. Robinson. Variable condensers.
18 748 L. A. Steen. Connection for electric wires or cables.

### June 29th.

18 959 Akt.-Ges. Brown, Boveri et Cie. Metal vapour rectifiers. (30/6/27, Germany.)
18 976 Automatic Telephone Manufacturing Co., Ltd., and G. W. Simister. Suction, etc., apparatus.
18 928 British Thomson-Houston Co., Ltd. Adjustable magnet devices. (29/7/27, U.S.)
18 966 Electrical Research Products, Inc. Manufacture of loaded conductors. (10/9/27, U.S.)
18 871, 18 872, 18 873, 18 874, 18 875, 18 876 C. E. Fry. Electric meters.
18 949 H. A. Hankey. Radio-telegraph transmitters.
18 893 Imperial Chemical Industries, Ltd., and T. R. Warren. Automatic control of turbo-alternators.
18 924 King's Patent Agency, Ltd. (W. P. Phillips). Switchgear for electric lighting systems of railway carriages, etc.
18 849 F. W. Lanchester. Induction coils.
18 925 C. Berrage-Moulton. Electromagnetic gramophone sound-boxes, etc.
18 909 D. N. Sharma. Television apparatus.
18 839 J. Todd. Utilisation of tidal energy.
18 894 Walker, Hunter and Co., Ltd., and J. Walker. Electric heating elements.

### June 30th.

19 012 J. A. Crabtree. Electric switches.
19 032 Electrical Research Products, Inc. Electro-optical transmission systems. (2/7/27, U.S.)
19 033 H. G. C. Fairweather (Allmanna Svenska Elektriska Aktiebolaget). Steam turbines.
19 041 R. Kapp. Grid controls for thermionic valves. (29/8/27.)
19 030 C. Oliver and Oliver-Pell Control, Ltd. Electromagnetic reproducers for gramophones, etc.
19 062 Siemens-Schuckertwerke Akt.-Ges. Telephone cables. (26/7/27, Germany.)
19 065 Siemens und Halske Akt.-Ges. Circuits for telephone installations. (3/3/28, Germany.)
18 992 B. and E. Thomas. Circuit breakers.

### July 2nd.

19 175 Allgemeine Elektricitats Ges. Glow lamp tubes. (2/7/27, Germany.)
19 135 Automatic Telephone Manufacturing Co., Ltd. and A. G. Foster. Interconnecting telephone system.
19 133 Benjamin Electric Ltd. Shock absorbing valve holders.
19 113 British Thomson-Houston Co., Ltd. Dynamo-electric machines. (1/7/27, U.S.)
19 114 British Thomson-Houston Co., Ltd. Telemetric systems. (7/7/27, U.S.)
19 115 British Thomson-Houston Co., Ltd. Ship propulsion.
19 128 Demag Akt.-Ges. Electrically operated pulley block.
19 134 S. G. S. Dicker and Naamlooze Vennootschap Philips Gloeilampenfabrieken. Electric transmission of images.
19 094 General Electric Co., Ltd. Packing machines. (1/7/28, Germany.)
19 095 General Electric Co., Ltd. Electric lamps. (2/7/28, Germany.)
19 107 E. B. Killen. Turbines.
19 093 M. O. Valve Co., Ltd. Thermionic valve devices.
19 158 G. Schönstein. Electric starter for gramophones.
19 166 Siemens-Schuckertwerke Akt.-Ges. Vacuum electric switches. (14/7/27, Germany.)
19 068 E. H. Tarlton and Hunter Walker and Co., Ltd. Picture telegraphy.
19 086 J. Walker and Hunter Walker and Co., Ltd. Electric irons.
19 088 J. Walker and Hunter Walker and Co., Ltd. Electric heating elements.

## Coming Events.

### Tuesday, July 31st.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

### Wednesday, August 1st.

Electrical Contractors' Association (Bath Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting. 2.30 *p.m.*

### Thursday, August 2nd.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

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# THE ELECTRICIAN

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# Current Topics.

## The Report on Rural Supply.

EVER since over-enthusiastic supporters of the last Electricity (Supply) Act broadcast the idea of a rural England in which life on the remotest farms would be revolutionised by a universal cheap supply of electricity, the question of rural electrification has exercised the minds of many people in the electrical industry and many more outside it. In 1927 the Commissioners decided to undertake a general review of the position and prospects, and, as a preliminary step, a Memorandum on Electrical Development in Rural Areas was issued in August last, dealing more particularly with the importance of overhead line distribution and wayleave facilities as factors in the economic extension of rural supplies, and inviting the active support of local authorities and others in a position to help. Last November, as a further step, the Commissioners convened a Conference on Electricity Supply in Rural Areas, and this body has now prepared a report giving the results of its investigations during the past six months. The report, details of which are presented on later pages of this issue, represents a considerable amount of work, and succeeds, both in co-ordinating the results of prior and concurrent investigations, and in obtaining further information necessary for a general survey of the position. Although it does not suggest any startlingly new way of dealing with the question, it certainly disposes of the fiction that recent legislation will solve all the problems of the agriculturist. It clearly states that it is evident that for economic reasons rural electrification cannot be proceeded with to the extent of placing a supply of electricity at the service of every inhabitant of farm and other premises throughout rural Britain, and adds that there is no doubt that the prospects in the sparsest and most remote areas are of such a low order as to preclude, or at any rate delay, for many years to come, the establishment of a public supply on a remunerative basis, even under the most favourable conditions of capital expenditure on rural distribution. This is, of course, no news to most people in the electrical industry, but so far as the public is concerned, the release of the cat from the bag, at the hands of a committee appointed by the Electricity Commissioners, may be expected to have a salutary and corrective effect. Having viewed the dark side, we may take some comfort from the statement that a potential demand, growing to the order of 230 000 000 kWh a year in the course of, say, the next ten years, is indicated for rural areas where supply powers already exist. This is certainly a little more encouraging, and we have no doubt that the report will promote the realisation of that development. The Commissioners are to be congratulated on arranging for the immediate publication of the report in advance of their full consideration.

## A Hire-Purchase Point.

WITH the continued growth of the hire-purchase system one of the supposedly retarding features in the way of rapid domestic electrical development—the high cost of electrical appliances—will tend to disappear. In other trades where hire-purchase methods have been tried it has been noticed that whereas in the past customers generally placed cheapness before quality, they now tend to buy the better class articles when they are available on the deferred payment system. This tendency, which has already been noted by some electrical traders, is one worth catering for, as there is often a considerable difference between the cost of an appliance or a fitting which a consumer will buy for spot cash, and what he would really like for his full and complete satisfaction. The new credit facilities greatly simplify the matter for the house owner contemplating modernisation and improvements, and enable him to think less of initial cost, and more of the permanent satisfaction that will follow the acquisition of a good quality article of which he will remain the proud possessor long after his final instalment has been paid.

## Hire-Purchase Finance.

THE problem of financing hire-purchase business is not always a simple one, and some traders investigating possibilities in this direction have wisely decided not to enter into negotiations for financial support which are likely to end with the relinquishment of personal interest in the customer. Others have found that the necessary backing is provided in such a way that customers are given the impression that the business cannot carry on without money support from outside, and yet others have taken exception to the complication and expansion of clerical work which some financing methods entail. Readers who desire to arrange hire-purchase finance on the most favourable terms will, therefore, be interested t learn that we have made arrangements for putting subscribers in touch with one of the foremost financing organisations in the country. Readers wishing to avail

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themselves of this service are asked to write to us, giving a concise statement of their requirements; applications received in this way will be forwarded to the organisation previously referred to.

### The Wireless-Cable Merger.

BOTH from the economic and from the political points of view the Report of the Imperial Wireless and Cable Conference, details of which are given elsewhere in this issue, may be said to be of far-reaching importance. Out of a tangle the complexity of which was almost unparalleled, with a host of conflicting interests, the Conference has produced a scheme which is fair to all parties and which definitely inaugurates a new era in the history of Imperial communications. While the wireless interests seemed to have little to gain from a merger of this kind, the cable companies were faced with a form of competition to which, in spite of their large reserves, they would sooner or later have been obliged to succumb. Owing to the strategic and economical importance of the cable services, competition with such results would have been disastrous to the British Commonwealth of nations, and this point should not be overlooked in considering and appraising the solution which has now been reached. Already the Eastern Telegraph and Marconi Companies had made tentative steps in the direction of public-spirited co-operation, but the retention by the Post Office of the beam service rendered further progress difficult. Now that the Conference has definitely recommended that the proposed merger company to combine the respective interests of the Cable and Marconi groups shall be supplemented by a communications company which, in addition to acquiring the communication assets under the merger will also acquire the Government cables and hold the lease of the Post Office beam stations, the final obstacle is about to be removed, and the way made clear for close co-operation on sensible lines. While conferring upon the co-operating interests the maximum freedom of operation under private enterprise, the plan includes adequate safeguards to the public against abuse of quasi-monopolistic powers. The safeguards include the fixation of a standard revenue and rigid provisions as to the allocation of surplus profits and alterations in rates, and these matters will be the concern of an Advisory Committee which will in effect function as trustee for the public. The advantages of unified control with elimination of wasteful competition, will be secured, and those who fear that this arrangement may be lacking stimuli to efficiency have only to observe the already increasing competition of foreign interests to set their doubts at rest. Our only criticism of a scheme which is, as we have indicated before, an achievement of the highest order is that it leaves the external telephone services of this country in the hands of the Post Office. When so much has been accomplished there seems little reason for excluding the external telephone services. Their inclusion would have added to the completeness of the plan and would have obviated any possibility of friction in the future.

### An Unexpected Danger.

IT has been brought to our notice that many of the new housing estates in and near London are wired by contract, the wiring being sold to the purchasers of the houses as part of the fittings. Our attention has been drawn to the fact that many of these contracting firms have sprung into being purely for executing these contracts, and examples of their work show their methods to be lacking in technical stability. On other building estates, electrical contractors are required to execute work in short intervals of time, in order that the purchaser may take early possession of his property, with the result that, in some cases, the work has been skimped. To give a particular instance, we have knowledge of a house wired for power supply, in which a 20 A meter with a 15 A main switch were installed in spite of the fact that the owner of the house stated that his electrical equipment consumed 30 A. In circumstances where electrical requirements are understood by the resident, these lax methods may be checked, but one wonders what would happen in other circumstances. Another point worthy of attention is the careless manner in which meters, fuse-boxes, switches, etc., are wired by contractors of the type referred to. In a number of houses which we have inspected the main switch has been placed so near to a gas meter as to render the switch almost inaccessible, while in other cases the power circuits are arranged to leave any appliances which may be used thereon, at high potential to earth. The contractors are, in the latter instance, a firm of some repute, thus making it all the more remarkable that such dangers are possible. We appreciate the circumstances of rush and the desire to please everybody, but that is no reason why the work should not be completed in a manner that is creditable to the industry as a wohle, to say nothing of the more important question of danger to life. These cases are, fortunately, few and far between, but since they exist when in fact they should not, they indicate that every precaution should be taken by master men before passing their work as satisfactory. It is possible that the supply company would detect any fault when connecting the house supply system to the mains, but even so, the public are likely to form a very poor opinion of contractors, if, when they are told to apply to the supply undertaking for connection, they are informed by the latter that the wiring does not comply with their requirements, and that until it does, no supply will be forthcoming.

### Electrified Tea Plantations.

THE application of electricity to the grocery trade is by no means new, but its latest application in this industry is, according to the "Grocery Gazette," of a somewhat novel character. A new factory, at present being built in Nyasaland for J. LYONS AND CO., will not only be electrified throughout, but will generate its own supply from water-driven plant for both power and light. A small hydro-electric station is being erected about half a mile from the factory, where water with 100 ft. normal head is available. With this it is anticipated that sufficient supplies will be generated for present and future needs.

### Electricity in Silesia.

ONE of the corners of the European continent where the use of electricity is developing with remarkable rapidity is Silesia. During 1926, the latest period for which statistics are available, 25 public supply undertakings producing and distributing current delivered a total of 514 130 000 kW for traction, industrial and domestic consumption. Silesia holds second place among the states and provinces of Germany in the use of electricity for railways, and about 316 km. of line have been so far electrified. The longest single line over which trains are now operating by electric motive power extends from Breslau to a little beyond Gorlitz, a distance of a little more than 204 km. Of the 25 companies or corporations engaged solely in the production and distribution of electrical energy to industries and to public and private consumers, in addition to concerns that generate electricity for their own use, six are distributing companies only, and nineteen are concerns generating supplies for sale. Only eight of the producing companies are owned by private capital, eight are owned by municipalities, one by the Province of Lower Silesia, one by the State of Prussia, and one by the German State Railways. The extensive and growing production and consumption of electricity indicate that there is a considerable market for electrical goods of all kinds, including generating plant, transformers, wiring material, cookers and general electrical domestic appliances. With regard to the last mentioned, locally made household appliances are, in many instances, of comparatively recent introduction, and are not so advanced in type as those of British manufacture. The opportunities offered by this country are, in consequence, particularly attractive.

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# STROBOSCOPY AND THE TESTING OF ROTATORY METERS.

## Stroboscopic Speed Measurement and its Application to Electricity Meters.

By G. E. MOORE, A.M.I.E.E.

DURING recent years technicians on different sides of the world have advanced methods of stroboscopic meter testing. The measurement of speed by means of "stroboscopic observation" has become an accepted test—capable of precision results, and the possible adaptability to rotating meters must naturally occur to many meter engineers. From time to time in the ever-increasing deluge of technical information the subject emerges, but no positively novel ideas commending themselves for general acceptance remain; it resembles the Varley phase-rotation test, which periodically seems fated to fresh re-discovery or re-exploitation in one form or another. In the writer's judgment there are serious limitations to stroboscopic meter testing; but the subject is worthy of more or less general treatment, and doubtless the remarks which follow will prove applicable to more instances than that dealt with—the testing of the rotatory electric meter, integrating ampere-hours, kilowatt-hours, etc.

Stroboscopy is the outcome of spectacular experiments with rotating objects which depended for their illusive effect upon the persistence of vision, and diverted both the scientific and the general public three or four generations ago. Optical toys like the thaumatrope, the phenakistoscope, the stroboscopic or magic disc, Stampfer's stroboscopic discs of 1846 and so on were then the vogue. The modern kinematograph is one result of those early playthings—as extraordinary in its simple basis as in its tremendous ramifications. And from the stroboscopic effect there were later developed not only methods of speed measurement but also the "slow motion" study of rapidly-moving machinery and kindred practical applications.

The word stroboscope is derived from Greek words meaning *whirling round* and *sight*. In general, a stroboscopic apparatus permits brief glimpses of an object at such a related rate that the meaningless blur seen by ordinary vision is resolved by glimpse-observation into a perceptible image of the moving object.

This effect was utilised when speeds of 30 000 to 40 000 revs. per min. were attained with an experimental steam turbine. At such speeds the usual methods and apparatus of speed measurement were useless. However, a mark upon the rotating part could be made visible stroboscopically. For example, assuming a turbo speed of 30 000 revs. per min., that mark (moving too quickly for ordinary optical or other perception) passed a point 30 000 times per min.; but if viewed through a disc having 30 equally-spaced holes and spun by a "counting motor" running at 1 000 revs. per min., the glimpse-frequency of 30 000 per min. enabled the mark to be seen in an apparently stationary position.

The counting-motor provided a means whereby a controllable and verifiable guide-speed of low value plus the stroboscopic effect made it possible to "reach" unusually high speeds.

The observed effect may be modified. For instance, if the "glimpse-speed" is slightly less than that of the mark the latter will appear to move in its actual direction; should the glimpse-speed be rather greater the mark appears to rotate backwards; and the rate of apparent rotation, together with the basic "stationary" speed, enables one to determine the actual speed of the marked part.

More than the minimum single mark may be made upon the observed shaft. If the equally-spaced marks and disc openings are adjacent and the whole under observation, the stationary effect obtains if *shaft speed/disc speed* is an integer (1, 2, 3, etc.); and the *number of coincident effects* is equal to (*number marks and openings*) by (*shaft speed/disc speed* $\pm$ 1), there being more coincidences if directions of rotation are opposite.

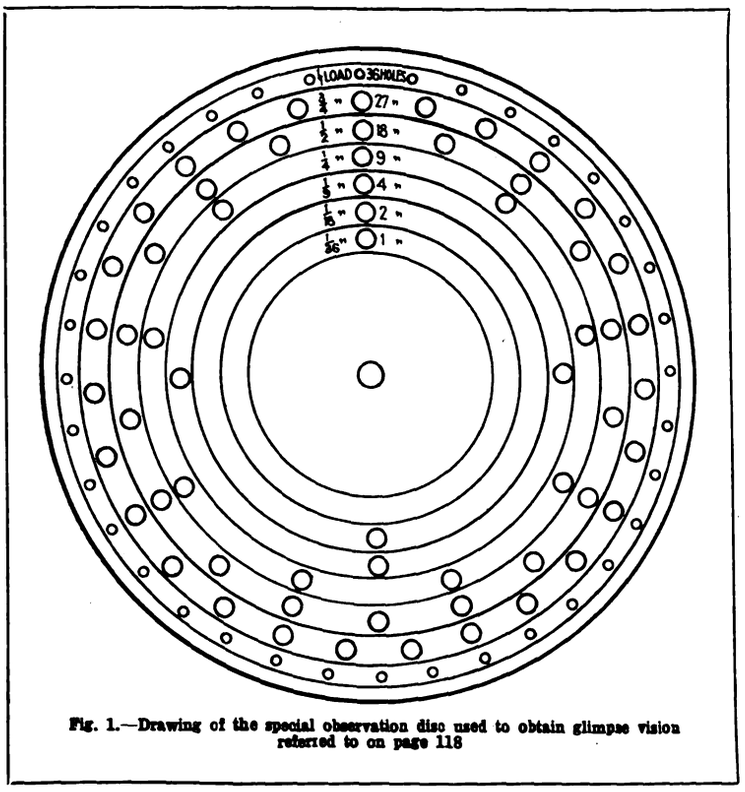


Fig. 1.—Drawing of the special observation disc used to obtain glimpse vision referred to on page 118

But usually vision itself is intercepted. If the glimpse frequency is equal to the mark frequency, the shaft-mark appears to be motionless; if double, twice as many marks are seen, or if half, then the real number of marks is visible—but more clearly; with the glimpse frequency a multiple or submultiple, the range is considerably extended. Apparent slow rotation due to slight disparity is more spectacular, especially when a multi-pointed symmetrical figure is used instead of a series of marks—an effect frequently noted on kinema screens with regard to the wheels of vehicles. Reversal of motion of glimpse-disc relative to the shaft merely increases definition.

Further modifications have been introduced, not only with regard to the observed part (by means of special designs providing speed-range and other significant indications) but in greater degree to the means of observation: periodic vision may be afforded by "blink illumination" (shutter-device over lamp, and electrical illumination by alternating-current or mechanically interrupted circuit); while through the use of carefully-calibrated tuning-forks and the like the glimpse frequency directly or indirectly given is of a high order of time accuracy, and hence not only may a truly instantaneous speed measurement be made but the result has a precision value.

A hint regarding the almost infinite speed range has already been given. When to all these advantages one adds the fact that no extra load whatsoever need be placed upon a mechanism under test, and that incidental uses such as the study of hunting and kindred effects are possible, then it is self-evident that stroboscopic speed measurement is an important method.

A method which meets with ready adoption in an inconsiderable field often falls into disuse or disrepute after a brief life: the originator, progressing along his technical path, eventually discards it, or it may attain a certain though scanty support elsewhere. It may later be unwittingly resurrected by many other workers; it may even, in an adapted form, achieve great popularity in a novel sphere—no doubt to the surprise or disgust of the actual originator (if still capable of any emotions). At different times stroboscopic observation has been applied in several ways, many similar. It was inevitable that its possible utility to such an apparatus as the rotating meter should tempt investigation: and there have been recurrent ventures of a limited character in many quarters.

Stroboscopic testing offers a number of advantages in meter engineering. Perhaps the most obvious and outstanding is

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the quick adjustment of meters during disc-revolution tests: for if a meter is under a form of " standard observation " its approximate (or possibly accurate) performance is at once evident, and adjustment to standard quickly achieved.

The optical effect could be attained mechanically or electrically, and by the direct or indirect interposition of the pre-

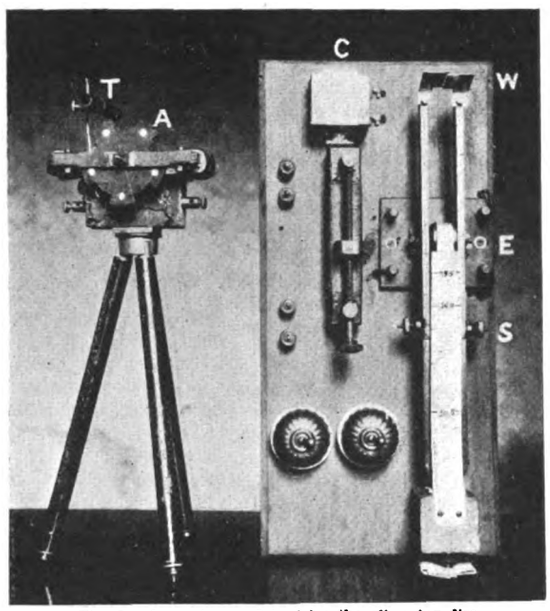


Fig. 2.—Apparatus used to drive the glimpsing disc.

cision factor(s) forming the standard. Meters running in series could readily be " lined " together. Again (as in the case of the writer's experiments in this direction) the calibration of a meter at different parts on its " curve " could be carried out with the elimination—or rather, absorption—of one of the usual factors: measurement of *load*, *disc-revolutions* and *time* being simplified to that of *load* and *speed*—load variations becoming less embarrassing, and the factor of speed determined by more accurate and consistent means than the stopwatch. Behind this lurks the possibility of actual load measurement by the meter in this manner. Transient variations and the like might also become obvious for study.

Naturally, a method of stroboscopic meter testing should not impose any load or likely eventual obstruction upon the members—particularly in meters required for installation. Patentees have at different times set forth various artifices to this end: Blathy, of Budapest, for instance, utilising meters having discs with a series of holes near their edges; and observable by, or to, each other directly or by reflected light. It is, however, very difficult to avoid some form of interference. Spark effects, the addition of observation discs or mirrors to the rotating parts, and so forth have been adopted. Possibilities with selenium are fascinating, but there appears a disinclination to its employment—doubtless for the good reason that the somewhat erratic qualities and incidental requirements of " moon-metal " have proved disappointing in many other directions.

The writer has on various occasions delved into the subject, and there follows a brief account of some experiments which are explanatory of the scope, difficulties and limitations.

## The Practical Approach.

The practical approach was by an investigation of possibilities in the stroboscopic testing of commercial meters. While all manner of adaptations and even complexity of apparatus may be admissible under laboratory conditions, simplicity and dependability are essential for routine work in a meter department. Further, as the majority of meters are encased under opaque covers, observation must perforce be through the register glass or disc window. As will be shown later, there are other practical difficulties even more formidable.

However, the disc used in " Met.-Vic." meters seemed to afford a ready means for stroboscopic testing—for it bore a series of 36 equally-spaced stiffening serrations of V-shape. Glimpse vision was given by means of a special 7½ in. diam. observation disc, dull-black in colour, of which a sketch is given in Fig 1. This carried a series of holes, concentrically arranged. This glimpsing disc was driven at 40 revs. per min. —the usual full-load speed of a meter—and accordingly the first series (that nearest the periphery) had 36 holes, the glimpse frequency of 1 440 per min. therefore equalling the mark-frequency of a correctly-adjusted meter running at full load. At ¾, ½, etc., loads the mark-frequency fell to 1 080, 720, etc., per min.; and the frequency of glimpsing was accordingly altered by changing to the respective series of holes as indicated in sketch—the observation disc running throughout at 40 revs. per min.

The glimpsing disc was driven very accurately by a phonic motor which, together with its controlling tuning-fork, is illustrated in Fig. 2 (reproduced by courtesy of " The Engineer "). A shows the 5-pole iron rotor, with synchronising spots, running in a field varying 3 000 times per min.; the rotor speed of 600 revs. per min. is changed to 40 for glimpsing-disc drive; T is an eyepiece tube, variable in position to align with any series of holes. On the right of the phonic motor is a 50 double-vibration tuning-fork, having at E a make-and-break and electro-magnet which maintain vibration and send a pulsating current to phonic motor stator; at C a condenser to nullify contact sparking; at S adjustable sliders for T.F. frequency control; and at W shutters for edge or slit stroboscopic vision (here useful in synchronising phonic motor).

In a test on a watt-hour meter, apparatus used also included a wattmeter and means for varying and exactly controlling the load; this could, if required, be arranged so that both the indicating instrument and the observed meter disc were visible at the same time. At each load point an ideal meter would rotate at the correct speed; in practice, however, it was necessary for stationary effect

(*a*) To vary the wattage, or (*b*) the tuning-fork and glimpse frequency in order to allow not only for curve characteristics, but also for general inaccuracy as against a 100 per cent. or other datum.

## Results of Experiments.

Certain facts soon emerged. The true stroboscopic effect was given at full and ¾-load speeds (i.e., with glimpse and mark-frequencies of 1 440 and 1 080 per min.), but at ½-load speed (720 freq.) it was ceasing and below that speed failed. This was owing to the fact that there is naturally a limit to the period during which a glimpse-picture is retained by the retina of the eye, and for a continuous persistent image at least 900 to 1 000 glimpses per minute are necessary. Hence at the lower speeds no instantaneous indication of meter per-

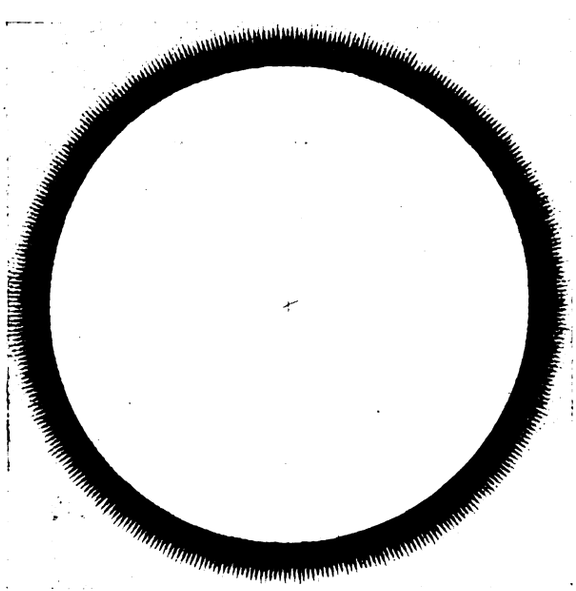

Fig. 3.—The photographically-reduced 3 in. observation figure.

formance was possible; at a correct setting *simultaneity of glimpse and mark* could be retained, but both adjustment for this and the actual observation were lengthy.

(The latter effect is somewhat akin to methods propounded by Wilkins in his prolix patent specification of 1907—he calibrated a standard meter with glimpse-observation of disc-spot controlled by a specially-variable pendulum, and then, with a number of service meters grouped in a sort of Druid Circle around the standard meter, instantaneously presented and compared the latter's disc spot with each service-meter's one in turn.)

It was also noted that even with stroboscopic vision at

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high load erratic and oscillatory effects somewhat marred observation. The presence of removable dirt or filings impinging on the disc, or variable gearing tightness, etc., in register could produce this, but such ineradicable causes as necessary play between gear-wheels, imperfect shape of disc, anti-creep holes in the latter (with consequent torque variation) must be tolerated. There may be a certain value in the stroboscopic detection or examination of such effects, but for reasons given later the benefits are dubious.

An observation figure with 360 points, and of 12 in. diam., was made and reduced photographically to give copies of 3 in. diam., as in Fig. 3. Attached to a meter disc such figure made it possible stroboscopically to examine the meter throughout its working range, with satisfactory results as regards accuracy of test. But erratic effects were now accentuated to the view. A three-point "kick" could occur —varying in direction according to level of apparatus, and when reduced to a vague hunting was apparently more marked on $\frac{1}{4}$ load than on $\frac{1}{2}$ or $\frac{1}{10}$ loads! Upon switching on correct load the disc attained its speed in under 1 sec.

Further experiments were performed with a meter disc having regularly-arranged points on its edge, and, utilising an induction-coil with high-frequency discharge and neon tube, blink illumination was given for the observation of other meters. Satisfactory results were achieved at high loads with no interference to the contact-disc, but the frequency-range is limited, and at low loads with mere synchronising of spots there was definite evidence of a clinging or retardive quality in the spark. Hence, the writer's experience of such arrangement is unfavourable.

It seems evident that stroboscopy as applied to meter testing has claims to spectacular rather than calibration purposes. Under laboratory conditions it can prove a useful means for examination of instantaneous effects, and for such tests dealing with accuracy change following voltage, temperature and other specific variations. But for routine work in a meter test-house its utility is seriously limited—for the following reasons in addition to those already mentioned.

Though a full-load speed of 40 revs. per min. has assumed the nature of a standard value in meter engineering, meters deal with speeds of more than double such value (in d.c. work) or have a figure as low as 16 revs. per min. (as in Fawssett's patent meter). And the tendency is to favour the low speeds—for technical reasons. Also, non-standard and special calibrations are often called for.

House-service and "power" meters usually have opaque covers, with perhaps only edge observation of disc(s), and varying in shape according to maker, etc.

For the above reasons attachment (temporarily, or preferably otherwise) of special observation discs would be necessary. This course has several serious objections. Similar interference with a standard meter must also be suspect. As proposed by the writer in a patent specification the meter disc could contain say 100 stiffening serrations—such providing not only means for stroboscopic observation, but also the much more general advantage of ready measurement of part-revolutions. This proposal has not appealed to any manufacturers—objections being conspicuous more for impercipience than for technical unanimity.

Further, meters such as those which drive a mechanism that prints periodic advances vary in speed over a cycle of disc revolutions.

The inherent electrical and mechanical variants in the meter as aforementioned were recognised by Wilkins in his specification as affecting speed *during* a revolution—though he still adhered to the opinion that one revolution formed sufficient criterion of a meter's performance.

The ordinary meter is a low-speed instrument. Stroboscopic methods were introduced for extra high speeds, and observation of rotating objects such as meter discs involves an inverse arrangement whereby the actual member under test must give the necessary high mark-frequency by a multiplicity of marks. This affects integrity of method.

An additional point against instantaneous indication is that a meter is essentially an *integrating* mechanism: true *registration* of kWh or the like must remain an important and final practical criterion. And the "dial-run" test is even more imperative under the exacting conditions obtaining when installed.

## BOOK REVIEW.

**Applied Elasticity.** By S. Timoshenko and J. M. Lessells. (London: Constable and Co.) Pp. xxi.+544. 25s. net.

There are not too many books dealing with the applied side of elasticity, and the present work, which is written from a practical standpoint, is a useful addition. It seems to be intended chiefly for the more advanced student and the design engineer, and since both the authors are attached to the research department of the Westinghouse Electric and Manufacturing Co., it may be assumed that the book embodies results of their own experience, and is therefore of particular interest to the electrical engineer who has to deal with problems of a mechanical nature.

The first section, occupying two-thirds of the book, and written by the first author, deals with the analysis of stresses, and is well illustrated by nearly 80 worked examples of a practical nature. The remainder of the book, by the second author, is devoted to the mechanical properties of materials.

One of the difficulties of the subject of applied elasticity is that many of the problems which arise in practice require for their complete solution investigations taking account of the elastic properties of the materials, and the mathematics involved is often too specialised and lengthy for inclusion in a text book. In this connection, the authors have adopted the happy mean of quoting only the chief results for the more complicated problems, and giving references in footnotes to the original scientific papers which are the sources of information. The systematic manner in which this has been done—there being over 300 references in all—adds greatly to the value of the book as a work of reference.

In the first section of the book, after chapters on tension, compression and torsion, the usual subjects of stresses and deflections in beams are dealt with. In a separate chapter on "Bending of Bars on Elastic Foundations," a short consideration is given to thermal stresses in cylindrical shells which has a bearing on the design of turbines. After chapters on "Combined Bending and Twisting," "Curved Bars," and "Thin Plates," the final chapter of the first section is devoted to the important subject of "Stresses Produced by Dynamical Causes," and, among other things, deals with stresses in rotating discs of variable thickness, critical speeds, torsional vibration and stresses due to impact.

In the earlier chapters the authors give some consideration to the important question of the local concentration of stress which may occur round holes and angles, including keyways in shafts, and reference is made to the experimental methods which are particularly useful in these cases; Coker's photo-elastic method for direct or bending stresses and the membrane method for stresses due to torsion.

In a number of cases in the first section of the book, graphical and approximate methods are developed, usually with a view to giving quick results. Problems dealt with in this way are the stress due to torsion in a shaft of variable diameter, and also the static deflection and dynamic stresses in such a shaft.

In the second section of the book dealing with the mechanical properties of materials, some useful curves are included in Chapter XII, showing the effect of temperature on the tensile properties of steels. Impact tests and hardness are dealt with in separate chapters. A succeeding chapter on fatigue is very valuable, as collected information on this subject is still somewhat scanty.

In the final chapter the basis of fixing working stresses is discussed, and ten pages of tables give useful information as to the tensile and fatigue properties of various steels and other materials.

The book is exceedingly well printed, and provided with nearly 400 very clear diagrams. It is thoroughly to be recommended.

R. T. C.

### BOOKS RECEIVED.

The "Rapid" Pocket Pricer. (London: Gall and Inglis). 1s. 3d. net.

The "Swift" Cubic Reckoner. By J. Gall Inglis. (London: Gall and Inglis.) 4s. net.

"A Text Book of Telegraphy." By A. E. Stone. (London: Macmillan and Co.) Pp. vii+455. 20s. net.

"The Evolution of Industrial Organisation." By B. F. Shields. (London: Sir Isaac Pitman and Sons.) Pp. xii+296. 10s. 6d. net.

"Protection Contre les Effets Nuisibles de L'Electricité. By F. G. de Nerville and A. Hardy. (Paris: J. B. Ballière.) Pp. 860. 137 1r.

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# INSULATORS ON OVERHEAD LINES.

## Explaining the Real Conductor Suspension—The Angle of Suspension String and Variation for the Different Methods of Insulator String Suspension.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

THE effect of suspension insulators on the mechanical features of a transmission line span with supports at unequal elevations differs from that of a span with supports at equal elevation. Also, for ordinary normal conditions, the effect differs according to whether the insulators are vertically suspended at both ends, whether a strain insulator is at one end and a vertically suspended insulator at the other end, or whether insulators are strained up at both ends. For abnormal conditions, such as the sagging-in of a span from any cause, or a broken conductor, etc., the effect on the mechanical features will again be different.

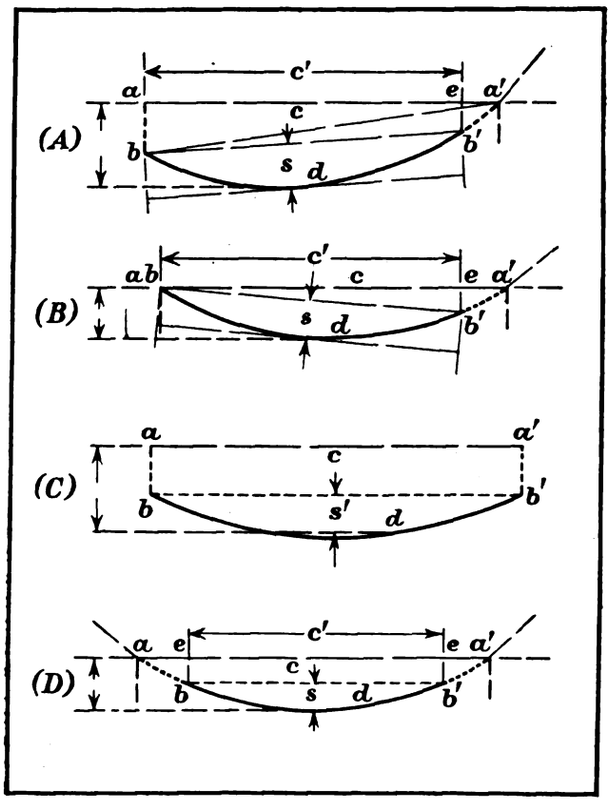


Fig. 1.

| | |
|---|---|
| *ab*, *a'b'* | = insulator suspension strings. |
| *a* and *a'* | = suspension insulator-string supports. |
| *b* and *b'* | = conductor attachments to insulator strings. |
| *c* | = length of span between supports. |
| *c'* | = conductor span-length. |
| *d* | = length of conductor between *bb'*. |
| *s* | = sag of conductor, *not* sag of span between supports. |
| *s'* | = sag of span between line supports. |

Fig. 1 shows four different cases for normal conditions, three of which are common to most transmission lines; they are:—

(*A*) Condition where at one end of a suspension the conductor is strained up to a support by a suspension insulator string (*a'b'*), such as a semi-strain position or a terminal, and at the other end of the span it is attached (at the same elevation) by a suspension insulator string which hangs vertically.

(*B*) Condition where at one end of a suspension the conductor is strained up to a support by a suspension string (*c'b'*) as with (*A*), and at the other end of the span the conductor is secured directly to an insulated support at the same elevation.

(*C*) Condition where, at both ends of the span, the conductor (at the same elevation) is attached to suspension insulator strings hung vertically, which represents a conductor suspension equivalent to that where pin type insulators are used.

(*D*) Condition where at both ends of the span the conductor (at the same elevation) is attached to suspension strain insulators.

In the design of spans with supports at equal or unequal elevations the general assumption for span and sag is as shown in Fig. 1 (*C*), span *c'* being unknown; this condition is so for suspension or pin-type insulators, the conductor suspension being the same in each case. However, where suspension insulators are used they are not always hung vertically as shown in (*C*), and a transmission line may adopt all the suspension methods shown in Fig. 1, so that for equal span *c*, the conductor span *c'* is different.

For very long spans the effect of the different methods of suspension on the mechanical features of a span is slight as compared with that on short or moderate length spans. Let *c'* represent the true conductor span and *s* the sag of conductor; it is clearly evident that for a short span, and a given length of span in each case, the effect on the mechanical features of the actual span between supports for the different methods of suspension will involve a difference in the actual sag of conductor, the clearances, the height of supports, etc. Depending on the number of insulator units in the string and the length of span, the true difference will vary from the common assumption and calculations employed, and is likely to be very much greater than the maximum difference between the stressed and unstressed state of the conductor. It is, therefore, evident that other methods for calculating actual length and sag of conductor suspension be used, and the respective differences *ea'* and *eb'* be corrected when calculating the true length and sag, etc., of conductor.

In practice, the question arises, are we justified in assuming that the resultant load on a strained insulator string is uniform, and has the same direction as that of the conductor, i.e., will a strained suspension string lie in the same plane in which the arc of the conductor is assumed to lie? In the design of spans we are safe in accepting this condition. We are aware that the suspension insulator is uniform and is a flexible string, but is the true condition satisfied when we assume that there occurs no change in the direction of the conductor and the insulator string at the point of attachment, or should we assume a condition where the suspension insulator can be likened to a straight rigid bar taking an angle of suspension so that the strain on the point of suspension of the insulator is in the direction making an angle $\varphi$ with the horizontal ($\varphi$ = angle of suspension of the insulator string)? This depends on the mode of suspension and the type of attachment; for a strain insulator the former is quite justifiable.

No matter which condition we assume, for design conditions we require to know the true length and sag, also apply means for adjusting (as accurately as the constants used) the combined effect of the suspension insulators and the conductor, i.e., correct the difference between *c* and *c'*, *ea'*, and *eb'*, for each case.

The greater the number of insulator units per string and the shorter the conductor span-length, the greater may be the need for increased clearances, both horizontal and vertical. In the case of a broken conductor a part of the insulator length will take the place of the equivalent length of conductor just the same as shown in (*A*); that is, for (*C*) suspension, we shall have the length *aa'* plus the length *ea'* of (*A*). However, a broken conductor need scarcely be assumed, because the circuit would be almost as quickly incapaciated, but the point in mind here (whether we consider normal or abnormal operating conditions) is that a long span is better able to keep nearer to its original sag than a short span where suspension insulators are used.

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### MARKING IMPORTED WIRELESS APPARATUS.

An application for an Order in Council to require the marking with an indication of origin of imported wireless receiving sets and components has been referred by the Board of Trade to the Standing Committee under the Merchandise Marks Act, 1926.

The Committee will consider whether these articles should be marked on sale or exposure for sale, and they may, at their discretion, also consider whether the articles should be marked on importation.

The date of the Committee's public inquiry will be announced later, and communications regarding it should be addressed to the Secretary, Mr. E. W. Reardon, Board of Trade, Great George Street, London, S.W.1, as early as possible, and in any case not later than August 24th.

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# EXPRESS PASSENGER ELECTRIC LOCOMOTIVES.

## Equipment for the Great Indian Peninsula Railway—Special Individual Axle Flexible Drive—Twin Armatures for Main Motors—Electro-pneumatic Control.

THE Great Indian Peninsula Railway is at present engaged on a comprehensive scheme of main line electrification covering the lines from Bombay to Igatpuri and Bombay to Poona, both of which pass over the Ghats, where heavy gradients are encountered. The existing suburban electrification scheme on this railway extends from Bombay to Kalyan and, with the main line extensions, will cover a length of approximately 300 track miles. Energy for working the line is generated three-phase at 50 cycles and transmitted to sub-stations along the line, where it is converted and delivered to overhead contact wires at 1 400 V d.c.

Motor coaches are used for the suburban service, but the main line trains will be drawn by electric locomotives.

Last Thursday we were afforded the opportunity of seeing, at the Newcastle works of Messrs. R. and W. Hawthorn, Leslie, a new express passenger locomotive which has just been completed for the G.I.P. Railway by the General Electric Co., Ltd., with Messrs. Hawthorn, Leslie as sub-contractors.

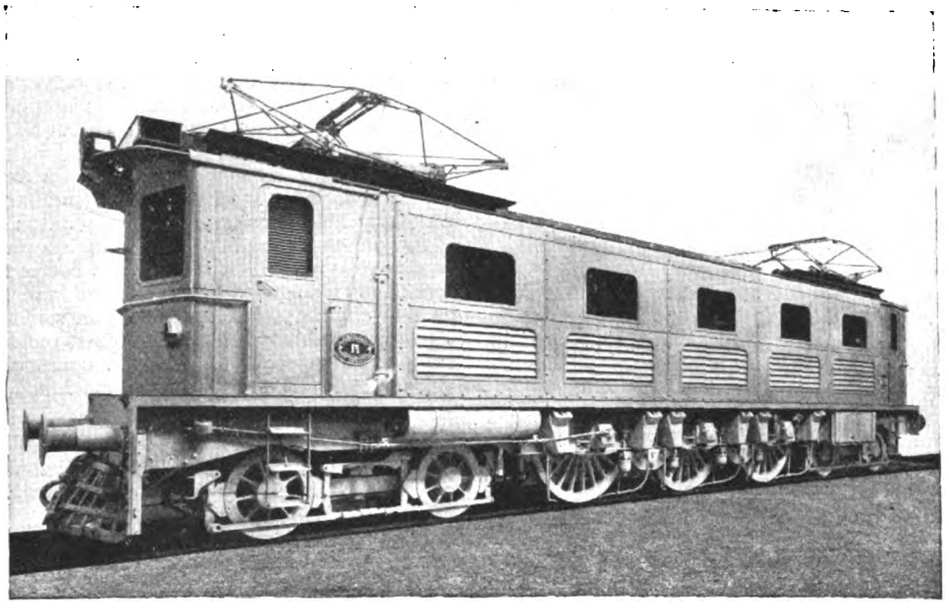

**Fig. 1.—General view of the new high speed electric passenger locomotive for the Great Indian Peninsula Railway.**

The locomotive, which was built to the specification of Messrs. Merz and Partners, the consulting engineers for the complete scheme, is of the 2-A-A-A-2 type, having three main driving axles arranged for individual drive and a guiding bogie at each end of the locomotive. A general view of the locomotive is given in Fig. 1.

Each main axle is driven by a twin armature motor through a flexible gear wheel secured to a quill surrounding the axle. The torque from the quill to the axle is transmitted by means of a flexible drive mechanism which permits relative motion between the axis of the axle and the axis of the quill, thereby allowing the motor to be mounted rigidly in the locomotive frame, and resulting in minimum unsprung weight with resultant minimum wear on the track. The two pinions at the end of the motor frame engage directly with the flexible gear wheel, the centre of which is rigidly secured to the quill.

Built for a track gauge of 5ft. 6 in., the locomotive has a total length over buffers of 56 ft. 2¼ in., with a rigid wheel base of 15 ft. and a bogie wheel base of 7 ft. The diameter of the driving wheels is 6 ft. 2 in., while that of the bogie wheels is 3 ft.

The weight of the locomotive is 108 tons, and having an overall width over platform of 10 ft., it develops 2 250 B.H.P. at the hourly and 2 130 B.H.P. at continuous rating, the speeds of these ratings being respectively 36 and 37 m.p.h.

Although the normal running speed does not exceed 75 m.p.h. the locomotive is designed for a maximum speed of 85 m.p.h. As it is required to operate in conjunction with freight locomotives of the Ghat sections it is also required to exert a tractive effort of approximately 16 000 lb. at 26 m.p.h. at 1 400 V.

A starting condition specified was that the locomotive should start from rest a train weighing 450 tons on an up grade of 1 in 100, and attain a speed of 36 m.p.h. at 1 400 V, and repeat this ten times at five minute intervals without the temperature of the main resistances exceeding 250 deg. C. Under these starting conditions the tractive effort is not to vary by more than 10 per cent. above or below the mean value.

Most early electrification schemes called for the use of goods and passenger locomotives of moderate speed. Express locomotives for speeds over 65 m.p.h. were rarely called for, especially in Europe, and it is only comparatively recently that demand has arisen for really high speed electric locomotives. This has raised important problems, particularly in respect of the mechanical arrangement, to ensure satisfactory running features and to provide a suitable high speed drive.

The General Electric Co., Ltd., in conjunction with their associates, Les Ateliers de Construction Oerlikon, Switzerland, have given considerable attention to this question, and have developed not only special types of drive, but have determined by experiment and analysis the most satisfactory general arrangement for high speed running.

The mechanical portion follows generally on standard British and Indian steam locomotive practice, and in many cases parts interchangeable with existing standards on the G.I.P. Railway have been adopted.

A driving cab is provided at each end of the locomotive body, the driving positions being arranged on the left-hand side of each cab. The train is fitted with vacuum brakes, but the locomotive itself is separately equipped with air brakes. Accordingly two compressors and two exhausters are fitted, both electrically driven, the exhausters being arranged for operating the train brakes, and the compressors for operating the locomotive brakes. Special valves are used to obtain automatically proportional action of both train and locomotive brakes by a single manipulation of the driver's vacuum brake handle. Both sides of each driving and bogie wheel are braked, and sanding of the driving wheels is provided for both directions of motion.

The drive used has been specially developed for high speed work by the G.E.C., in conjunction with Messrs. Oerlikon, the arrangement being illustrated in Fig. 2. Known as the "Yoke" drive, it was constructed for the G.E.C. by Messrs. Hawthorn, Leslie.

The main requirement of a flexible drive mechanism is that it shall transmit the torque of the driving motors to the road wheels and axle under varying conditions of eccentricity and angularity between the centre line of the quill and the centre line of the axle. A number of drives have been developed in the past for this purpose, but in general they suffer from the fact that with varying eccentricity a relative angular acceleration between wheel and armature takes place which may result in very heavy stresses being thrown on the members of the drive mechanism. It is claimed that the present design of drive, having regard to any possible relative movement of the axle and quill, results in a mechanical transmission which is almost perfect in operation.

Each of the twin-armature type main motors is supported on the main frames, and each armature has a pinion meshing

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with a common gear wheel mounted on the quill. The quill itself is carried in bearings housed in the motor frame. Thus, accurate meshing of the teeth and constancy of the gear centres are easily maintained. The gear wheel is of the flexible type, to ensure uniform transmission of the torque. The flexible drive mechanism is mounted at the opposite end of the motor frame from the gear wheel, and is coupled to heavy pins on the driving wheel. The torque is, accordingly, transmitted from the motor pinions, through the gear wheel to the quill, thence through the flexible " Yoke " drive

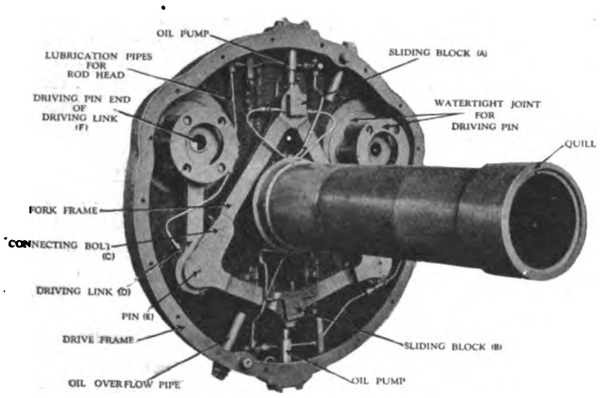


**Fig. 2.—The quill and flexible yoke drive with cover removed.**

to the adjacent driving wheel, and subsequently through the axle to the other driving wheel of the pair on that axle.

Fig. 2 illustrates the principle of the drive. The torque from the quill passes to the drive frame, which is arranged to enclose the link mechanism. The torque then passes through sliding block *A* and sliding block *B* to the forked framework, via connecting bolts *C*. The driving link *D* is pinned at *E* and *F*, the former being connected to the forked frame, and the end *F* being connected to pins on the driving wheel. The connecting links are provided with the necessary spherical bearings, in order to allow the angular movement between the road wheels and the drive. The drive, therefore, transmits the torque with varying eccentricities between centre line of axle and centre line of quill without rapid acceleration or deceleration of the armature masses.

This drive embodies the following important features :— There are no spring members—rigid coupling links only being used—thus the breakages so common in spring drive mechanisms are avoided. Springs are used in flexible driving mechanisms to absorb the stresses arising from the imperfection of the drive. The absence of springs in the " Yoke " drive follows from the avoidance of such stresses due to inherent accuracy of the principle employed, The drive, furthermore, facilitates the use of double-armatured motors—which have great mechanical as well as certain electrical advantages—and complete enclosure of the gearing, thereby ensuring proper protection from dust and obviating loss of lubricant.

The gear wheel on the quill is not stressed by the presence of coupling pins attached to the wheel itself, so that any tendency to deform the gear is avoided.

The drive is simple in construction, in that the mechanism requires only four universal joints and two sliding blocks. Lubrication of the drive is automatic, being effected by two ball valve pumps operated by the motion of the drive frame, and these pumps pick oil up from the periphery of the drive frame. The oil is whirled outwards by centrifugal force.

Suitable covers are provided to permit inspection of the drive mechanism, links and lubricating arrangements, and the drive may readily be dismantled by lowering the complete wheel set, with motor, into a pit, and subsequently removing the motor from the quill.

## Accessibility of Motors.

The general arrangement of the locomotive and the layout of the equipment is illustrated by Fig. 3. The arrangement adopted gives great accessibility of main and auxiliary motors and control gear, combined with a uniform distribution of the weight throughout the locomotive. The body is of the box type, provided with driver's compartments at each end, these being provided with entrance doors furnished with drop lights on either side.

Electrical and air and vacuum brake gauges are arranged for ready observation. Two through corridors are provided, one along each side of the locomotive and connecting the two driving compartments. These gangways also facilitate inspection of the main motors and auxiliary machines.

The central portion of the locomotive forms the machinery compartment. The main traction motors are mounted rigidly on the locomotive frame, and suitable openings are provided at each end of the motor frames to permit inspection. The space immediately above the traction motors is occupied by the main starting resistances and the auxiliary machinery, the latter comprising two electrically-operated compressors, two electrically-operated rotary exhausters, a motor-driven double blower, and the auxiliary motor-generator set.

Air for the forced ventilation of the traction motors is fed from the motor blower to the commutator ends of the main motors. It then passes along the axes of the motors, is exhausted at the pinion ends, and is thence conducted to the main resistances, being finally ejected through louvres in the roof clerestory.

Intermediate between the central machinery compartment and the driver's compartments are the two high tension compartments. Each has a gangway along the centre line of the locomotive, separated from the driver's compartments by doors interlocked with the high tension circuits to ensure that all apparatus is dead before access can be gained to either high tension compartment.

In the high tension compartments are located the main contactors, main motor reverser, inductive field shunts and auxiliary high tension control apparatus.

As previously stated, the main motors are of the twin-armature type, which results in a better mechanical arrangement than if single-armature motors were used. Furthermore, as two commutators are always in series across the line the electrical stability of the motor is considerably improved, since it is possible to adopt a conservative value for the voltage between commutator segments.

## Single-Sided Driving.

Each forced ventilated motor is rated at 710 B.H.P. and 750 B.H.P. respectively on the continuous and one hour ratings at the average line voltage of 1 400. Single-sided driving only is used, a pinion at one end of each armature shaft gearing with a common gear wheel secured to the quill.

Of box construction and made of high permeability cast steel, the main motor frame is provided with suitable openings for inspecting the interior of the machine. The motors are of the four-pole type, the main poles being arranged on the vertical and horizontal axes, with interpoles at 45 deg. The armature bearings are arranged for ring lubrication. The main quill bearings are oil and wool waste lubricated.

The control system is of the electro-pneumatic type, using separate unit switches for the line switches, resistance switches and combination switches. The direction of running is changed by means of a drum-type reverser, which also operates as the motor cut-out switch. The drum-type reversers are also electro-pneumatically operated. No cam-type switch units are utilised.

The control system is arranged to give series, series-parallel and parallel connection of the main motor armatures, corresponding respectively to six armatures in series, two parallel groups of three armatures in series, and three parallel groups of two armatures in series.

Resistance steps are provided in each motor grouping, there being thirteen series notches, ten series-parallel notches and ten parallel notches, thus ensuring very even starting. In addition, two weak field notches are provided, capable of use in any one of the three motor groupings, thus further enhancing the flexibility of the control by making it possible to use any of nine economic running speeds, i.e., without main resistance in circuit.

Field control is by field shunting, inductive shunts being used for this purpose. This method was preferred to field tapping, as the latter has some tendency to cause flash-over of the motors. In designing the field shunting equipment, the resistance and inductance of the shunts have been proportioned to give the same time constant as the main motor fields, thereby ensuring that the current builds up simultaneously in the two parallel circuits, thus practically obviating the possibility of a flash-over.

Overload protection is provided by main fuses, one immediately in front of each of the two pantographs, and by duplicated line switches in conjunction with overload relays in each of the three motor group circuits. A choke coil is provided in conjunction with each pantograph circuit, and an

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aluminium-type arrester ensures protection from lightning and surges.

Pantograph isolating switches are provided in conjunction with each pantograph, and are capable of operation by a hooked stick. In addition a pantograph bussing switch is provided so that, with either pantograph cut-out, current may be fed to either or both main motor circuits.

The main earthing switches are interlocked with the high tension doors. Arrangements are provided for the isolation of any particular motor. This is carried out on the reversers by a simple manual operation. In addition the whole equipment is divided into two halves, and, by means of multi-point switches, either of the halves can be quickly put out of operation without the need for entering either high tension chamber. This duplication is also carried out as far as possible on the auxiliary and all control circuits. Two separate feeds to the auxiliary circuits are therefore provided, these feeds being taken from the negative side of the main earthing switches and being separately protected by auxiliary fuses and auxiliary coke coils. Furthermore, each individual auxiliary motor circuit is protected by a 1 500 V fuse, all circuit being controlled by 1 500 V electro-magnetic contactors under remote control.

The two 1 500 V exhauster motors are arranged for two-speed control by means of a contactor which short-circuits a section of the motor field and a small series resistance. This contactor is energised by contacts on the driver's brake valve, so that during normal running the exhausters run at normal speed in order to maintain the vacuum in the train pipe line; when the brake is operated the exhausters are run at high speed to re-create the vacuum. The 1 500 V compressor motors are switched direct on to the 1 500 V line.

## Starting the Blower Motor.

The blower motor is provided with two starting steps, a large resistance being inserted in the circuit at the initial step, this resistance being partially cut-out automatically as the set runs up to speed, this being effected by means of a time lag relay.

The motor generator is of a special type, the unit comprising motor, generator and a small exciter. The windings on these three machines are so arranged that with widely fluctuating conditions on the high tension side the voltage on the low tension side is approximately constant. Thus, with a load of 35·5 A on the low tension side, there is no appreciable variation in low tension voltage when the line voltage varies suddenly from 1 900 to 700 V.

A suitable battery is provided which floats across the generator. It is controlled by means of the usual cut-in and cut-out switch, the nominal voltage of the auxiliary circuits being 50 V.

As previously stated the locomotive is provided with both electrically-operated compressors and exhausters, the train brake being of the vacuum-type, and the locomotive brake of the compressed air-type. Each driver's compartment is provided with a driver's vacuum brake valve, which is that normally used, and when operated actuates not only the train vacuum brakes, but, by means of a special diaphragm-type valve, the air brakes on the locomotive, the release in both cases being proportional.

## Straight Air Brake on Locomotive.

Furthermore, a straight air application valve is provided on the locomotive for applying air brake on the locomotive only, should this be required. Arrangements are also made for the locomotive brakes to be locked off while a brake application is made on the train. This feature enables the driver to make smooth service stops, especially when hauling long trains.

The master controller is provided with the necessary handles for controlling the various resistance notches, the grouping of the motors, and forward or reverse running respectively. The main drums are interlocked with the reverser drum in such a way that the main drums cannot be moved unless the reverser is fully thrown into either the forward or reverse position. Furthermore, the reverse drum cannot be operated unless the drums are in the "off" position.

The main and motor grouping handles are fixed, but the reverser handle is removable, a shroud being provided on the cap plate to ensure that the reverser handle can only be removed in the "off" position. Thus, the reverser handle controls the operation of the whole of the controller, and, consequently, unauthorised operation of the controller is rendered impossible.

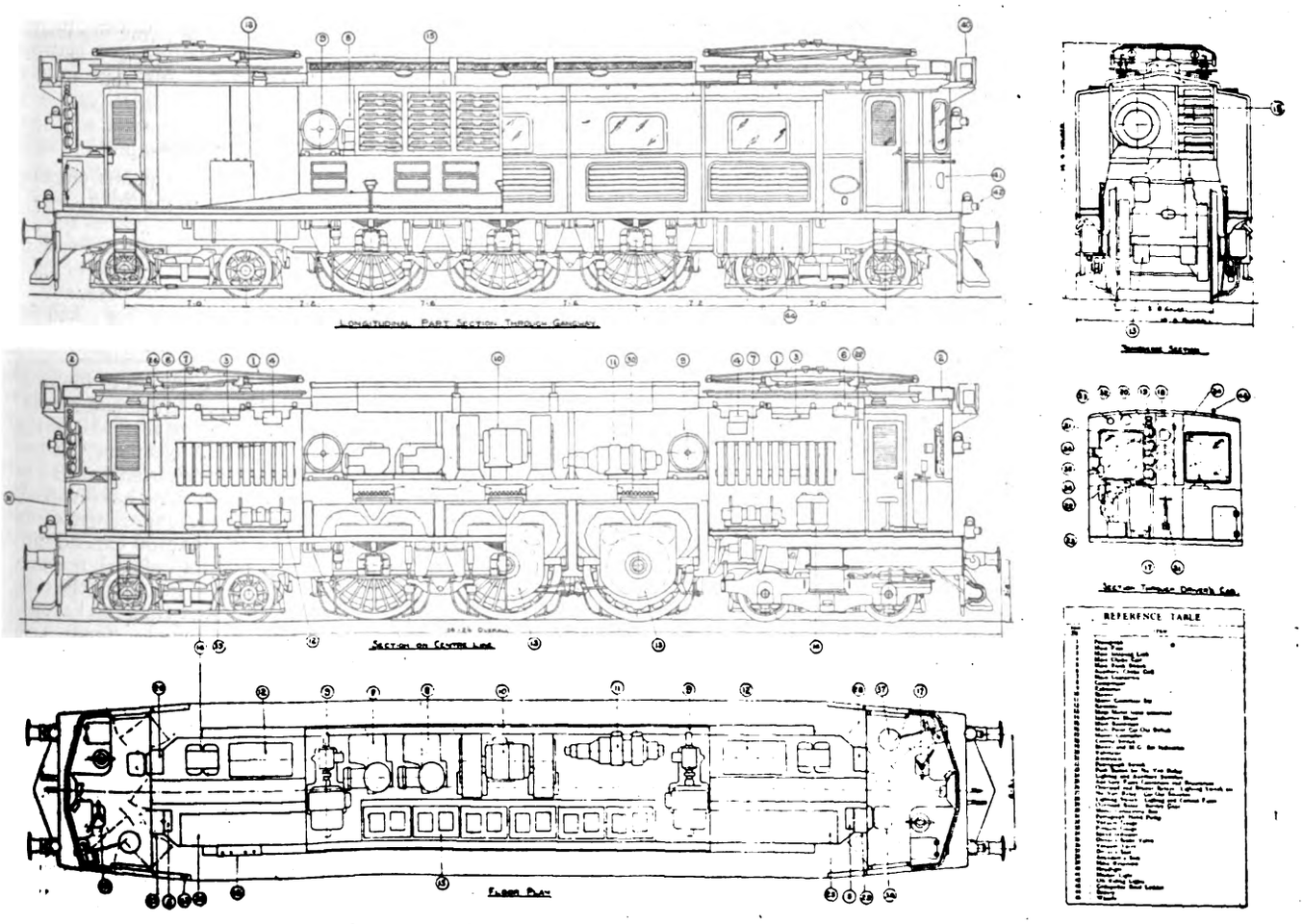


Fig. 3.—General arrangement of the express passenger electric locomotive for the Great Indian Peninsula Railway.

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# ELECTRICITY SUPPLY IN RURAL AREAS.

## Conference Issues Report on Investigations—Nature and Extent of Potential Demand—General Effect of Supply and Equipment Costs—Attractive Two-Part Tariffs Essential—E.D.A. Suggestions—Some General Recommendations.

THE Conference on Electricity Supply in Rural Areas which was convened by the Electricity Commissioners and presided over by Sir Harry Haward has now issued its Report (H.M. Stationery Office, 1s. net).

At the first meeting of the Conference last November, two sub-committees were appointed, one to investigate the nature and extent of the potential demand for electricity in rural areas, and the other to consider the bearing and general effect upon rural development of the price of supply and the cost of electrical equipment. The Conference also remitted the question of publicity and propaganda to the British Electrical Development Association for consideration and report.

The reports made by the two sub-committees and by the E.D.A. are reproduced in the Report of the Conference, and their chief features are reviewed below.

### Electrification Prospects.

The Report of Sub-Committee No. 1 reviews the salient statistics relating to the area and population of the rural portions of the country, and points out that the provision of an electrical service for rural areas of wide extent and a low average density of population presents economic considerations of a kind substantially different from those applying in the case of urban areas. It is shown that statutory powers for the supply of electricity for *all* purposes already exist as regards about 53 per cent. of the rural areas of England and Wales, containing upwards of 69 per cent. of the rural population, with an average density of 196 persons per square mile; that limited powers of supply for certain purposes exist in other rural areas; and that the "unoccupied" portions of rural England and Wales in which no supplies of electricity have hitherto been authorised cover about 40 per cent. of the rural areas, and include about 22 per cent. of the rural population, with the much lower average density of 85 persons per square mile. The Report points out that while the areas presenting the better possibilities are covered by statutory powers, the prospects of electrification depend, not only upon the existence of a remunerative demand, but also on the readiness with which the undertakers concerned are prepared to carry out the obligations attaching to their statutory powers.

The Conference attaches importance to the completion by the Commissioners of their analysis of the existing developments in distribution areas throughout the country, since this analysis will indicate the extent of the rural territory in which supplies of electricity are being given or on the point of being established, and also reveal the extent of territory covered by distribution powers which have not yet been put into force.

The Report then reviews available statistics for the present supply of electricity in 669 townships and villages in rural areas in Great Britain, embracing a population of over 1 400 000 inhabitants, and makes special reference to the value attaching to the load of the larger individual consumers. In the majority of cases where the supply has been established in recent years the present average *per capita* consumption is shown to range from 16 to 20 kWh per year. It is pointed out, however, that a consumption of about 60 kWh should be attained in the more promising rural areas in three or four years after the commencement of supply.

There were 1 770 farms connected to public supply mains in rural areas in Great Britain at the end of 1927, the electricity consumed in that year by 1 473 farms for which particulars were available amounting on an average to 1 150 kWh per farm. An analysis of the particulars for 834 of the farms shows that farms as a whole did not make any substantial use of electrical power for the various processes associated with farming.

In a review of the electrical potentialities of rural areas from the standpoint of the collective requirements of rural communities for light, heat and power, reference is made to the position in the more advanced *urban* areas where the consumption of electricity in average middle and working class houses ranges from 100 to 300 kWh per annum for lighting only, but reaches a figure of 1 000 to 3 000 kWh when electricity is also used for cooking, occasional heating, and for various labour-saving devices. After pointing out that for various reasons the consumption in similar classes of premises in *rural* areas cannot be expected to attain the figures representative of the practice in such urban areas, the Sub-Committee indicate that distinct possibilities attach to the general domestic demand in rural areas, and express the view that this load is an important factor in rural electrification. Statistics are then given for the number of farms in the country, and the number and types of engines and motors at present in use on farms, together with an indication of the nature and extent of the combined electrical requirements for domestic and power purposes in the case of individual farms of the most common types. The conclusion is drawn that when electrical equipment of ordinary character is installed for farm purposes and reasonably full use is made of electricity both for farming and farmhouse purposes, individual farms of the types in question are likely to represent, on a conservative basis, potential consumers to the extent of from 4 000 to 14 000 kWh per annum. Reference is also made to other purposes for which electricity may find an application in connection with farming and horticulture, and to other loads which may be expected in rural areas, such as the power required by pumping engines for water supply and for the drainage of fen and other land.

The Report refers to a number of factors which render it difficult to arrive at a reliable forecast of the potential demand in rural districts. The broad conclusion at which the Sub-Committee arrived is that a potential demand growing to the order of 230 000 000 kWh per annum in the course of the next ten years is indicated for the rural areas of Great Britain where supply powers already exist.

In summing up their general conclusions, the Sub-Committee emphasise the important part which overhead lines and wayleaves must play in the rural electrification of Great Britain, and in their recommendations, deal with the need for still further revision of the Regulations affecting the construction of overhead lines. Attention is also drawn to the advantages which will accrue by close co-operation between undertakers engaged in rural development and the general body of land owners and farmers.

### Two Main Considerations.

The Report of Sub-Committee No. 2 first points out that the limits of price within which supplies of electricity would have to be offered in rural areas to ensure its *general use* are affected by two main considerations, namely, (i) the cost to the potential consumer of alternative forms or sources of light, heat and power, and the value attached by the consumer to the convenience and utility of an electrical service; and (ii) the question whether it is economically practicable for undertakers to provide supplies within that limit.

The Report proceeds to deal with the question of limits of price from the standpoint of capital expenditure and reasonable remuneration thereon, this matter being reviewed in the light of the average working results of all electricity undertakings in the country during the four years from 1922-23 to 1925-26. It is shown that remunerative working has involved, on an average, the obtaining of an *annual revenue* representing about 20 per cent. in relation to the *total* capital expenditure on an undertaking; that upwards of one-half of such revenue was required for meeting working expenses, including the cost of generating or purchasing electricity; and that the balance provided for interest, loan repayment, sinking funds and dividends in respect of capital, and for reserve, renewals, depreciation funds, etc. After a consideration of the different characteristics of urban and rural electrification schemes, the Sub-Committee saw no reason for concluding that the general relation between revenue and total capital expenditure for remunerative working in the case of rural electrification would differ to any extent from the average results indicated, and accordingly adopted that basis when dealing with the question of limits of price.

The Conference considers it necessary to emphasise that the percentage figure adopted by the sub-committee does not represent a clear profit or margin over and above all the costs and charges involved; and that a *gross* revenue amounting

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to 20 per cent. on the total capital expenditure on an undertaking would have to meet all the working costs of providing, transmitting and distributing supplies, only the residual part of the revenue being available for capital charges such as interest or dividends, and loan repayment or depreciation. It is necessary to distinguish this percentage on *total* capital from the relationship laid down in the Electricity Acts between revenue and *particular* capital expenditure on distributing mains for giving supplies to an individual consumer.

## Expenditure and Charges.

The Report then illustrates the position by reference to a rural scheme involving a certain capital expenditure, and indicates how the necessary resultant revenue for remunerative working on the basis of that capital expenditure could be obtained by various scales of charges in accordance with the consumption of electricity. It is emphasised that the circumstances attaching to different classes of supply necessitate and justify different scales of charge, and that small and short-hour supplies for lighting purposes alone cannot be economically given at the same rates as are possible for the larger domestic supplies used for cooking and/or heating as well as lighting, or for the longer-hour supplies at a good load factor used for power purposes.

The sub-committee state that it is not possible to arrive at any one set of limiting prices for the main classes of supply which could be regarded as approximately applicable to every rural area which offered prospects of electrical development.

Consideration is given to the costs of the alternative forms or sources of light, heat and power available to potential consumers in rural areas, the information available indicating that the annual expenditure for lighting by means of oil lamps ranges from a minimum of 25s. to £5. An analysis showing the actual or estimated costs involved in connection with the lighting, heating and power requirements of 42 farms of various sizes and types is also given. The sub-committee formed the opinion that the costs of other facilities could not be regarded as presenting a serious obstacle to the adoption of electricity when offered on reasonable terms; and that the substitution of electricity would, as a general rule, prove an economic proposition to the average consumer even when account was taken of the cost of installation.

In summing up on the question as to limits of price, the sub-committee express the opinion that the *general use* of electricity for domestic and other purposes by the population in rural areas can only be brought about by the offer of a two-part or "all-in" tariff which will be attractive to the consumers and at the same time enable the undertakers to provide supplies on a remunerative basis; and that the aim in view should be a limit of 1½d. or 2d. per kWh. for the unit charge of two-part tariffs.

On the question of suitable forms of electricity tariffs for rural supplies it is stated that there are no special characteristics of any two-part tariffs hitherto devised that can be regarded as rendering a particular tariff pre-eminently suitable for rural as contrasted with urban development. The sub-committee express the view that pending the formulation of a single tariff suitable for general application, existing tariffs —those in which the fixed or service charge is based on the rateable value of the consumer's premises, or the number of rooms wired, or the wattage of the consumer's lighting installation, are likely to prove most suitable.

The attention of the Conference was drawn to the position which will result from the revaluation of premises under the Rating Act of 1925, which may have a disturbing effect in the case of existing electricity tariffs based upon former rateable values.

## Wiring and Apparatus Costs.

The Report then deals in detail with the question of the cost of electrical wiring and apparatus, pointing out that this factor assumes special prominence in the case of rural electrification owing to the generally lower spending power of the population concerned. Reference is made to the nature of the wiring installation required in rural premises of an average character; to the power equipment needed on average farms; and to ascertained costs of wiring and equipment of various kinds. The sub-committee express the view that the success of rural electrification is essentially dependent upon the provision of the best possible facilities in the way of assisted wiring schemes and the hire and hire-purchase of apparatus for all classes of potential consumers. After giving particulars of schemes and arrangements which have proved acceptable to consumers in certain rural areas of supply, and indicating the rental charges at which domestic electrical apparatus should be available, the sub-committee state that it is of importance, in the case of hire-purchase, that repayment by the consumer (unless otherwise desired by him) should be spread over a period of not less than three years. Reference is also made to a difficulty arising in connection with the electrification of farms where the potential consumer is a tenant farmer and not the owner.

In summarising their general conclusions, the sub-committee emphasise that the development of rural electrification on a commercially remunerative basis is essentially dependent, among other factors, upon the reduction to a minimum of capital expenditure on transmission and distribution by the adoption of an overhead system of inexpensive design. As a last point, the sub-committee record their view that the electrification not only of rural but also of urban areas, would be facilitated and expedited by reductions in the present costs of electrical wiring, lamps and apparatus generally.

The Report submitted by the British Development Association as to the methods of propaganda and educational publicity best adapted for the advancement of rural and agricultural electrical development contains a general review of the factors involved, and emphasises the desirability of limiting the circulation of propaganda for the present to those areas where a supply is available or likely to be available in the near future. Reference is made to various aspects of electricity supply to which propaganda should be directed; to the methods which can be employed; to the nature of the assistance that can be given by the Association; and to the desirability of keeping the supply industry advised as to districts in which development is likely to take place and propaganda issued.

## General Recommendations.

The Reports of the two sub-committees were generally adopted by the Conference, subject in the case of certain of the recommendations to modifications and additions. The recommendations adopted or made by the Conference are as follows:—

(i) That the Electricity Commissioners be asked to regard the development of electricity supply in rural areas as a special branch of their work to which continuous attention should be devoted; and to consider the advisability of appointing a special officer for the purpose.

(ii) That the Electricity Commissioners be asked to undertake a review of their new Code of Overhead Line Regulations within the next two years, with the view of effecting further reductions in the cost of rural lines by relaxations as regards ground clearance and factors of safety in respect of lines for supplying sparsely populated rural areas; and to consider the practicability of providing for different classes of construction for different types of rural area.

(iii) That the Electricity Commissioners be asked to urge undertakers to make a periodic canvass of the potential demand in the unsupplied portions of their areas; and to take such steps as are possible from time to time to ensure that undertakers carry out their obligations in cases where there is a reasonable prospect of supplies being given on a remunerative basis.

(iv) That undertakers who are able and in a position to extend supplies into neighbouring "unoccupied" areas should be urged by the Electricity Commissioners to consider the question of carrying out such extensions and of obtaining powers for that purpose in the absence of any other satisfactory proposals for supplying the areas in question.

(v) That statutory powers for the supply of electricity in new or extended areas should not be granted to existing undertakers either by private Bill or by Special Order unless the undertakers can show that they have not neglected their existing areas and have taken all reasonable steps to develop them.

As a rider to this recommendation, the Conference desires to record the view that in cases where it is found advantageous that supply powers should be conferred upon a gas undertaker, provision should be made to ensure that the electricity powers are duly exercised.

(vi) That the Electricity Commissioners be asked (*a*) to devote a special section of their annual report to the question of the supply of electricity in rural areas and the progress attained; and (*b*) to invite the co-operation of authorised undertakers in furnishing appropriate statistics dealing with the technical and financial aspects of such supply with a view to the periodic publication of a suitable summary in the annual report or otherwise.

(vii) That the principal Government Departments concerned be asked to consider jointly the question of taking steps to secure the further investigation of the various other aspects of rural electrification, including the collation and issue of such particulars as are likely to assist development in this direction.

(viii) That the Ministry of Agriculture and Fisheries and the Board of Agriculture for Scotland be asked to prepare and make available to bodies interested in electrical development a schedule of Drainage

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Authorities with particulars of their engine equipment; and to urge such authorities to consider the question of taking supplies of electrical power from a public system, when available, in lieu of extending or installing independent power plants.

(ix) That the Electricity Commissioners be asked to urge upon supply authorities the desirability of greater uniformity in respect of methods of charge and to invite the principal associations jointly to formulate definite proposals for achieving this object.

(x) That undertakers engaged in rural electrification who have not hitherto offered a multi-part or "all-in" tariff for general domestic supplies should be urged by the Electricity Commissioners to do so.

(xi) That the Electricity Commissioners be asked to invite the assistance of the principal representative associations of the electrical industry in devising a practical financial scheme for ensuring that facilities in the way of assisted wiring and for the hire or hire-purchase of apparatus are available, wherever needed, to prospective consumers in rural areas of supply.

(xii) That with the view of facilitating the electrification of farms in the occupation of tenants, the representative associations of the various bodies concerned be urged by the Electricity Commissioners to confer on the question of obviating the risk of loss of tenant farmers on expenditure on electric wiring and fixtures in the event of an early termination of tenancy.

(xiii) That the principal associations connected with the electricity supply industry be asked to consider the practicability of arranging for an annual conference of managers and engineers of municipal and company undertakings for the purpose of an interchange of views on the problems arising in connection with urban and rural electrification.

The Conference expressed the desire that the report of its proceedings should be published as soon as possible; and endorsed the proposal that a further meeting of the Conference should be convened after an interval of, say, twelve months, for the purpose of considering the action which had been taken in the meanwhile upon the various recommendations embodied in the Report, and of reviewing the position generally.

# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Overhead Lines and Aircraft.

[To the Editor.]

Sir,—I have just returned from the Paris Aero Show to read with interest your reply to my earlier letter in The Electrician of July 6th, with reference to overhead lines and aircraft.

Electricity at present admittedly offers greater service to the masses than aviation, but I still fail to see why airmen should be exposed to unnecessary danger on that account. As well to say that water-mains should be tolerated on the surface of our main roads because water is more essential to the masses than the convenience of motorists.

Your comparison of submarine cables with overhead power lines is equally unfortunate, for the only places in which submarine cables are allowed to be brought within reach of ships' hulls are when they come ashore—the last place in which any self-respecting seaman would wish to find his ship. Further, the simile is unsound because if a ship hits a submarine cable it is merely an incident, whereas if an aeroplane hits an overhead power wire it usually means an inquest.

Your implied suggestion that British pilots are inferior to American airmen also betrays a sad lack of knowledge of American accident statistics—the highest in the world—as well as ignorance of the universally recognised aerial supremacy of your own countrymen.

May I venture to suggest that before proceeding with your criticism of the aviators' "unreasonable demands" you experience the unique sensation of complete engine failure over a tract of country in which the only possible landing ground is obstructed by a high tension overhead power line?—I am, etc.,

T. Stanhope Sprigg.

110–111, Strand,
London, W.C.2.
July 27th.

[In view of our correspondent's previous admission that overhead telephone and telegraph wires are equally dangerous to airmen, we fail to appreciate why overhead power lines should be singled out for attack. While we have no desire to depreciate the achievements of our airmen, we do feel that if they are in frequent danger of colliding with wires near the ground they are almost equally liable to bowl over any human being who may be in the vicinity. When descending to earth from their own element they must exercise care, and there is no reason why pilots should not be provided with maps indicating the routes of aerial obstructions. We do not question the supremacy of British pilots; it was merely observed that in a country with far more overhead lines than we shall ever have, airmen seem to experience little difficulty in avoiding these obstructions.—Ed.]

## "A General Manager for the Industry."

[To the Editor.]

Sir,—Personally I am opposed to any such appointment as that of a super-general manager of the electrical industry; even if we know of such a man it is difficult to see what use he could be to our profession at the present time.

I am one of those who believe that we have suffered in the past, and still suffer, from too much management and interference in our purely business affairs which, as is well known, are at present satisfactory.—I am, etc.,

R. E. Crompton.

Thriplands,
Kensington Court,
London, W.
July 30th.

## Eddy Current Losses.

[To the Editor.]

Sir,—May I encroach on your valuable space to draw the attention of your readers to a few errors which have occurred in my contribution on eddy current losses in transformers, published in your issue of July 27th?

On p. 89.

First column, line 45, for $B\pi = \ldots$ read $B_x = \ldots$

Second column, line 17 for $\left\{\frac{m^3-(m-1)^3}{3u^2}-\frac{\pi^2}{H^2}\right\}^2$

read $\left\{\frac{m^3-(m-1)^3}{3u^2}-\frac{x^2}{H^2}\right\}^2$

Second column, line 24, for $9^2-\frac{2}{3}\frac{a\{m^3-(m-1)^3\}}{u^2}x^3+\ldots$

read $a^2-\frac{2}{3}\frac{a\{m^3-(m-1)^3\}}{u^2}+\ldots$

On p. 96.

First column, line 21, for $\frac{m^2-m+\frac{1}{12}}{3n^2}$

read $\frac{m^2-m+\frac{1}{12}}{3u^2}$

These are purely printers' errors, and do not affect the final formulæ given.—I am, etc.

Ralph M. W. Grant, B.Sc.(Hons.).

## POINTS OF VIEW.

Electricity is conspicuously the world's traveller.—*Sir Oliver Lodge.*

* * *

The god of his (the modern boy's) idolatry is electricity.—*Lady Cynthia Asquith.*

* * *

The omnibus was invented by a man who ought to have known better.—*Sir Lynden Macassey.*

* * *

Anything that is going to bring down the price of power is a direct stimulus to industrial progress.—*Mr. P. W. Harris, M.P.*

* * *

There is evidence on all hands that the rural districts are clamouring for a cheap supply of electricity.—*Mr. T. P. Wilmshurst.*

* * *

The fundamental error of the cable companies was that they did not recognise, years ago, that wireless was a potential competitor.—*Sir Robert Donald.*

* * *

During my tour of some of the Dominions last year I was greatly impressed by the immense benefits which cheap electricity confers upon the homes of the rich and poor alike.—*H.R.H. The Duke of York.*

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# WIRELESS AND CABLES.

## A Merger Company Recommended by the Imperial and Wireless Conference.

THE report of the Imperial and Wireless Conference, 1928, appointed to examine the situation which has arisen as a result of the competition of the Beam wireless and the cable services, " to report thereon and to make recommendations with a view to a common policy being adopted by the various Governments concerned," was issued on Friday of last week, and we give below an abstract of the findings.

The merger company to be formed will acquire as from April 1st, 1928, all the ordinary shares of the Eastern, Eastern Extension, and Western Telegraph Companies, and all the ordinary and preference shares and debentures (if any) of Marconi's Wireless Telegraph Co.

### Another Company.

There will also be formed a communications company to which the cable and Marconi Companies will sell as at April 1st, 1928, all their communication assets in exchange for shares. The communications company will therefore hold all the communication assets of the cable and Marconi Companies except in so far as these belong to the subsidiary companies in which the cable and Marconi Companies' holdings are less than 100 per cent. The communications company will acquire the holdings of the cable and Marconi companies in those communications companies in which the cable and Marconi companies' holdings are less than 100 per cent. The communications company will also acquire the Government cables and hold the lease of the Post Office Beam stations. The capital of the communications company not to exceed at its inception £30 000 000. By the formation of the communications company on the lines indicated above an arrangement is made to segregate in one company what may be termed the purely " communications " aspect of the undertaking, leaving in the hands of the merger company the investments of the cable companies and the Marconi interests in non-traffic undertakings and other activities, such as the manufacture of radio apparatus and the exercise of wireless patent rights in which the parties to the merger company are interested.

The communications company to take over as from April 1st, 1928, the Pacific Cable Board's Cables, the West Indian Cable and Wireless System worked by the Pacific Cable Board, the Imperial Atlantic Cables, and the lease of the Post Office Beam services (including provision for the transfer to the company of existing staffs) on terms to be arranged. The Beam services to be leased for 25 years at a rental of (*a*) a basic sum of £250 000 per annum ; (*b*) as from April 1st, 1931, an addition equivalent to 12 per cent. on any increase in the company's profits (from communications services) above the standard revenue ; (*c*) a payment of £60 000 to be paid.

The communications company to undertake to meet the annual service of the outstanding debt on the Pacific Cable Board as on April 1st, 1928, and to pay in addition a capital sum of £517 000 for the Pacific Cables, together with interest at 5 per cent. as from April 1st, 1928 ; to pay £300 000 for the West Indian cable and £450 000 for the Imperial cables. The rental payable by the communications company and the service of the Pacific Cable Board debt will be guaranteed by the merger company.

The Board of directors of the merger company, the communications company, the cable and Marconi companies will be identical. Two of the directors, one of whom shall be chairman of the communications company, to be persons approved by the Government on the suggestion of the cable companies. At the outset the number of directors will, in consequence of the amalgamation, be large. It has, however, been accepted by the companies, that as and when opportunities offer this number will be reduced to a smaller figure—say, 12—including the two directors approved by the Government.

A standard net revenue of £1 865 000 (exclusive of non-telegraphic investment revenue) from the communications company services to be fixed to the purposes of the company ; all net revenue from communications service in excess of that sum to go as to 50 per cent. to the company, and as to 50 per cent. to reduction of rates or such other purpose as the Advisory Committee may approve. If additional capital expenditure is incurred by the communications company in relation to traffic, there shall be added to the above initial standard revenue an appropriate charge for interest.

The communications company to consult in regard to questions of policy, including any alteration of rates, an Advisory Committee, which the Conference suggests should include representatives of the Governments participating in the Conference, to whom representatives of other parts of the Empire may be added as required from time to time with the approval of the Governments concerned.

The report does not attempt to lay down the precise composition of the committee or to define the status of its members.

It is to be agreed (*a*) that British control of all the companies must be guaranteed ; (*b*) that the Governments may assume control of the cable and wireless systems in time of war or other national emergency ; (*c*) that the Fighting Services are entitled to build and work cable or wireless stations for their own purposes, but not for commercial purposes.

Before detailing the suggested scheme, the report explains that representatives of the following companies attended meetings of the conference and described the nature and status of their undertakings, their relationship with the Governments concerned, and their views on the problems under consideration : The Eastern and Associated Telegraph Companies, The Indo-European Telegraph Company, Marconi's Wireless Telegraph Company, The Canadian Marconi Company, The Wireless Telegraph Company of South Africa, and The Indian Radio Telegraph Company. The Conference also received a deputation from the Empire Press Union, and communications were received from the Federation of British Industries and the London Chamber of Commerce.

The report continues to point out that an amalgamation in one undertaking of all the cable and wireless interests conducting communications between the various parts of the Empire would remove most of the objections raised for consideration. By such an arrangement unity of control and unity of direction would be secured. The continuance of the cable system would be assured, economies could be effected, and the creation of a common purse and a common interest would leave the union free to devote its united energies to resist encroachments on the part of foreign competitors. The proposed fusion involves considerations of policy in regard to the disposal of Government-owned assets—such as the Pacific Cable Board's system, the Imperial Transatlantic cables, the General Post Office Beam stations in Great Britain, and the Government-owned cable and wireless system in the West Indies. The Conference report :—

We formed the opinion that a merger between the Eastern Telegraph Companies and Marconi's Wireless Telegraph Company, negotiations towards which had been instituted by the companies themselves before the first meeting of the Conference, would facilitate the solution of the problem referred to us provided satisfactory arrangements were secured to safeguard the interests of the Governments and public. We accordingly addressed a communication to the Governments represented on the Conference, setting out the considerations which had prompted us to form this opinion, and inquiring whether any objection was entertained to a solution being sought on this basis.

On the day that replies were being considered by the Conference, we received a letter signed jointly by the chairmen of the two companies, to the effect that a merger between them had been arranged subject to certain conditions.

### Government Owned Beam Systems.

Any scheme of complete fusion would entail also a transfer in regard to ownership or management of the beam wireless and cable assets belonging to H.M. Government in Great Britain. We were informed that the arrangements contemplated by the Eastern and Marconi companies included a transfer to them of these assets ; and it is possible that unless the beam installations were transferred to the new company, the merger would not, in fact, take place. Such a transfer would involve for H.M. Government in Great Britain a departure from the policy hitherto adopted in regard to the conduct of wireless services. We felt, therefore, that no useful purpose would be served in pursuing the consideration of such an arrangement until we were advised as to the attitude of the Government in Great Britain towards it.

We accordingly instituted negotiations with the companies concerned, and in doing so were careful to emphasize that they were undertaken on the understanding that their object was merely to enable us to formulate recommendations to the Governments concerned, with whom rested the final decision in regard to all the matters involved.

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# AUSTRALIAN LETTER.

## Prospective Hydro-Electric Developments in Queensland.

By W. DAVEY (Managing Editor, "Australasian Electrical Times").

MELBOURNE, June 27th.

AS a result of the report of the Royal Commission which inquired into the letting of tenders for steam raising plant for the Sydney City Council's Bunnerong power station, the deputy-general manager of the Electricity Department, Mr. S. Y. Maling, has been dismissed from his office*, and the City Solicitor has been instructed to apply to Mr. Maling for a refund of £10 600, alleged to have been received by him as a secret commission from the successful tenderer for the plant.

The Sydney City Council was recently abolished by the State Government, and the Civic Commission which is carrying out its work announces that other Electricity Department tenders, and in particular one involving the purchase of over a million pounds worth of coal, will be investigated. Many transactions of the late Council have been the subject of "graft" rumours. In one instance, Labour aldermen came within an ace of engineering the purchase at £60 000 of a coal mine for the purpose of obtaining power house supplies, and it is interesting to know that immediately after this proposed deal fell through, the same mine was offered for sale in other quarters at £35 000.

* * *

Melbourne City Council has decided to expend £30 000 upon the conversion of the lighting in the principal city streets. In Collins Street powerful units, with scientifically designed reflectors, are mounted on artistic standards, and this system is to be extended to the major portion of the city proper.

* * *

The Labour Government of Victoria recently passed an Act the practical consequence of which was to drive off the roads nearly all the motor 'buses in operation. Strong feeling has been aroused, and it is feared in some quarters that electric traction will be hindered, rather than helped. The human factor is of great importance in the Road *v.* Rail controversy, and the summary annihilation of road services may foster the feeling that they were an opponent too formidable to be met by railways and tramways. This feeling may easily cause people to believe that they are being robbed by the politicians of the best service available and engender hostile thoughts towards rail transport.

* * *

An important investigation has begun in Queensland. Mr. Harry A. Curtis, the genial and able general manager of the Tasmanian Hydro-Electric Department, has been "loaned" by the Tasmanian Government to the Queensland Government and the Development and Migration Commission, a federal body, for the purpose of investigating certain hydro-electric proposals in the Cairns district. Mr. Curtis, accompanied by Mr. A. P. Flockhart, hydraulic engineer to the Tasmanian Hydro-Electric Department, is now in Queensland engaged on the work. The Cairns hinterland is a wonderful country indeed. Its population is trifling; its potentialities are enormous. Its area includes 15 000 square miles of the Atherton Plateau, the only tropical plateau in the world of any size situated more than 2 000 ft. above sea level. Its mineral, pastoral and agricultural resources will some day make it one of the world's great centres of production. For the present it is somewhat handicapped by labour and other difficulties. But it offers freedom and opportunity to any Briton who goes into it with a little capital and a will to work.

* * *

Melbourne has recently changed-over several of the cable tram routes in the city to electric traction. There have been complaints of the noise caused by these trams, and an investigation by Prof. T. H. Laby, of the University of Melbourne, reveals that they are the noisiest vehicles on the streets. The Melbourne Tramways Board is, however, investigating the matter itself, and will doubtless find some means of ameliorating the trouble.

* * *

The radio broadcasting situation in Australia has been radically changed during the past month by amalgamations of the existing companies. Two separate companies have been operating "A" class broadcasting stations, which are subsidised by the Government from revenue collected from listeners, in Melbourne and Sydney, but in both cities the concerns have amalgamated. The Broadcasting Co. of Australia Pty., Ltd., with a capital of £200 000, now controls both Melbourne stations, and the N.S.W. Broadcasting Co., Ltd., with a capital of £100 000, has been formed to conduct the two Sydney stations.

Negotiations are also in progress which will in all probability result in the control by the former company of "A" class broadcasting in the States of South Australia, Western Australia and Tasmania, in each of which one "A" class station is being operated. The reason for these movements has been a determination expressed by the P.M.G.'s Department, which oversees Australian broadcasting on behalf of the Commonwealth Government, to secure a better level of entertainment, and to eliminate duplication of programmes.

* * *

Mr. Stanley W. Ellis, one of the leading figures in South Australia's electrical contracting fraternity has recently sold his business in Adelaide, and left by the R.M.S. "Narkunda" on June 6th with letters of introduction to leading British electrical firms. Mr. Ellis will make a special study of electrical installation and illumination in Great Britain, Europe and America, and will give his home city the benefit of the knowledge thus gained when he returns. British electrical people who have anything of special interest which they would like to show to Mr. Ellis may reach him by communicating c/o Head Office of the English, Scottish and Australian Bank, Ltd., London.

* * *

Plans have now been completed by the State Electricity Commission of Victoria for the extensions mentioned in a previous letter. This involved expenditures of £308 000 for enlarging the Commission's power station at Yallourn, £1 511 400 for steam raising and generating plant and associated equipment, and £224 000 for switchgear and miscellaneous items. This extension will involve also the provision of a new terminal station at Richmond which will be situated at the site of the Melbourne Electric Supply Co.'s old power house on the Yarra River, about two miles from the heart of Melbourne. The cost of this station is estimated at £264 000, made up of £48 000 for land and buildings, £136 000 for transformers and switchgear, £58 000 for other machinery and equipment, and £22 000 for contingencies.

A new high tension line between Yallourn and Richmond, which will carry two three-phase circuits operating at 132 000 V, and will be approximately 100 miles long, will cost £342 000.

The new plant at Yallourn will consist of three 25 000 kW sets, giving a normal output of 50 000 kW. The estimated cost for delivering energy from this plant to Richmond terminal station and stepping it down to 22 000 V for bulk distribution is 0·597d. per kWh with a load factor of 35 per cent., of 0·415d. with load factor 55 per cent. The Commission now has a normal generating capacity of 66 000 kW, and the hydro-electric stations at Sugar Loaf, Rubicon, will add 10 000 kW before the winter is over.

Next year an additional 15 000 kW will be provided by the new set which is being installed at Richmond. This generating capacity is expected to meet demands up to the end of the winter of 1930, and the present Yallourn extension will be required for the winter load of 1931.

* * *

On the merchandising side, the principal feature of Australian development this winter is the marked increase in house-to-house canvassing for the sale of domestic appliances. Scarcely a day passes without the housewife being called upon by salesmen who seek permission to demonstrate vacuum cleaners, clothes washers, radiators, etc. It is to be feared that, in many cases these itinerant salesmen are regarded rather as a nuisance than an acquisition.

* * *

A new company of interest to the Australian electrical industry has been formed at Melbourne during the month to handle the whole Australian agencies of the Brush Electrical Engineering Co., Ltd., Howden Ljungström Heaters, Ruths Steam Accumulators, the products of Turbine Gears, Ltd., and other lines. The chairman and managing director is Major P. B. Coulston, formerly a director of the Brush Co. in Britain, and associated with him on the board are three well-known Australian business men, Messrs. Colin Templeton, chairman of the Mt. Lyell Mining and Railway Co. and other large undertakings; P. J. Pringle, managing director of the Electric Supply Co., of Victoria, Ltd., and Mr. C. C. Johnson.

[* Later reports state that Mr. Maling has been sentenced to six months' imprisonment and to pay a fine of £500, or a year's imprisonment in default. It is understood that an appeal has been lodged.—ED.]

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# NEWS IN BRIEF.

## Woolwich Council's All-Electric Houses—Decorative Lighting at Tynemouth—Extension of Hull Electric Baths—Bust of Faraday for Southwark Library—Overhead Lines Association's Conversazione—U.S. Army's Electric Cookers.

THE minimum charge for reply-paid telegrams to the Irish Free State is now 1s. 6d. (for 12 words).

Darlington Corporation require a lady to act as electric cooking demonstrator and showroom assistant.

Wimbledon Electricity Committee has obtained sanction to borrow £15 000 for electrical domestic apparatus.

Woolwich Borough Council are about to erect 90 all-electric houses at West Horne Road, Eltham, and 31 at Kidbrooke Lane.

In aid of a fund, estimated at £300, for an electric light installation and other improvements in the Grassendale parish hall, a fête and gymkhana were held recently at the Priory, Grassendale.

A third turbo-electric liner is to be built by the Newport News Shipbuilding and Dry Dock Co., for the International Mercantile Marine Co. The vessel will be 612 ft. in length, with an 83 ft. beam, and her tonnage will be 35 000.

In the electrical engineering department of the Faculty of Science, at the University of Birmingham, there are courses extending over four years and leading to the degree of Bachelor of Science in Electrical Engineering. The session commences on October 1st, 1928.

Tynemouth Corporation Sands Committee have asked the superintendent to confer with the borough surveyor and electrical engineer, and submit a scheme, with estimate of cost, for providing poles and festoons carrying coloured lamps, at the Bathing Pool.

**In view of developments in the near future in connection with the Stretford and Urmston Electricity Bill, Stretford Electricity Committee have decided that it is not desirable to reconstitute the Electricity and Tramways Sub-Committee for the current year.**

Mr. W. R. Rogers, proprietor of Betty's Bakery, in Crwys Road, Cardiff, has recently had the bakehouse equipped with electric ovens and other electric labour-saving appliances. This is said to be the first electric bakery installation, on a commercial scale, in Wales.

Hull Corporation's vapour, medical and electrical baths, although only established a short time ago, have already proved unequal to the demand which has arisen for medical and electrical treatment, and the Baths Committee have approved plans for extensions estimated to cost £1 800.

Recently the Council of the Institution of Electrical Engineers decided to present a replica of the Faraday bust in the possession of the Institution to Southwark B.C. Library. The president-elect of the Institution, Lt.-Col. Kenelm Edgcumbe, R.E., has accepted the invitation to unveil the bust on October 17th.

The first conversazione of the Overhead Lines Association will be held on October 10th, 1928, at the Wellington Rooms, 105, Victoria Street, London, S.W.1. Amongst the attractions will be overhead line exhibits, dancing, etc. Tickets, half-a-guinea each, from the hon. secretary, Mr. Theodore Stevens, 50, Lincoln's Inn Fields, London, W.C.2.

The Leith Dock Commissioners' new grain warehouse and electric sub-station were recently inaugurated. The sub-station, situated near the grain elevator, contains two motor converters of about 2 000 H.P. capacity, made and installed by Bruce Peebles and Co., Ltd. The a.c. bulk supply is taken from Edinburgh Corporation's mains.

The Standing Committee on Merchandise Marks held an inquiry last week into an application by the High Conductivity Copper Association, the Manufactured Copper Association, and the Brass and Copper Tube Association, for an Order for the marking of imported copper plates, sheets, strips and other rolled sections, rods and wire (other than insulated wire) and tubes.

At a luncheon, presided over by Mr. J. A. B. Horsley, chief electrical inspector of mines, in connection with the recent Colliery and General Mining Exhibition at Manchester, Mr. H. O. Dixon, president of the Manchester Geological and Mining Society, said in the application of electricity to coal-mining Lancashire was equal to any other part of England, but it was behind Scotland. Unfortunately there was not much spare money available for investment in new appliances, and he regretted that engineers and manufacturers had not seen their way to put the prices on a lower basis.

Croydon electricity works are buying 25 tons of coal at 17s. 6d. per ton delivered, according to the daily Press.

To replace inefficient cooking appliances in officers' quarters, the United States Army have purchased 1 900 modern electric cookers.

Over 2 000 new consumers have been added to the mains of the Croydon electricity undertaking during the last twelve months.

Gravesend Electricity Committee are making an offer of £3 500 for "Cromer House" for use as electricity offices and showrooms.

Fifteen miles of steel columns will be electrically welded to form the book racks of the new memorial library at Yale University.

It is estimated that nearly 10 000 people have availed themselves of the Electricity Supply Board's invitation to visit the Shannon works.

An automatic device which utilises the hum of an aeroplane engine to close the circuit of an airport lighting system has been developed in America.

Cape Town Electricity Committee have authorised the city electrical engineer to utilise the rooms in the house above the Wynberg sub-station and showroom as a model electric flat.

The south front and clock tower of the City Hall, Cardiff, were floodlighted during the period of the Conference of the British Medical Association last week. The illuminations are being continued until to-morrow.

Wimbledon Corporation's All-Electric Flat Exhibition, which was held from April 23rd to June 9th, is reported to have been an unqualified success, many new customers having been secured as a result of visits to the exhibit.

Barking Electricity Committee have instructed the electrical engineer, in collaboration with the director of education, to prepare a report as to the desirability of installing electric cookers at the various cookery centres in the district.

The Metropolitan Asylums Board propose to put in a new automatic telephone system at North-Western Hospital, at a cost of £980. The engineer-in-chief submitted alternative estimates for the automatic system at £980, and for the central battery system at £650.

Medical members of the House of Commons have approached the Minister of Health with a request that he should discuss with them the question of registration of establishments at which artificial sunlight is administered, as many of these are now carried on without supervision.

At the International Congress of Heliotherapy at Lausanne, from September 10th to 13th, there is to be an "Exposition de sources lumineuses artificielles et d'appareils de measure des radiations." Current will be provided free of charge. British exhibitors should apply to the Service d'Hygiene de la Ville de Lausanne, giving particulars of exhibits.

Examinations for Graduateship and Associate Membership of the Institute of Transport will be held in London and at other centres on April 25th, 26th and 27th, 1929. The four main line railways, the Metropolitan, and the London Underground and L.G.O.C. Group, subject to the exigencies of each company's business, have agreed to grant leave of absence (without loss of pay) to members of their staffs taking these examinations.

According to data compiled for the Canadian Department of the Interior, 550 000 H.P. of turbine capacity will be installed during the present year in new developments or in additions to existing hydro-electric stations in Canada. It is stated that undertakings in the initial stages of construction and others in prospect will, when completed within the next few years, result in an addition to the total installation in the Dominion of over 2 000 000 H.P., and will require an aggregate direct investment of over $200 000 000.

Essex County Council report that the local authorities have approved of the installation at Brentwood Mental Hospital of plant to enable the Committee to produce electricity by means of an oil engine-driven generator, the estimated cost being £22 750. The Minister of Health has refused to sanction a loan for this scheme, which involved the generation of electricity by the Committee's plant. The Committee therefore propose to obtain a supply of electricity from the mains of the Brentwood District Electric Co., Ltd.

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# LEGAL INTELLIGENCE.

## Application for Compulsory Licence and Reduction of Royalty.

THE hearing by the Comptroller-General of Patents of the application by the Brownie Wireless Co. (of Great Britain) for a compulsory license under certain Marconi patents and for a reduction of royalty, was concluded on July 26th.

Mr. James Barber, governing director of the Brownie Co., said if retail prices were lowered the retailer received a credit in respect of sets in stock. There would not be an application made to the Marconi Co. for a return of the excess royalty paid. His case was that if he sold a set for 25s. he had to add the 12s. 6d. royalty to the purchase price. There was an impression that an amateur could make a set and it would not be subject to royalty. That was a delusion. He was sure that the Radio Manufacturers' Association, which was morally supporting him in this application, would join the Marconi Co. in propaganda to show the public the true facts as regarded royalties.

Mr. Hubert Alexander Gill, patent agent and adviser to the Marconi Co., said he considered any attempt to charge royalties as a percentage of the retail selling price would entirely fail. The result would be that manufacturers would be tempted to concentrate parts subject to royalty in one small unit to be sold separately, and to put the parts not embodying patents into other units which would be sold free of royalty. He considered that the method of charging royalties per valve holder was the fairest that could be arrived at.

For the applicants, it was suggested that they should pay 5 per cent. only on retail prices of wireless receiving sets containing the patents, or 10 per cent. on the wholesale prices, or if the valve-holder remained the basis of calculation, 5s. on the first valve-holder and 2s. 6d. on each succeeding one in the set.

Mr. Whitehead, K.C., for the Marconi Co., argued that under the Patents Act the Controller could not alter this particular royalty. He must be satisfied there was some abuse of monopoly rights before he intervened to reduce the royalty, and that in law could not be shown. Supposing in this case the royalties were reduced, what guarantee was there that the price charged to the public for receiving sets would be modified in the slightest degree ? The association to which the applicants belonged—the Radio Manufacturers' Association—has as its principal objects good programmes, the keeping down of royalties and the maintenance of prices. That was why they were a trade union ; otherwise the last object would be wholly illegal.

Mr. Moritz said if a reduction of royalty were made, they were convinced that they could then combine with the Marconi Co. and put them in a position to stop the home constructor. If royalties were reasonable they would pledge themselves to help them, and they believed the home constructor would be stopped or made to pay royalty. If so, it would treble the amount of royalty paid.

Judgment was reserved for a week, the Comptroller-General saying he hoped in the meantime the parties would arrive at an agreement.

## Application by German Firm for Wireless Licence.

The Comptroller-General of Patents (Mr. W. S. Jarratt) heard, on Friday of last week, an application by the Loewe Radio Co. for a licence under certain Marconi patents to manufacture and sell in this country a new wireless receiving set which they claimed was equal to a three-valve set.

The Hon. Stafford Cripps, K.C., for the applicants, said that the question arose as to what were the most suitable terms for a licence in a special case of this sort. The applicants could, if the royalty were reasonable, sell this set at such a price as to reach an enormously large public at present untouched by the valve sets on the market. Last year in Germany over half a million sets were sold. In respect of these a total royalty of £35 000 was paid to the Telefunken Co. They were prepared to pay royalties to the Marconi Co. on an equivalent system. Provided the royalty here was fixed at a figure comparable with the German royalty, the company was anxious and willing to transfer immediately the whole of the manufacture of this part of their business to this country. They had a factory at Tottenham ready to manufacture these sets directly they got a licence.

Mr. David Loewe, a director of the English company, said that the sets would probably be sold in this country at first at about 30s. each. When they got up to mass production state, they hoped to reduce that price to 25s. Of the 30s., about 50 per cent. went in labour, between 30 and 35 per cent. in material, and between 15 and 20 per cent. in overhead charges and profit. This 30s. figure made allowance for a 10 per cent. royalty.

Mr. James Whitehead, K.C., for the Marconi Co., asked whether his clients would be acting fairly to all their other licensees if, just because these valves happened to be enclosed in one casing in the Loewe set, they only charged a royalty on the one valve.

The Comptroller reserved judgment for a week, subject to no agreement being reached between the parties in the interval.

## Sequel to Dismissal of Electrical Employee.

In the Chancery Division, on July 26th, Mr. Justice Maugham had before him an action brought by the Attorney-General, acting at the relation of Mr. Herbert Halsall, a ratepayer and member of Birkenhead Corporation, against the Corporation for declarations that certain resolutions passed by committees of the Corporation and confirmed by the Corporation were unlawful.

Mr. Lynskey, for the Attorney-General, said it was unlawful for the Corporation to require any person as a condition of employment or continuance in employment to become or be a member of a trade union. He asked for an injunction to restrain the Corporation from acting upon or enforcing the resolutions. On July 6th last year the Corporation confirmed and adopted resolutions of various committees that the employees of the committees should be required to become members of certain trade unions. On August 21st, 1927, the Corporation dismissed Arthur Ernest Stafford an employee, because he was not a member of the Electrical Trades' Union, but allowed him to resume work when he became a member of that union on September 19th. Stafford brought a successful action in the Birkenhead County Court for a declaration that the Corporation had acted in contravention of the Trade Disputes and Trades Unions Act, 1927. On December 7th last Mr. Halsall moved at a Corporation meeting that the committees' resolutions should cease to be operative. The motion was defeated.

For the Corporation it was stated that on August 20th, 1927, the district secretary of the Electrical Trades' Union threatened Mr. Spencer, the Corporation's electrical engineer, that that union would withdraw its members who were employees of the Corporation unless Stafford joined that Union.

His Lordship in giving judgment said the passing of the resolutions and the issue of information to the Corporation's employees regarding them was perfectly legal. The Trade Disputes and Trade Unions Act came into operation shortly afterwards, and he was not sure that it was obligatory on the Corporation to declare that the resolutions were to be no longer operative. There were however incidents that instructions were given to the electrical engineer to dismiss Stafford. These general instructions, given by the Electricity Committee with regard to the employment of electricians, remained unrevoked, and further it was wrong on August 31st, after the Act made void the requirement of trade union membership as a condition of employment, to cause a notice to be posted up in the tramways department that the employees there were required to become members of a trade union.

His Lordship said he must draw the inference that the refusal of the Corporation in October, 1927, to instruct heads of departments that they were no longer to insist on trade union membership, showed that the Corporation did not desire that the resolutions should cease to have any effect. He was, however, satisfied that there was no desire to oppress people who were not members of trade unions or to put into force the resolutions except to a limited extent.

Accordingly he did not think it right to grant any injunction to restrain the corporation from acting on or enforcing the resolution. There would, however, be a declaration that it was not lawful for the corporation to require any person as a condition of employment or continuance in employment to become or be a member of a trade union. The corporation must pay the costs of the action.

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Wimbledon Electricity Committee is seeking sanction to borrow £5 000 to meet expenditure in connection with the wiring of consumers' premises. The Committee also propose to borrow £100 000 to meet over-expenditure and for mains and services.

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# PERSONAL.

THE marriage of Lt.-Col. A. Tyler-Hitch and Miss K. M. M. Williams, was solemnised at Ware, Herts, on July 19th.

Mr. F. J. E. Brake has been appointed a director of Standard Telephones and Cables, Ltd. He was formerly sales manager.

It is understood that Mr. F. Harding has intimated a wish to resign his position as manager of the Derby Corporation Tramways.

Mr. J. P. Sykes, manager of the Rotherham tramways, has been authorised to attend the annual Road Safety Congress in London from October 16th to 18th.

Mr. W. J. Wiles has resigned his position with the British Thomson-Houston Co., Ltd., to join S. G. Leach and Co., Ltd. He has been appointed to a seat on the Board of Directors.

It is reported that Sir Philip Dawson, M.P., will be chairman of Electromonic (Foreign Rights), which is being formed to take over the foreign rights in patents held by the Electromonic Co., Ltd.

The statement made by a London daily paper recently to the effect that Sir John Denison-Pender is about to retire from the chairmanship of the Eastern Telegraph Co. and its associated companies, is denied.

Visitors to the I.M.E.A. Convention at Bath this year will learn with interest that Alderman Cedric Chivers, whose hospitality was a notable feature of the meeting, has accepted the office of Mayor of Bath for the sixth term.

Mr. G. C. Usher, general manager and director of International Combustion, Ltd., sailed on July 28th for an extensive tour of the United States, in connection with "Lopulco" interests, and will be away from England until September 16th.

Mr. James B. Shield, on resigning his position as works manager to Anderson, Boyes and Co., Ltd., Flemington Electrical Works, Motherwell, has been presented by the staff and employees with a cut crystal lamp, and silver rose bowl for his wife.

West Ham Town Council have increased the salary of the general manager of the Tramways Department, Mr. L. Slattery, from £850 per annum, plus bonus, to £900, with additional annual increments of £50 to a total of £1 000 a year, plus bonus.

Mr. W. C. Galloway, chief clerk of Birkenhead electricity department, who is retiring, has been presented by his colleagues with a gentleman's wardrobe. The presentation was made on July 13th, by the borough electrical engineer, Mr. F. E. Spencer.

West Ham Town Council have agreed to the electrical engineer and manager, Mr. F. W. Purse, acting temporarily as technical adviser to the London and Home Counties Joint Electricity Authority, subject to 50 per cent. of the fees received by him being paid over to the Corporation.

Mr. C. E. Knowles, J.P., who has retired, after 27 years' service, from the position of resident engineer and manager of the Urban Electric Supply Co.'s Glossop electricity undertaking, has been presented by the staff with an inscribed Jacobean oak electric standard. He is succeeded by Mr. T. L. Podmore.

Mr. T. B. Goodyer, manager, Croydon Tramways Department, has intimated his desire to retire after 22 years' service. The Tramways Committee recommend that he be retained as a consultant at a salary of £500 per annum, and that Mr. G. V. Stanley, engineering assistant, be appointed acting manager at a salary of £550 per annum.

Bolton Electricity Committee, on Friday of last week appointed Mr. Harold E. Annett, borough electrical engineer and manager, at a salary of £1 250 per annum, rising by £75 a year to £1 400. On the resignation of Mr. W. J. H. Wood a year ago, Mr. Annett was appointed engineer in charge at a salary of £1 000 per annum.

Leeds Tramways Committee have received a letter from Mr. W. Chamberlain giving three months' notice to terminate his agreement of service as general manager and chief engineer, consequent upon his appointment as general manager and chief engineer of Belfast Tramways. It has been decided to invite applications for the position at the salary of £1 500 per annum.

The West Midlands Joint Electricity Authority have appointed Mr. E. F. Hetherington as engineer and manager in succession to Mr. S. T. Allen, who will shortly be vacating that position to take up his new appointment as Central England Engineer under the Central Electricity Board. Mr. Hetherington, who had previously completed over twenty years' service with the North Metropolitan Electric Power Supply Co., was appointed early last year by the West Midlands Joint Authority as their senior technical and engineering assistant, in which capacity he has taken an important part in the development of the Authority's scheme of extension, inter-connection and joint operation of their four power stations, the preparatory work in connection with the projected new base-load station at Ironbridge on the River Severn, and the building up of the technical organisation of the Authority.

Mr. W. E. Bush has resigned his position with the E.L.M.A. as manager of the Lighting Service Bureau and has accepted an appointment as general sales manager with Curtis Lighting (Europe), makers of the X-ray reflectors and lighting equipment. The change will not, however, take place for some months. Mr. Bush was apprenticed to the British Thomson-Houston Co. in 1904, and during the 20 years with which he was with the company, served in a number of capacities. It was for this company that he established the Lighting Service Bureau in 1923, and when this organisation was taken over by the E.L.M.A., Mr. Bush transferred his services to the Association. During the four years he has been at Savoy Street, he has been responsible for many interesting and important developments. He introduced the demonstration method of teaching illumination, organised 16 illumination courses, the national shop lighting campaign in 1925, and played a very important part in planning the W.O.B. Campaign. The establishment of the Electric Circles which have become so vital a feature of electrical propaganda work in this country was primarily due to Mr. Bush, and his assistance in the establishment of the various provincial lighting service bureaux proved most useful. His other activities on the E.D.A. Council, and committee work, are well known to many of our readers. In addition, he has delivered many lectures on lighting in all parts of the country, and written numerous articles on various aspects of illumination. His pioneer work in the field of architectural lighting was first made public in the columns of THE ELECTRICIAN, and before he leaves the E.L.M.A. we hope to be able to refer to some practical work that is being done along these lines in London. Before his alliance with E.L.M.A., Mr. Bush achieved international renown as the inventor of the "Bush Candle" at Wembley, and during the past four years he has distinguished himself not only as a propagandist, but as a lighting expert of the first order. His departure will be a great loss to E.L.M.A. and the industry generally.

[Photo: W. F. T. Pinkney

**Mr. W. E. Bush, who has resigned his position with the E.L.M.A.**

At the monthly meeting of the London and Home Counties Joint Electricity Authority held on July 25th, it was unanimously decided to elect Mr. W. F. Marchant as chairman of the authority in succession to Alderman Sir Duncan Watson, who has resigned the position owing to the amount of work entailed by his duties as a member of the Central Electricity Board. Mr. Marchant was Mayor of the Metropolitan Borough of Deptford in 1914–15, and a member of the Deptford Borough Council for about twelve years. Since 1921 he has been a member of the London County Council, and, amongst other committees, served as a member of the Special Electricity Committee appointed by the L.C.C. to deal particularly with problems relating to the development of electricity in the county of London. Mr. Marchant was elected as one of the members to represent the London County Council on the then newly established London and Home Counties Joint Electricity Authority in 1925. See page 137.

## Obituary.

MR. S. E. DAY, on July 21st, after nine weeks' illness, aged 44 years. In 1900 he was apprenticed at the Bury St. Edmund's Corporation Electricity Works, under the late Mr. Roe. He completed his period of apprenticeship and later served as assistant engineer both under Mr. Roe and under the latter's successor, Mr. L. P. Greig. He was appointed engineer and manager in 1905, when only 22 years of age, and held that position at the time of his death.

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# IN PARLIAMENT.

## Committee Recommend that Post Office Should be Free to Buy Foreign Cables.

IN the second report of the Select Committee on Estimates, it is stated that the total value of the stores purchased by the Post Office is at present about £5 000 000 per annum. To give preference to British manufacturers, foreign tenders are not invited, except when the articles required cannot be obtained at a reasonable price in this country. The report states that the manufacture of cables is, with the exception of two firms, in the hands of the Cable Manufacturers' Association, from whom the Post Office buys abut 80 per cent. of its total requirements, which amount to £1 000 000 per annum. The cables could be obtained from foreign manufacturers at considerably lower prices. The Committee are of opinion that the Post Office should have a free hand to accept tenders from abroad in cases where it is unable to obtain satisfactory evidence that the prices quoted by British manufacturers are not excessive.

### Electricity Orders Approved.

The House of Commons has approved Electricity Supply Special Orders in respect of (1) the borough of Wilton and parts of Wilton rural district; (2) parts of Chirk and Oswestry rural districts; (3) part of Bowland rural district; (4) parts of the city of New Sarum, and of Salisbury rural district; (5) part of Tisbury rural district; (6) transfer of undertaking authorised by Chasetown and District Electricity Special Order, 1924; (6) part of Lydney rural district, Usk urban district, Monmouth rural district and parts of Chepstow and Pontypool rural districts; (7) part of Walsoken urban district; (8) the borough of Bridport and parts of Bridport and Beaminster rural districts.

### Replies to Questions.

The following are points from answers to questions in the House of Commons:

The Central Electricity Board have asked Sir Reginald Bloomfield, R.A., to advise them on questions arising out of the design and erection of standards and other erections in connection with the new electrification scheme.

The Home Secretary has no information as to the number of racecourses where electricity is available for working a totalisator or other mechanical appliance for betting.

In reference to a remark that at the present rate of progress, it will take 58 years to instal telephones in rural stations in Essex, the Postmaster-General says the railway companies are being urged to have telephones in their rural stations. Essex was singularly unlucky last year. In every other part of the country the telephones at rural stations were a record.

No suggestion has been made by the Post Office that manufacturers of telephone cable should temporarily close down those sections of their factories. Development, however, will be for the present more in the direction of local lines than of main cables, and, consequently, the requirements for the latter type of cable are likely to be smaller.

In reference to the cancellation of a contract for equipment for a relief telephone exchange at Manchester, which necessitated paying a contractor £10 820 as compensation, the Post master-General says this was due to a falling off of trade, which affected business in Manchester, and invalidated the earlier forecast of telephone development. The forecasts are, in the main, reasonably accurate.

No applications have been made to the Postmaster-General from the British Broadcasting Corporation for his permission to adopt the process of radio transmission that will enable listeners to pick up current pictures from other parts of the world.

The estimated surplus of Patent Office revenue over expenditure was, during the last ten years, £881 676. In 1925 it was £88 540, in 1926, £98 813, and in 1927, £112 939. The surplus is paid over to the Exchequer. The number of complete specifications awaiting first action by the examiner is about 6 300. Steps have been taken for further increasing the examining staff.

The Postmaster-General intends to alter the system of guarantees for rural telephones. The expected revenue from a new telephone office will be assessed, and the new guarantee will represent the difference between the estimate and the charge on the estimated amount of the cost.

The number of broadcast licences in force is just over 2 500 000. The Postmaster-General does not think it advisable to make all such licences commence on January 1st.

The question of laying a submarine telephone cable between the Isle of Man and the mainland is under consideration.

The average cost of one mile of subscribers, light pole route carrying one pair of telephone wires, in a rural area, is about £80.

In regard to a suggestion that steps should be taken, in connection with any schemes of electrical development, to minimise risks to fire fighters by placing upon owners of premises an obligation that the main controls of high tension current shall be placed in a fire resisting chamber near the main entrance, the Minister of Transport says the Electricity Commissioners' Regulations are under revision, and careful attention will be given to the matter referred to.

The Assistant Postmaster-General states that the telephone facilities at Chaddesley Corbett, Worcestershire, cannot be extended, as the traffic does not warrant it. There is one telephone in the Post Office and another opposite.

# LOOKING BACKWARD.

## An Early Attempt at Lighting Gas Lamps by Electricity.

FIFTY years ago, according to THE ELECTRICIAN dated August 3rd, 1878:—

A whale which severed a submarine cable between Portugal and Brazil became so entangled in the coils of one end that it was held fast, and, being unable to rise to the surface for air, was drowned.

The new Telegraphs Bill was the subject of considerable criticism, Prof. Graham Bell and the company interested in his patents being among its strongest opponents. It was remarked that the Bill, if passed, would "of course put a stop to the public use of the telephone except in the usual telegraph offices."

The Edison-Hughes microphone controversy was still proceeding.

To discourage attempted damage, certain telegraph posts in Australia were, "by an arrangement of supplementary currents," caused to communicate a severe shock to anyone meddling with them."

A test in Pall Mall of Mr. Lane Fox's system of lighting public gas lamps by electricity resulted in the inventor being asked to remove the apparatus.

* * *

Twenty-five years ago it was recorded in THE ELECTRICIAN for August 7th, 1903, that:—

Bradford Corporation was the first municiaplity to embark on the motor-hiring business.

On the third reading of the Beckenham U.D.C.'s Bill in the Lords, a clause giving special protection to the Crystal Palace Gas Co. against electrolysis was struck out.

In the "Tenders Accepted" column there were several cases in which the lowest tender was not accepted. In several cases the fortunate tenderer was the lowest but one, but in one case—for arc and glow lamps—"there were five tenders lower than that accepted."

The Ekstromer Accumulator Co. was registered with a capital of £25.

Birkenhead had 519 electricity consumers.

Sir William Preece was seriously ill with pneumonia and pericarditis.

### SOCIAL SIDE.

Nelson Electricity Department won a premier prize in the Reedyford Hospital sports at Nelson.

The employees of Messrs. R. J. and H. Wilder, electrical engineers, of Wallingford, Berks, for their first annual outing, journeyed by motor coach to Southsea, the party numbering about 40. The men were the guests at lunch of the three partners in the firm, Mr. R. J. Wilder, Mr. H. Wilder, and Mr. Little, all of whom were present. The whole of the arrangements were made by Mr. A. Baber.

Dover Electricity Department had its annual outing recently, when a trip was made to Brighton. The party left at 6.30 a.m. for Tenterden, where a stop was made for breakfast. The journey was continued, passing through Hawkhurst and Lewes, and the party arrived at Brighton at 11.20 a.m. Lunch was served at Booth's Restaurant. Leaving Brighton at 6 p.m. the return journey was made through Tunbridge Wells, Maidstone and Canterbury, Dover being reached at 12.30 a.m. after a most enjoyable day.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

STOCKPORT CORPORATION.—Supply of 2 000 yards of 0·0225 sq. in. by 0·0225 sq. in., 2 000 yards of 0·0225 sq. in. by 0·0225 sq. in. by 0.0225 sq. in. and 1 000 yards of 0·1 4-core, paper insulated, lead covered cable, jute served and compounded over-all; and 250 yards of 0·25 v. b. single core cable, all to B.E.S.A. specification No. 7, and suitable for 660 V working pressure.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, August 3rd.—Manufacture and erection of switchgear and transformer kiosk. Specification, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

GLASGOW EDUCATION AUTHORITY, August 3rd.—Electric lighting and electric heating installations in two new temporary schools at Springfield Road and Hamilton Hill, Glasgow. Specifications, etc., from the Education Offices (Property Dept.), 129, Bath Street, Glasgow; deposit £1 1s. for each.

RENFREWSHIRE EDUCATION AUTHORITY, August 3rd.—Electrical installation in proposed school at Lochfield Road, Paisley. Schedules, etc., from Executive Officer, County Education Offices, 16, Glasgow Road, Paisley; deposit £1.

STOURBRIDGE GUARDIANS, August 8th.—Electric light installation at the institution. Particulars from the Master.

FORFAR INFIRMARY, August 11th.—Electric lighting work, in connection with extension of the infirmary. Specification, etc., from Mr. D. Watterson, 34, Castle Street, Forfar, or from the Joint Secretaries; deposit £1 1s.

SALFORD CORPORATION, August 11th.—Re-wiring portion of the Municipal Offices, Regent Road, Salford. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 13th.—Supply of electric cable and wire. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, London, S.W.1.

DUNDEE CORPORATION, August 13th.—Electric lighting work in administrative block, Ashludie Sanatorium. Particulars and specification from Mr. George Baxter, city engineer, Dundee; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of one 20 000 kW turbo-generator, with condenser and auxiliaries. Specifications, etc., from City Electrical Engineer; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of two water-tube boilers, with stokers, fans, motors, pre-heaters, grit catchers, coal chutes, ash chutes, and chimneys complete, each with a minimum normal evaporative capacity of 65 000 lb. of water per hour. Specification from City Electrical Engineer; deposit £2 2s.

MANCHESTER CORPORATION, August 14th.—Sand-drying plant, for the Tramways Department. Specification from General Manager and Engineer, 55, Piccadilly, Manchester; deposit £1 1s.

PORTLAND URBAN DISTRICT COUNCIL, August 15th.—Manufacture, laying and erection of underground mains, overhead mains, transformers and meters. Specifications etc., from Mr. R. A. Colenutt, clerk to the Council; deposit £3 3s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 16th.—Supply and erection of steam boiler and feed pump, etc., at Forest Products Research Laboratory, Princes Risborough, Bucks. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

STRATFORD URBAN DISTRICT COUNCIL, August 16th.—Supply and laying of about 9 200 yards of 33 000 V underground transmission lines. Specifications, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

METROPOLITAN ASYLUMS BOARD, August 22nd.—(1) re-wiring fire alarm system at Caterham Mental Hospital; and (2) electric lighting installation in shore and pier buildings at Long Reach Hospital, Dartford; deposit £1 in respect of each work.

BIRMINGHAM ASYLUMS COMMITTEE, August 25th.—Electric lighting and power installation at Winson Green Mental Hospital, Lodge Road, Birmingham. Specification, etc., from City Engineer, Council House, Birmingham; deposit £5.

HARROGATE CORPORATION, August 25th.—Supply of two 2 500 kVA transformers, and supply and erection of 11 000 V switchgear and 30-ton travelling crane. Specification from Borough Electrical Engineer.

BRISTOL GUARDIANS, August 30th.—Supply of electrical fittings for six months. Particulars from clerk, Mr. Thomas S. Lamb, St. Peter's Hospital, Bristol.

LLANTARNAM URBAN DISTRICT COUNCIL, September 3rd.—(1) High and low-tension switchgear; (2) transformers, and (3) overhead and underground mains. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

ST. PANCRAS (LONDON) BOROUGH COUNCIL, September 4th.—Supply and erection of 15 000 kW generator, condenser and auxiliaries, at King's Road generating station. Specification, etc., from Electricity Offices, 57, Pratt Street, London, N.W.1; deposit £1.

BATH, CLUTTON, MIDSOMER NORTON AND RADSTOCK JOINT HOSPITAL, September 17th.—Installation of 134 lighting and heating points. Specification can be seen at the offices of Mr. A. J. Pictor, 14, Queen Square, Bath.

### Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

WATERFORD CORPORATION, August 3rd.—Supply and erection of 10 000 V, three-phase switchgear, 400 V, three-phase switchgear, and 200 V d.c. switchgear for central station and five sub-stations. Specifications, etc., from Messrs. MacEntee and O'Kelly, 23, Upper O'Connell Street, Dublin.

VICTORIAN ELECTRICITY COMMISSION, August 6th.—Supply of three-phase, 60 cycle, interconnected star, oil insulated, self-cooled, outdoor type neutral earthing compensator. (Reference B.X. 4 519.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 7th.—Supply of 50 kVA transformers and 2 100 V, three-phase, 50 cycles, truck pipe switchgear. (Reference B.X. 4 526.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 9th.—Supply of six electrically-driven overhead travelling cranes. (Reference A.X. 6 409.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4505.)

BULAWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain-grate, turbo-alternator, spray cooling equipment and circulating waterpiping and three-panel switchboard with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, August 14th.—Supply and erection of overhead and supply and laying of underground distribution mains and services in Blackrock, Booterstown, Monkstown, Sandycove and Dalkey, in the county of Dublin. Specifications, etc., from Secretary, 60-62, Upper Mount Street, Dublin; deposit £5.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 14th.—(1) Supply of a.c. motors and starting pillars; (2) paper cables and terminal and joint boxes; and (3) rubber cables. Forms of tender from the Company's Offices, 25, Buckingham Palace Road, London, S.W.1; fee £1 1s. for each specification; not returnable.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kW switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B.X. 4 477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

CAPE TOWN MUNICIPALITY, August 15th.—Supply of l.t. switchgear for the new Pavilion, Muizenburg. (Reference B.X. 4 562.)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, August 15th.—Supply of (*a*) house service single-phase a.c. meters; (*b*) house service combined fixed and variable charge type prepayment single-phase a.c. meters; (*c*) power meters, three phase, three and four wire; (*d*) house service meters as

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in (*a*) and (*b*), but mounted on meter board, with distribution fuse or fuses for one distribution circuit, and alternatively for two distribution circuits, for alternatively (*a*) one year and (*b*) two years. Tenders to the Secretary, 60-62, Upper Mount Street, Dublin.

VICTORIAN ELECTRICITY COMMISSION, August 20th.—Supply and delivery of 66 000 V transformers and spares. (Reference B.X. 4 541.)

IRISH FREE STATE ELECTRICITY BOARD, August 22nd.—Supply and erection of approximately 32 kiosk and 13 pole type transformer stations, with switchgear and transformers (10 000/380-220 V) in various towns. Conditions of contract, specification, etc., from Mr. P. J. Dempsey, secretary; deposit £5.

STATE ELECTRICITY WORKS, MONTEVIDEO, August 22nd.—Supply of metal filament lamps. (Ref. B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

JOHANNESBURG MUNICIPALITY, August 30th.—Street Lighting switches. (Reference B.X. 4 584.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of tramcar tyres and street lighting time switches.

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of six 10 kVA induction voltage regulators for 400/200 V supply (contract No. 4). (Reference B.X. 4 617).

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 1 000 kVA and 250 kVA transformers. (Contract No. 8). (Reference B.X. 4618.)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cords for indoor installations. (Reference B.X. 4 590.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. Reference A.X. 6 538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21). Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

CAPE TOWN MUNICIPALITY, September 4th.—Supply of 1 000 kW converter set (specification No. 427/1928). (Reference B.X. 4 604).

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 6th.—Motor-driven milling, pipe screwing, grinding and planing machines, etc. (Reference A.X. 6 592.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th.—Supply of 338 000 meters of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (Contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA) MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. Reference B.X. 4 542.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 17th.—Supply of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, with junction and terminal boxes. (Reference B.X. 4608.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 19th.—Supply of lead covered conductors, for 250 V. (Reference B.X. 4607.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6221.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

## Tenders Accepted.

COLCHESTER CORPORATION.—The Electric Construction Co. Ltd., four switch panels.

ST. MICHAEL'S CHURCH, MYTHOLMROYD.—J. Hunter and Co., electric light installation at.

LONDON COUNTY COUNCIL.—Haggerty, Lawrence and Co., four Bull electric welding plants, for tramways department.

FALMOUTH GUARDIANS.—J. H. Deeble and Sons, wiring the institution for electric light, £279 17s. (highest tender was £488 16s. 4d.)

LONDON COUNTY COUNCIL.—Pneumatic Conveyance and Extraction Co., Ltd., soot and dust extractor plant for Greenwich power station, £7 920.

ILFRACOMBE URBAN DISTRICT COUNCIL.—Sanders and Sons, fairyland strip lighting of concert hall, £40; Ilfracombe Electric Light Co., electric exhaust fan in concert hall, £22 9s. 9d.

MANCHESTER CORPORATION.—Ferranti, Ltd., 15 000 kVA static transformer for Stuart Street generating station; Fuller Electrical and Mfg. Co., five 125 kVA static transformers; British Insulated Cables Ltd., cable.

METROPOLITAN WATER BOARD.—Stapleton and Sons, electric light installation, etc., at No. 4, Beacon Hill, Holloway, £197 (recommended). Other tenderers: W. H. T. Kelland and Sons, Ltd., £209; Collins and Co., £210; J. Webb and Son, £235.

METROPOLITAN WATER BOARD.—Barlow Bros. and Co., improved telephone service in accountant's department, £278 (recommended.) Also tendered: A. Dean and Co., Ltd., £284; Girdlestone and Co., £294; Troughton and Young, Ltd., £307; Duncan Watson and Co., £324.

CROYDON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., motor generator, £575. Also tendered: English Electric Co., Ltd., £590; Mather and Platt, Ltd., £626; British Thomson-Houston Co., Ltd., £671; Kingsdown Electrical Co., electric light installation at Davidson School, £258.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., wiring and fittings, for electric light, power, bells and telephones, at Henry Thornton School, Clapham, £1 149 (recommended.) Also tendered: Cox Walkers, £1 170; H. J. Cash and Co., Ltd., £1 232; A. Hawkins and Sons, £1 295; Stegman and Co., £1 410; Electrical Installations, Ltd., £1 415; A. Dean and Co., Ltd., £1 496; Pinching and Walton, £1 576; Berkeley Electrical Engineering Co., £1 616.

### THE BOYS' BALLOT.

A saloon motor car and 350 other prizes to the value of £1 500 are still waiting to be won in the fascinating sports and pastimes competition which is being organised in aid of the John Benn Hostel for East End working boys at Stepney.

All you have to do is to place a list of sports and pastimes in what you consider will prove to be their popular order and to give your own particular favourite. Tickets for the ballot are 1s. each, 10s. for a book of 11. Send at once for tickets and complete prize lists to the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

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# ELECTRIC TRACTION.

## Diesel-Electric Locomotives for the N.W. India Railway.

THE General Electric Co., Ltd., has received an order for two Diesel-electric locomotives for the North-Western Railway, India. The locomotives are of the o-4-4-o type, comprising a power unit on the main frame carried on two four-wheel bogies, the weight of each locomotive being approximately 50 tons when fully loaded. Each locomotive will be equipped with a six-cylinder 350 B.H.P. high speed oil engine, manufactured by William Beardmore and Co., Ltd., coupled to a 200 kW d.c. generator feeding four axle-hung traction motors rated each at 85 B.H.P., on the one hour rating at 600 V. A driver's compartment is provided at each end of the locomotive, the electrical control equipment and brake valves being duplicated. Operation of the driver's electrical controllers energise solenoids controlling the engine throttle, the electrical connections between the generator and the motors being arranged to give automatic adjustment of the vehicle speed with the load for each throttle position. The Diesel engine is started by motoring the main generator from a battery, push-button control being provided, in conjunction with a time lag relay which prevents over-discharge of the battery in abnormal circumstances. An electrically-operated two-speed rotary exhauster for operating the vacuum brake is included in the equipment.

The London, Midland and Scottish Railway announce that trials under service conditions are being made with their new Diesel electric train unit between Blackpool and Lytham. As already explained in THE ELECTRICIAN, the train, of four coaches, is entirely a new departure in railway traction in this country. The power unit consists of an oil engine driving generators which supply current to the motor. The train can be driven from either end, and it is claimed that there is greater acceleration than by other methods. Being a self-contained unit it eliminates the necessity of additional rails or overhead gear.

# METAL AND CHEMICAL PRICES.

TUESDAY, July 31st.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 10 0 | — | — |
| Electro Wirebars | ,, | £69 5 0 | — | — |
| H.C. Wires, basis | per lb. | 9 1/16d. | — | — |
| Sheet | ,, | 10 1/4d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0 1/16d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2d. | — | — |
| Sheet ,, | ,, | 9 3/8d. | — | — |
| Wire ,, | ,, | 9 7/8d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 10 0 | — | 5s. od. |
| *Lead Pig*— | | | | |
| English | per ton | £22 5 0 | 5s. od. | — |
| Foreign or Colonial | ,, | £21 0 0 | 2s. 6d. | — |
| *Tin*— | | | | |
| Ingot | per ton | £214 15 0 | — | £1 7 6 |
| Wire, basis | per lb. | 2s. 10d. | — | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £25 2 6 | 10s. od. | — |
| *Mercury* | per bottle | £20 10 0 | — | 10s. od. |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2 1/2d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3 1/2d.
*Rubber*—Para fine, 11 1/2d.; plantation 1st latex, 9 1/2d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

### LEAD MARKET REPORT.

According to James Forster and Co. the lead market has been very quiet, with small turnover. The price in the U.S.A. is unchanged at 6.20 cents.

Closing prices on July 27th were £20 18s. 0d. for July and August, £21 1s. 3d. for September, £21 2s. 6d. for October, and £21 3s. 9d. for November, or 3s. 9d. up to unchanged on the week.

# NEW LONDON EXCHANGE.

## Details of Latest Automatic Telephone Exchange at Sloane.

THE Sloane automatic exchange situated in Sedding Street off Sloane Square, is the third automatic telephone exchange to be cut into service by the General Post Office in the London area and has been manufactured and installed by the Standard Telephones and Cables, Ltd. This company is engaged at the present time in the installation of further automatic exchanges in the London area at Langham (which will be known as Welbeck Exchange), Temple Bar, Bermondsey, and Fulham, and these exchanges will form part of the G.P.O. scheme for transforming the London Telephone area to automatic working. In general the automatic exchange equipment at Sloane is similar to those which have already been put into operation during the last few months at Holborn and Bishopsgate. It has been arranged to cater for an ultimate capacity of 10 000 lines and is at present equipped for 8 400 subscribers. The equipment is installed in a typical Post Office building which was utilised to accommodate Sloane manual exchange prior to the transfer to automatic working on July 28th. The automatic plant is arranged on three floors, the first accommodating the main distribution frame, to which are connected the underground cables carrying the lines to the subscribers and the junction lines to other exchanges. On the same floor is another frame known as the intermediate distribution frame which serves as a convenient method of cross-connecting the subscribers' lines and junctions to the various parts of the automatic plant.

### Other Apparatus.

The major portion of the automatic switching apparatus itself is situated on the second floor, but as there is insufficient room on this floor to accommodate all the automatic gear, it was found necessary to erect part of it on the first floor. A further part of the equipment is installed on the third floor, and this is known as the auto-manual portion and consists of the so-called "A" and "B" switchboards together with the supervisor's desk. The "A" switchboard is for the purpose of handling calls for special services such as calls from coin box stations, complaints, queries and assistance generally to the Sloane subscribers. The "B" switchboard handles incoming calls for manual exchanges, and the operators at this board complete the call by operating press-button keys corresponding to the four digits of the wanted number. This operates the automatic machinery in the Sloane exchange and extends the calling subscriber to the Sloane number required.

A special feature of the automatic switching equipment which is being provided for the exchanges in the London area enables the impulses from the dial for the three digits representing the first three letters of the exchange name, to be translated to any combination of from one to six figures as may be determined by the engineers of the General Post Office when designing the exchange. Calls for Sloane or for other exchanges in demand by Sloane subscribers are given a simple one or two-digit translation, while those exchanges on which there is less traffic are allotted the more complicated translations which enable the calls to be piloted through the tandem exchange to the required automatic or manual exchange in the London area. In the case of a call from one Sloane subscriber to another on the same exchange, the register translator, as this special device is called, routes the call to switches in the Sloane building specially allocated to handle this local traffic and when the called party has been selected by these switches, which operate in accordance with the four digits of the required number, the telephone bell of the called party is rung and a signal passed back to the caller indicating this fact.

For calls from a Sloane subscriber to a subscriber on another automatic exchange, the signals from the dial are routed to the register translator where they are given a different translation from that used when a local subscriber is wanted, and the call is routed direct or via the tandem exchange to a set of switches situated in the distant exchange. Here it is piloted to the required telephone which is rung and, as in the previous case, the caller is notified by the usual ring-back tone. If a number on a manual exchange is wanted, the Sloane subscriber proceeds in a similar manner to that described above and the call is routed to the distant exchange, where it is received on a manual position, the required number being displayed by a set of lamps in front of an operator.

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# ELECTRICITY SUPPLY.

## Mains Extensions Proposed at Leeds—New Plant for West Ham—Kingston-on-Thames and Supply to Walton—Overhead Lines and Buckingham T.C.—Tenders for Cables to Moreton from Wallasey—Additions at Croydon.

ILFORD T.C. have applied for a loan of £17 095 for electricity purposes.

West Ham T.C. have received sanction to a loan of £216 548 for generating and boiler house plant.

A canvass has been made at Cowbit to ascertain whether it is wise to instal another l.t. overhead cable and a transformer.

Taunton T.C. have received sanction to borrow £5 378 and £7 122 for mains and services; and £667 and £833 for meters.

Beckenham U.D.C. have received sanction to a loan of £4 500 for the conversion of public gas lamps to electricity.

Boston Guardians have referred the scheme of lighting the infirmary and the chapel at the institution to the group visitors for their approval.

Leeds Electricity Committee seek sanction to borrow £14 000 for the laying of mains for electricity supply in bulk to the Morley Corporation.

The County of London Electric Supply Co. have applied to the Electricity Commissioners for consent to the extension of the site of the company's station at Barking.

Bury St. Edmunds T.C. have decided to give a supply of electricity to the United Sugar Co. on a flat rate of 3½d. per kWh.

Haddington T.C. are discussing with the Lothians Electric Power Co. the question of lighting the burgh during the coming winter.

Kingston-on-Thames Electricity Committee are to instal new plant, at an estimated cost of £5 283 in connection with the supply to Walton.

In connection with the police call box system, Bradford Watch Committee have voted £905 for electricity service charges, wiring, fittings, etc.

Larne R.D.C. have assented to the proposal of the Larne Electric Light and Power Co. to erect overhead lines in the district for transmitting electricity to Ballymena.

Subject to the necessary guarantees being obtained, it has been resolved that extensions to the electric cables be made in Pinchbeck Street and Red Lion Street, Spalding.

Ealing T.C. have agreed to lay mains from Uxbridge Road to the works of Messrs. Stewart and Arden, Ltd., Talbot Road, and to construct a transformer station in a room at the works.

Ruskington Electricity Committee recommend that £1 10s. per light be offered to the Ruskington Electric Supply Co. for 11 lights on Sleaford Road, Lincoln Road, Westgate and Rectory Road.

Buckingham T.C. have decided to allow the Northampton Electric Light and Power Co. to erect overhead mains in the borough, with the exception of a short distance in the centre of the town.

Berkhampsted Guardians, after considering the question of a supply of electricity for the institution by the Chesham Electric Light Co., have asked Col. Michod to advise the Board on the matter.

Wallasey Electricity Committee recommend that tenders be invited for the laying of 5 800 yards of cable to Moreton, and that application be made to the Commissioners for sanction to borrow the amount required.

Croydon Electricity Committee have received sanction to the borrowing of £25 042 for mains, transformers, switchgear, and additions to buildings. The committee propose to carry out mains extensions, at an estimated cost of £1 245.

Hastings Corporation seek sanction for a loan of £10 000 for the rental wiring and hire purchase scheme.—The Electricity Committee have received sanction to borrow £702 for mains, £30 384 for building work, and £464 for switchgear.

The Oswestry Electric Lighting and Power Co. have secured an Order extending their area of supply to Oswestry rural district. The charges in the rural area will be the same as those in the urban district.

Cheltenham Electricity Committee are to apply to the Electricity Commissioners for consent to a change of the a.c. system of supply from single-phase 100 cycles, 200 V, to single and three-phase, 50 cycles, 200 V.

Montrose T.C. have agreed to approve, subject to satisfactory adjustment of wayleaves, the proposal of the Grampian Electricity Supply Co. for the erection of overhead and the laying of underground mains in the burgh.

Birmingham Corporation Health Committee, in a report on houses let in lodgings states that artificial lighting is usually by oil lamps. In new by-laws which will be submitted for the approval of the Council at an early date a proposal will be made that only illumination by gas or electric light shall be allowed.

It is proposed to form a new company for the supply of electricity to the village of Caersws. Messrs. Smith and Bellhouse have prepared a scheme, which includes the purchase and installation of a crude oil engine, alternator, battery and motor generator. The capital expenditure is estimated at £2 000.

Approval has been given by the Liverpool City Council to a series of extensions in the districts of Halewood, Gateacre and Netherton, the aggregate cost of which will be over £9 000. Authority has been given to the Town Clerk to seek Fringe Orders where required, and the necessary consent for the construction of overhead lines.

A deputation from Blackburn Corporation have interviewed three representatives of the Central Electricity Board and placed before them the case for the inclusion of Whitebirk generating station in the list of selected stations. The suitability of the station and plant is not in question: it is only a matter of terms. There is reason to believe that the Board will try and meet the Corporation.

The Central Electricity Board have selected as a suitable site for its main sub-station at Bedford four acres on the Wingfield Estate.—The Corporation have arranged terms with Ampthill U.D.C. for a supply of electricity for street lighting, at a capital cost of £1,175.—The Electricity Committee have obtained sanction to borrow £9 500 in connection with the proposed extension to Aspley Guise and Aspley Heath.

Prominent residents of Rothbury, Northumberland, objecting to a scheme of the Newcastle-upon-Tyne Electric Supply Co. for supplying current by overhead cables, are interesting themselves in a project for purchasing the existing gas company in Rothbury, establishing a generating station, and utilising existing pipe tracks, so that all cables will be laid underground. It is proposed that the generator shall be driven by the Malone heat engine. It is estimated that under this system electricity can be supplied at 4½d. per kWh.

Croydon Electricity Committee have reported on a proposal to establish mills in the south of England, Croydon being amongst the various districts under consideration. The district selected depends very much on the price quoted for electricity. The committee have quoted prices for the supply, subject to an agreement containing a coal clause, a guaranteed minimum payment, etc. The demand at the start is estimated at 200 to 300 kVA, gradually increasing to 1 000 kVA. The total cost of the scheme is estimated at £6 250. The Committee recommend that it be authorised to take steps to provide the supply if required.

Hastings Electricity Committee have had before them a report from the borough electrical engineer, Mr. A. J. Ryan, on the subject of a scheme for rental wiring of power, heating and cooking points. Mr. Ryan recommends that the rentals should be 2s. quarterly for installations costing up to £2 per point, and 3s. quarterly for installations costing between £2 and £3 per point. At the end of six years the installation would become the property of the consumer, who would then be responsible for its maintenance. The Committee recommend the adoption of the scheme, and that in the extended area of supply payments be increased by 25 per cent.

Brighton Corporation Electricity Committee have authorised mains extensions, chiefly to the Patcham area, at a cost of £6 350. The Electricity Committee have obtained sanction to borrow £3 000 for improving the lighting of the main thoroughfares of the borough.—A letter has been received from Coun. Nield calling attention to the inadequate lighting of the thoroughfares of Rottingdean, and requesting that steps may be taken to improve them. It has been decided that the present lanterns at the top of the existing 21 posts be scrapped, and that the latter be fitted with miniature Wembley lanterns and 100 W lamps at an estimated cost of £3 10s. per post.—Coun. Galliers and the borough surveyor have been authorised to visit Paris for the purpose of inspecting the latest type of decorative lighting fittings and equipment.

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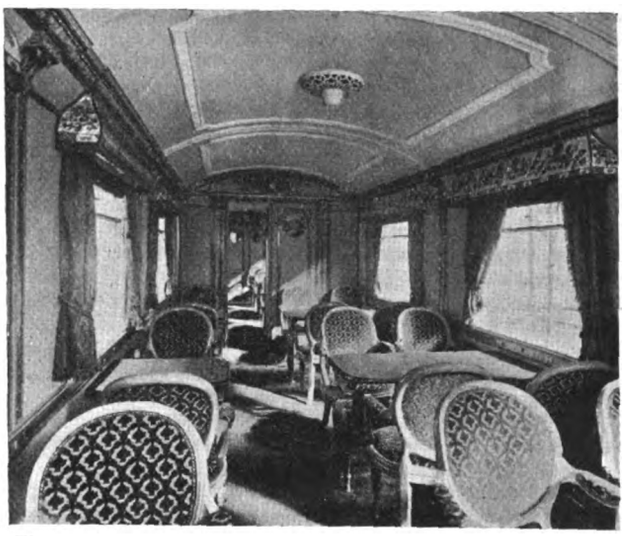
# ELECTRICAL NEWS IN PICTURES.

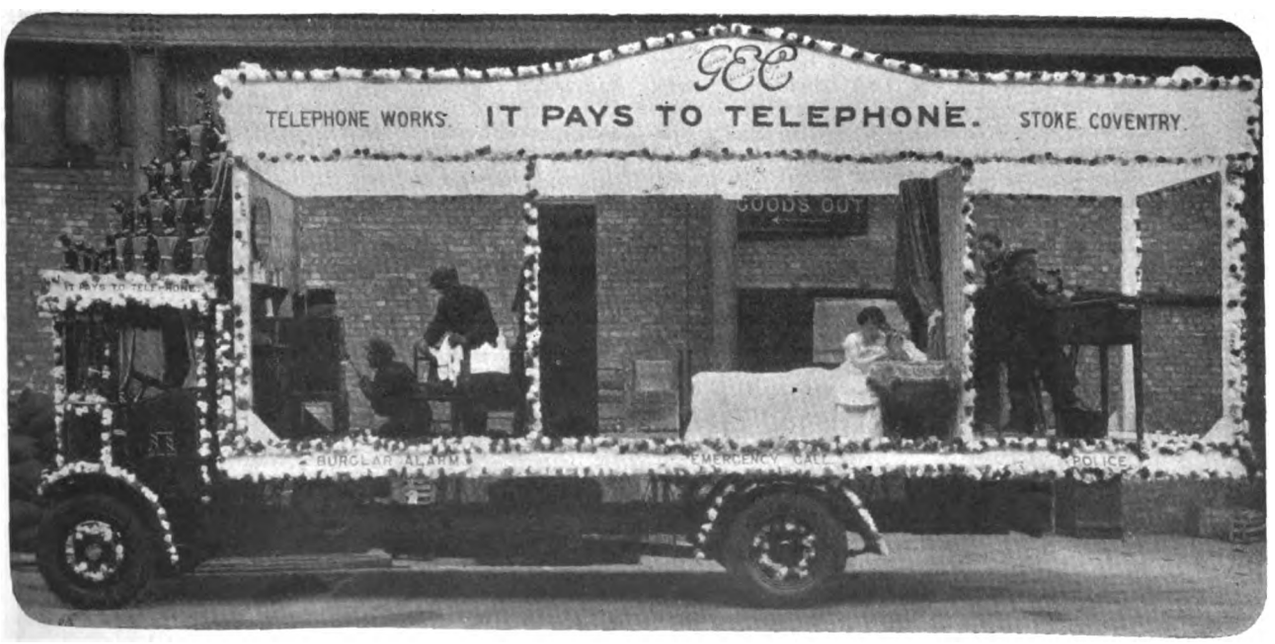
Right.—Mr. W. F. Marchant, who, as announced on p. 131, has been elected chairman of the London and Home Counties Joint Electricity Authority in succession to Ald. Sir Duncan Watson.

Left.—One of the exhibits of the Halifax Electricity Department at the Great Yorkshire Agricultural Show. The stand was divided into five compartments. It is interesting to note that all the available literature distributed about the stand was taken away by visitors. P 138.

This novel electrically operated clock may be seen at Les Avants, near Montreux. The dial and figures are designed in rock plants, while the arrangement permits both Greenwich and Mid-European times to be read at a glance.



The new restaurant cars, which were recently brought into service on the "Flying Scotsman" express, are fitted with electric kitchens, while the ingenious lighting scheme arranged in the dining cars is shown above.




Among the decorated lorries which took part in the recent Hospital Carnival, at Coventry, was one by the General Electric Co., Ltd., depicting the use of burglar alarms, in detecting the presence of "uninvited guests." The three tableaux represented, the scene of operation, the awakened sleeper, and the police. The lorry was awarded a prize as being one of the best exhibits.

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# BUSINESS ITEMS.

THE decorative electric lighting of the Ramsey (I.O.M.) promenade has been carried out by the Manx Electric Railway Co.

Messrs. Collman and Southwood have opened "Bargain Corner," in Tavistock Place, Plymouth, for the sale of electrical appliances and wireless apparatus.

Hill, Upton and Co., electrical engineers, of George Street, Oxford, held an exhibition of electric refrigerators at their new showroom last week.

An arrangement has been entered into between Vickers-Armstrongs, Ltd., and Automatic and Electric Furnaces, Ltd., whereby the latter company will demonstrate and sell the Vickers-Armstrong's hardness testing machine.

Through the enterprise of Mr. N. Plunkett, a wireless engineer, of Barrowford, near Burnley, a ten-valve set has been installed at a distributing station from which the postal authorities have run lead-covered wires to certain houses, where the only requirement is a loud-speaker.

An attractive stand at the Bridgwater Trades and Industries Fair, held last week, was that of Mr. F. A. Pine, of that town. His display of electric appliances for heating and lighting, electric lighting plants, electric vacuum cleaners and wireless pick-up sets, etc., made a strong appeal to those attending the exhibition.

The British Legation at Berne reports that the Public Health Department of Lausanne propose to organise an exhibition of X-ray apparatus, electric medical apparatus, etc., to be held at Lausanne from September 10th to 13th. Further particulars upon application to the Department of Overseas Trade, quoting reference number B.X. 4600.

To create interest in their electric washing machines and electrical appliances generally Burnley Components, Ltd., in conjunction with Burnley Electricity Department, organised a demonstration at the electricity showrooms on July 26th. Practical demonstrations of the electrical and the old "steam systems" of washing were given.

A firm of manufacturers' agents in Wellington desire to obtain the representation of British manufacturers of transformers, meters and electrical accessories. A representative of the firm is at present on a visit to this country and would be prepared to meet with British firms interested in representation in New Zealand, upon application to the Department of Overseas Trade, quoting reference No. 570.

Radio Electric Stores, Birmingham, who are service agents for Stratton and Co., Balmoral Works, Bromsgrove Street, Birmingham, were responsible for a successful radio demonstration with a new portable receiver, which is being marketed by the latter firm, at the Moseley Hall Gymkhana, Birmingham, recently. The receiver, which utilises only three valves, was coupled through an amplifier to a Brown public address loud-speaker.

The wireless photogram service which has been conducted by Marconi's Wireless Telegraph Co., Ltd., since May, 1926, for the transmission of photographs, etc., by wireless between London and New York, has now been extended so that photograms received in New York by wireless may be transmitted by wire on to other centres in the United States. A photogram sent from London by wireless addressed to these centres is transferred in New York to the telephone-wire picture service of the American Telegraph and Telephone Co. The cities included in the wireless-and-wire photogram service are Boston, Cleveland, Atlanta, Chicago, St. Louis, Los Angeles, and San Francisco.

A conference of municipal electrical engineers was held at the headquarters of Holophane, Ltd., on July 17th. There was a good attendance, and much interest was shown in the various papers which were read by members of the Holophane staff. Particular interest was shown in the latest Holophane developments in street lighting, colour lighting and the manufacture of high-grade illuminating glassware. In the evening the company assembled at dinner at the Criterion Restaurant under the chairmanship of Lord Ernest Hamilton, the chairman of Holophane, Ltd. The subsequent proceedings were enlivened by professional artistes, and an instructive and informative day finished on a high note of cordiality and friendship.

One of the chief exhibitors at the Greater Yorkshire Agricultural Show, which was held at Halifax last month, was the Halifax Corporation Electricity Department. The stand comprised five compartments, two being fitted up with electrical refrigerators both domestic and commercial, the centre showed various types of vacuum cleaners, floor polishers and motors, while the ceiling displayed different types of fittings; the remaining portions of the stand included an electrically equipped kitchen, where cooking demonstrations were carried out throughout the day. In front of this a literature table was provided, in order that those of the public interested might take whatever booklets, etc., appealed to them, and it is interesting to note that well before the end of the last day all literature was entirely gone—even with two extra consignments from various sources. The right-hand side of the stand was equipped with the most up-to-date types of electric fires, while on a raised dais were two special fires fitted in fireplaces as when placed in the home. The back of the stand was arranged for washing and ironing demonstrations, two different types of machines being demonstrated during each of the three days. Wash boilers, water heaters and various small types of appliances were also shown under working conditions. A special brochure was prepared dealing with the department and distributed as a souvenir of the show. A feature of the stand was the slogan "Electricity at your Service" in electric lamps of the same colours as is used on the department's envelopes. It is estimated that between 20 000 and 30 000 people passed through the stand on one day alone. (See page 137).

## TRADE PUBLICATIONS.

WE have received from the Automatic Telephone Manufacturing Co., Ltd., a new catalogue dealing with telephones and signalling apparatus.

The British Thomson-Houston Co., Ltd., have recently published a pocket edition of their latest catalogue of lighting equipment. This edition should be of interest to electrical contractors and others concerned in the planning of lighting schemes, as it gives to them, in convenient form for carrying in the pocket, the complete information contained in the quarto edition of the "B.T.H. Catalogue of Commercial and Industrial Lighting Equipment" published a few weeks ago. It is identical in every respect with the quarto edition, and contains particulars of fittings, lanterns, and reflectors designed to suit practically every lighting requirement with the exception of domestic and decorative lighting which is to be dealt with in another volume. The catalogue comprises 164 pages bound in an attractive light brown cover printed in dark brown and embossed in gold. It is profusely illustrated and well arranged. An index ensures easy and rapid reference.

*THREE views of the stand of the Halifax Corporation Electricity Department, at the Great Yorkshire Agricultural Show, which was held at Halifax last month. A description of the exhibit is given above, while another view of the stand is given on page 137.*

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# COMPANY NEWS.

## Increase of Metropolitan Railway Interim Dividend—Refusal of Offer for Wallingford Co.'s Shares—Berry's Electric (1928) Ltd.—Yorkshire Power Companies' Reports—The Burndept Wireless Reconstruction Scheme.

A THREE-point rise has brought the quotation for Eastern Telegraph stock to 253, but Marconi's Wireless have eased off 1s. 3d. Marconi's International Marine shares at 51s. are 1s. up. W. T. Henley's Telegraph Works shares at 113s. 9d. are 3s. 9d. lower than a week ago, and English Electrics and Ericssons have each shed 7½d. Edison Swan 1st preference are over 1s. up, at 26s. 1½d. London and Suburban Traction "A" debenture stock has risen 3 points and Underground Electric Railways ordinary have given way 6d. Newcastle Electric Supply shares are 7½d. down.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927 Highest. | 1912 to 1927 Lowest |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. .. | 26/6 | 26/6½ | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92 | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | " " " 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6½ | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7 | 52/10½ | 20/3 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/- | 38/- | 68/6 | 14/6 |
| 6 | " " 6% C.P. .. .. | 23/6 | 23/- | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/- | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord .. .. | 47/6 | 47/6 | 43/- | 8/- |
| 4½ | " " " 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | " Elec. Sup. Ord. .. | 25/- | 25/7½ | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (c) | St. James' & P.M. Ord. (£1) .. | 27/6• | 28/- | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 31/6 | 31/6 | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) .. | 27/6 | 27/- | 52/- | 18/- |
| 4½ | " " 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6• | 34/6 | 32/9 | 12/6 |
| 6 | " " " 6% C.P. .. .. | 23/6• | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk .. | 125 | 125 | 152½ | 24 |
| 6 | " " " 6% Pf. Stk... | 126 | 120 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | " " 4% Deb... .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 70½• | 72½ | 73½ | 10 |
| 4 | " " " 4% Pf. Stk. .. | 73½ | 75½ | 84/2/6 | 43 |
| 4 | " " " 4% Deb. .. | 80 | 79 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 84 | 81 | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69½ | 101½ | 49 |
| 5 | " " " 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 67½ | 66 | 84½ | 19 |
| 3½ | " " 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | " " 3½% Deb. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 75½• | 75½ | 66½ | 12½ |
| 4½ | " " 4% 1st Pref. .. | 80½• | 82½ | 91 | 45 |
| 6 | " " 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 25/6• | 26/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | " " " 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord .. | 85/- | 85/- | 86/3 | 26/6 |
| 6 | " " " 6% C.P. .. | 22/6• | 23/1½ | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | " " " 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/1½ | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 83/9 | 83/9 | 86/- | 22/- |
| 6½ | " " 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | " " 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6• | 17/6 | 18/- | 8/- |
| 7 | " " 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/- .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | " " 1st. Pref. .. .. | 20/1½• | 25/- | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | " " 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord... .. .. | 7/6 | 8/1½ | 29/3 | 7/3 |
| 6 | " " 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/- | 20/7½ | 22,9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 28 - | 27/6 | 93.9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19 - | 19/- | 19/4½ | 16/9 |
| 7 | " 7% 2nd Pref. .. .. | 19 - | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 38/6 | 39/3 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 113.9 | 117.6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67 11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 23/9 | 22/6 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 31/3 | 30/7½ | 37/- | 13/1 |
| 8 | " " 8% C.P. (£2) .. | 52/6 | 52/6 | 67 10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½ | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 77½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 253 | 250 | 213½ | 113/2/6 |
| 3½ | " " 3½% Pref. Stk. .. | 64½ | 64½ | 84/17/6 | 49 |
| 4 | " " 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 25 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 65/-• | 66/3 | 9/10/3 | 20/9 |
| 12½ | " Int. Mar. .. .. | 51/6 | 50/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25 | 23 | 11/3/6 |

(a) 1s. 7½d. per share. (b) £8 8s. 6·66d. per cent. (c) 1s. 6·940d. per share. (d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. ·912d. (g) 1s. 7·223d. ‡Including 1s. bonus. •Ex dividend.

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Intm. div. of 3 p.c., less tax (the same as last year) is proposed.

TILLING-STEVENS MOTORS, LTD.—Div. at rate 7½ p.c. p.a. on cum. pref. shs. for half-year ended June 30, 1928, payable September 1.

CABLE, TELEPHONE AND GENERAL TRUST, LTD.—Divs. on 6 p.c. cum. pref. and 7 p.c. non-cum pref. shs. for six months to June 30, 1928, declared.

METROPOLITAN RAILWAY CO.—Intm. div. of 1½ p.c., agst 1 p.c. for same period last year, on ord. stk., and intm. div. on surplus lands stk. are announced.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904) LTD.—Div. of 1s. 3d. p. sh. (at rate of 5 p.c. p.a.). less tax, for three mos. ended June 30, 1928, will be payable on Aug. 16.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD.—Intm. div. on ord. shs. of West-End undertakings for half-year ended June 30, 1928, at rate 9½d. p. sh., less tax, declared.

ALTON BATTERY CO., LTD.—Int. div. of 3 p.c. actual, less tax, on ord. shs. for six mos. ended June 30, 1928, and div. on 7 p.c. cum. pref. shs. for the same period have been declared.

WALLINGFORD AND DISTRICT ELECTRIC SUPPLY CO., LTD.—A recent meeting of shareholders was not in favour of accepting an offer by the Wessex Electricity Co. to purchase the undertaking at 25s. per share.

SHAWINIGAN WATER AND POWER CO.—Co. has acquired majority control in Laurentide Power Co. Basis of control is $150 in cash and one sh. of Shawinigan Co. stk. in exchange for each sh. of Laurentide Co. stk.

WARD AND GOLDSTONE, LTD.—Net pft. for past year, before providing for taxation, £18 151, agst £21 248. Fin. div. on ord. 4 p.c., making 11 p.c. for year (same as last year); participating div. on cum. pref. shs., 1 p.c., making 8 p.c. Fwd. £29 804, agst. £25 864.

BENN BROTHERS, LTD.—Directors recommend paymt. of the followg. fin. divs. for year ended June 30th, 1928: 3 p.c. on pref. shs., which with intm. div. of 3 p.c. paid in Jan. makes 6 p.c. for year; 11½ p.c. on ord. shs., which with intm. div. of 6¼ p.c. paid in Jan. makes 17½ p.c. for year; 2s. 3d. p. sh. on dfd. shs., which with intm. div. of 1s. 3d. p. sh. paid in Jan. makes 3s. 6d. for year.

ROSS ELECTRIC LIGHT AND POWER CO., LTD.—Gross rev. for 1927, shows pft. of £1 544, agst. £959, and expenditure on rev. acct. was £2 373, agst. £2 605. After takg. into acct. deb. int., etc., £552, less int. on deposit acct., £18, and allowg. £553 for depreciatn. and £124 income tax, net loss is reduced to £6 323. An a.c. supply from Hereford was commenced near beginning of year and has resulted in a small reduction in exes.

BERRY'S ELECTRIC (1928) LTD.—A statement issued to comply with Stock Exchange regulations, intimates that the co. has been formed to acquire the assets and undertakg. of Berry's Electric, Ltd., mfrs. of electrical apparatus and appliances, as from March 31, 1928. Informatn. is given regardg. the patents owned by that co. and the net assets on June 13, 1928, are certified as £149 706 10s. 1d., after deductg. sundry creditors, £12 229 179. 8d. The purchase price is £215 000, of wh. £75 000 is in cash, and the remainder in shs. Particulars are also given of the directors' holdings and the contracts entered into by the co.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—Intm. div. has been declared at rate of 9 p.c. p. a. for half-year ended June 30, 1928. No. of consumers continues to increase, and it is anticipated that reductns. in price made during half-year will further stimulate demand for the co.'s supply. Mains have been extended to supply townships and villages in rural districts, and local councils are taking advantage of these extensns. to make agreemts. for street ltg. Airedale Special Order and Ardsley, Methley and District (Extension) Order have been confirmed by Parliament.

ATLAS LIGHT AND POWER CO.—It is proposed to incr. cap. from £5 500 000 to £6 500 000. Co. owns, through subsidiaries, electricity supply businesses and traction systems of Cordoba and Santa Fé, and traction system in Montevideo. It also owns the capital of the Argentine Tramways and Power Co., La Sociedad Commercial de Montevideo, La Transatlantica Compania de Tranvias Electricos de Montevideo; Compania de Luz y Fuerza de Parana and Parana Tramways Co. It

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has also a controlling interest in Tucuman Light and Power Co. A circular letter sent to shareholders states that development of co.'s undertakings in South America promises to be such as to make it desirable to provide for issue of further cap. to meet requirements as they arise.

YORKSHIRE ELECTRIC POWER CO.—Rpt. for half year to June 30th, 1928, states that intm. divs. at rate of 6 p.c. p.a. have been declared on pref. and ord. cap. issued prior to 1928. Div. on 897 000 ord. shs. issued in Feb. last will be included with div. payable in Feb., 1929. Co.'s output continues to grow despite trade depressn. and special difficulties of coal industry. Economies are being effected by the increasng. use of Ferrybridge station ; the lower price of coal has enabled further reductns. to be made in charges for electricity. Applicatns. have been made to Electricity Commissioners for authority to supply electricity in parts of the counties of Derby, Lincoln, Nottingham and York (East Riding), which adjoin co.'s area of supply.

## Company Meetings.

MEXICAN TRAMWAYS CO.—At the recent meeting in Toronto, the chairman said the receipts for the first six months of the present year showed a satisfactory increase. The new cars were appreciated by the public, and competition by "jitney" cars was diminishing. The report was adopted.

MEXICAN LIGHT AND POWER CO., LTD.—At the meeting in Toronto last week, the chairman said good progress was being made with the construction of the Lerma dam. The Light and Power Co. of Toluca had recently been acquired. The net earnings for the first half of this year showed a considerable increase. The report and accounts were adopted.

OSWESTRY ELECTRIC LIGHTING AND POWER CO., LTD.—The report, submitted and adopted at the meeting last week, states that the year's profit, after providing for depreciation and interests, and adding the balance from the previous year, justifies the directors in recommending a dividend at the rate of 8 per cent. The report was adopted and the dividend approved. The retiring directors, Mr. P. H. Minshall, chairman, and Mrs. K. Bremner Smith, were re-elected, and the shareholders expressed their satisfaction at the continued progress of the undertaking. During the past year electricity sold increased by 39 105 kWh, and revenue by £800. A 100 kW rotary converter and a transformer and switchgear were installed and part of the supply is now taken in bulk from the North Wales Power Co. The company have obtained an extension of area and are now supplying the villages of Gobowen and Whittington, and the three new sewage pumping stations of Oswestry R.D.C.

RICHARD JOHNSON AND NEPHEW, LTD.—The statutory meeting took place last week. Major Ernest Johnson, chairman, said the board were pleased to see the ready response to the public issue of their preference shares and the satisfactory reception of the ordinary shares. Having been associated with the old private company since boyhood, and having regard to its long history as a wire-producing firm, founded in that city (Manchester) over 150 years ago, he felt that to-day was simply one more milestone on the road to prosperity, and that, while they were now in the eyes of the law a new-born baby, they had traditions and records behind them second to none in the wire trade. The results of the trading of the old company were set forth up to March 31st, 1928, and had been shown as a capital reserve in the prospectus. To this would have to be added the profits earned between that date and May 24th—the date of incorporation of the company—which profits, as far as they could see, would be satisfactory, and give additional financial strength to the company. The electrical industry was a large and growing consumer, and it was anticipated that the big schemes now being sanctioned by the Electricity Commissioners would create a greater and further demand for their products. It was proposed to make up the first accounts of the company to March 31st, 1929, which would show practically ten months' trading under the new regime.

W. AND T. AVERY, LTD.—At the meeting last week Sir J. Fortescue Flannery, chairman, said the year under review had been comparatively uneventful and undisturbed, and the accounts showed continued progress and improvement. The developments of the several generations, say 200 years, during which Avery's firm had been at work, had produced a refinement, an elaboration, and a mechanical perfection in the art of quick and accurate weighing which represented scientific progress second to none in the applied sciences. They were trying to assist that hard-pressed industry, coal mining, by special machinery for pit-bank weighing and recording. He had spoken on previous occasions on the work which had been done to establish their products on the Continent of Europe, where there were five factories manufacturing to Avery designs, aided in every way by the skill and knowledge that they had acquired in the industry. They had opened a branch in Canada, and found the name of Avery welcomed and respected throughout the Dominion. Including £52 451 brought forward, there was a balance to revenue account of £151 975, which was some £14 000 in excess of last year's figure. It was proposed to pay final dividends for the year on the A and B preference shares, and a further dividend of 10 per cent. on the ordinary shares, as before, making 15 per cent. for the year on those shares, and, in addition, a dividend of 10 per cent. on the 225 486 ordinary shares, which were created by their resolution of June 8th, 1928. It was also proposed to place £10 000 to general reserve, making a total of £280 000. The report was adopted.

BURNDEPT WIRELESS, LTD.—At the extraordinary meeting of the company last week, a resolution approving the reconstruction scheme was carried by a large majority, and Mr. R. A. Hamlyn (as liquidator of the old company) was authorised to consent to the registration of a new company to be named Burndept Wireless (1928), Ltd., and authorised to enter into an agreement with the new company in the terms of the scheme, and to carry the same into effect. Mr. T. A. Barson, one of the directors nominated by the shareholders' committee to the Board in 1926, explained the events which led to the formulation of the scheme. The position last autumn was that, had the company gone into liquidation, the business closed down and assets realised, the unsecured creditors would have had a very small, if any dividend, and the shareholders nothing at all. In April the unsecured creditors approved that portion of the scheme which provided that they should receive a composition of 10s. in the £, payable in unsecured notes of the new company, the small creditors under £10 receiving 7s. 6d. in the £ in cash. The scheme gave the shareholders, if they wished to exercise their rights, a definite holding in the new company. The preferred ordinary shareholders received in respect of every preferred ordinary share held in the old company two shares in the new company of 5s. each, allotted as paid up to the extent of 1s. 9d. per share. At a cost of 6s. 6d. each preferred ordinary shareholder would receive two fully-paid shares of 5s. each—that is, 10s. for each preferred ordinary share at present held. Subsequent separate meetings of the preferred ordinary and deferred ordinary shareholders also approved the scheme.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—The Marquis of Winchester, presiding at the meeting last week, said leases and concessions, expenditure in connection with the power stations, etc., and the investment in the Rand Mines Power Supply Co., Ltd., stood respectively at £967 723, £1 651 484 and £1 656 096. The item under the head of Electricity Supply Commissioners of South Africa, Witbank Undertaking, appeared on this occasion at £84 854, compared with £170 632 at the end of 1926. At the present date the amount outstanding at the end of the year had practically all been repaid, but, as they were now extending the station on behalf of the Electricity Supply Commission, this amount would tend to increase temporarily. Net profit was £373 444, the highest figure they had reached. This enabled them to pay again the full 10 per cent. on the preference shares and a dividend on the ordinary shares of 15 per cent. Sales continued to expand, the electricity sold during 1927 being upwards of 34 000 000 kWh over the sales for 1926. It was expected that they could look forward to a continuance of activity on the Witwatersrand for many years, and it was more than probable that, provided labour was available, the demand for power would continue to show an upward tendency for several years to come. There had been a gradual and steady increase in demand, both for electricity and air, which called for further machinery to meet the load. He could now report that the 20 000 kW turbine set at Vereeniging had recently gone into commission very satisfactorily. The new large compressor for Rosherville was expected to be at work early next year, together with an extension at the Electricity Supply Commission station at Witbank of one 20 000 kW turbine set. It was forecast that the demand would increase beyond the capacity of the equipment at present projected. This position, together with the renewal of existing plant, was now having close attention, and the reinvestment in the business of a considerable amount of the sums taken out of earnings as provision for depreciation and renewals would shortly have to be decided upon. The report and accounts were adopted.

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# W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.

## Business Grows More Prosperous Year by Year—Reserve Account Equals Half Share Capital—Pension and Benevolent Funds Exceed a Quarter of a Million.

THE 49th ordinary general meeting of W. T. Henley's Telegraph Works Co., Ltd., was held at the Abercorn Rooms, Great Eastern Hotel, London, E.C.2, on Friday, July 13th, Sir George Sutton, Bart., M.I.E.E., chairman, presiding.

The chairman said: Ladies and Gentlemen,—the report and accounts, showing as they do a comparison with the previous year's figures, leave very little for the chairman to say in regard to the figures. You have a very prosperous business, which by year by year grows more prosperous, and perhaps the one anxiety of your chairman at these meetings is the possibility that the shareholders might desire to ask for a larger distribution than the directors think it wise to recommend.

### Loyalty of Shareholders.

I do not know that we ought to be anxious about that, or that I, your chairman, ought to be anxious, because hitherto, the shareholders have always very loyally abided by the recommendations of the board. On the debit side the only item of moment, if the recommendations of the directors be accepted by this meeting, is that the reserve account will have reached half the share capital of the company. On the other side of the account—the credit side—there is an increase in the investments by £50 000 of Treasury Bonds (1934). The holding of Henley's debentures which we acquire as they come on the market has gone up by some £4 000 or £5 000, and £15 000 has been added to our general investments in electrical undertakings with whom we have business. The stock-in-trade is about £40 000 up. The debtors are about £40 000 down, and the bills and bills receivable in hand—Treasury Bills and cash, are practically the same as they were the previous year. The sum of £126 416 has been added to the capital account for land, buildings, machinery and plant, and represents expenditure for economising and increasing of production, with the exception of between £2 000 and £3 000 which is included in that figure on account of a sports ground that we are establishing at Gravesend. Some £6 000 or £8 000 more will have to be spent on that, but it will have to come into next year's accounts. An item which does not appear on the balance sheet, and which you ought to know of is the amount standing to the credit of the pension and benevolent funds. That total has reached now £262 000. We shall presently apparrently be outgrowing our share capital with the pension and benevolent fund, and that is a consummation devoutly to be desired. On the credit side, trading account shows a profit of £342 000 which, I think, must be a satisfactory figure to you. The net result is that, if the directors' proposals be adopted, there will be a carry-forward to next year of £532 930, against £506 000 brought in. It is a wonderful statement of accounts, ladies and gentlemen, but it does not produce any applause. I am afraid that the figures are so large and the report so favourable that they take some time to settle down and you do not realise that you have such a splendid balance sheet before you.

But how has the result been arrived at? I am disposed to put the primary cause to the ability, the experience and the unslackened interest of the large number of employees of this company. I have in my mind not only the commercial side but the designing side also and the manufacturing side, from the chiefs—and we have many chiefs—to the man at the machine. As to the latter, the machine hand, he or she, has to take a large measure—or at any rate some measure of responsibility for the high quality of the products which the company turns out. I desire that they should not lose some of the credit for the successful undertaking which you have. Besides that—the quality of work they turn out—it will be of interest to you to know the statistics which I have put before me of the company's work. They show that since 1913—and I am taking that year as the year before the war—the cable department has had its production increased by about 10 per cent. By production I mean the production increase per head per worker. That is to some extent due to the industriousness of your workers. In one department of the works that increase per head per worker has gone up by the large figure of 14 per cent. greater than it was in 1913. Now after the war, of course, the rate of production per head got very low year by year. Since then it has improved. The reason for that is that our factories have been very fully employed, and where you have a fully-employed factory the tendency is always to get a better output. Another reason for the improvement is the new machinery and changes in organisation which have been made in the works and in the office. The machine operator must have credit for something far more than mere workmanship. He must have some credit for the large number of suggestions that he makes to his foreman and managers. They are not always adopted, but very often they are, and in that case there is a reward. And so I give these reasons as the primary cause of the successful balance sheet before you. To that cause we must attribute very largely our increased turnover. We have made an increase in turnover in quantity as well as in value. Of course, by having an increased turnover we have an increased amount of employment at the works. Actually, the people taken on in 1927 were greater than the number in the previous year 1926, which, in its turn, was greater than the number in 1925, and so on. The increased number last year over the previous year was between 300 and 400.

The home trade gives us our largest increase, and I think that perhaps that is desirable. It is natural, anyhow, that our home trade should give us our largest increase. It is a very great satisfaction to know that the overseas trade has increased in the year under review substantially. It amounts to about 10 per cent. over that of the preceding year. I am excluding from the figures the two large contracts which we reported to you last year—the Indian and the Egyptian contracts—both of which are still in course of execution, and neither of which have been brought into this year's account, so these increases are excluded from the increase in the foreign trade—the overseas trade—which I have reported to you. We have very fierce competition abroad, but it is satisfactory to know the large turnover of this year. Last year shows more than one-third of it has gone overseas. So far as the new year is concerned we have satisfactory orders—rather larger than we brought in last year. The report refers to the important results obtained by the Henley Tyre and Rubber Co. I need not detain you very long about that company. We have told you in the report that we are satisfied with the year's trading, the best we have had for some time. Tyres are the principal things, but our tennis ball department has doubled its turnover. We are very successful in the tyres we are supplying. I am making you a very short speech to-day. There are two or three reasons for it. One, perhaps, is the hot weather, and I am solicitous not only for the pockets of the shareholders, but also for their health. But I am very optimistic about the outlook for this company. As you see, we are continually increasing our facilities for a larger output to meet the demand which we hope will be increasing year by year. The consumption of electricity at home has doubled itself in the last seven years. These are the official figures from the Board of Trade, and you know as well as I do that there is every reason to expect a larger increase in the next seven years from the efforts which are being made by the Government and elsewhere to increase the demand for electricity. We have to be ahead, of course, of that demand, and to anticipate what we shall have to provide, because, you see, if we decide on augmenting our plant, it means, perhaps, nine, twelve or eighteen months before we are able to use the plant which we order. And so we have to be well ahead of the demand, and that is one of the things that you look forward to your directors to do.

### Anticipating Future Demands.

They have to be able to forecast with some degree of certainty the future of the trade and to spend money to prepare for the fulfilling of the needs of the trade when such needs arise. We are in the happy position owing to the very conservative way you have dealt with the funds of this company, the capital of the company, and the financial disposition you have made in the past, of being able to go on with this work and to spend large sums of money every year. Last year you spent £126 000, the year before £142 000. That has been done without appealing for any increase in the share capital. We have 150 000 ordinary shares that we are authorised to issue, but I do not see any likelihood of our making a new issue of shares. So far the company is financing itself. Nevertheless, I think you will agree that we are paying you a handsome dividend.

The report and accounts were adopted, and a final dividend on the ordinary shares of 2s. 6d. per share, less income tax, in respect of the year ended March 31st, 1928, and a bonus of 1s. per share, less income tax, were approved.

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# EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.

## Effect of Conditions in China on Traffic—A Satisfactory Year—The Beam System and Cable Tariffs to Australia.

THE 94th ordinary general meeting of the Eastern Extension Australasia and China Telegraph Co., Ltd., was held at Electra House, Moorgate, London, on Thursday, July 26th, Sir John Denison-Pender, G.B.E., K.C.M.G., chairman, presiding.

The Chairman said: Ladies and Gentlemen,—Before proceeding with the business of this meeting, I would mention, with deep regret, the great loss which the company has sustained by the decease of Mr. George Cockburn Jack, who had served the company for 51 years, and for 37 years had so ably filled the position of accountant. He earned and justly deserved the high confidence and respect reposed in him by your directors, as also the affectionate esteem of his colleagues and of the staff abroad. The board have appointed to the accountancy Mr. Eaton H. Adye, in whose ability they have every confidence.

Owing to your directors having been engaged in important negotiations, to which I shall later refer, our annual meeting, which is usually held in May, was postponed to this date, solely with the object that it might have been possible to have then given you some fuller information on the subject than was available at the earlier date.

Dealing with the accounts for 1927, the net result, before charging income tax payable in England and interest on the 4 per cent. mortgage debenture stock, shows a profit of £1 068 144, against that for 1926 of £1 115 974; the revenue being decreased by £68 624 and the working expenses by £20 794. The balance to be dealt with is £838 181, plus the carry forward of £415 430, making a total of £1 253 621, from which sum £200 000 has been placed to the general reserve fund, £400 000 paid in dividends, and £653 621 carried forward.

Your directors considered the carrying forward of the large amount specified as being advisable, in view of possible contingencies in connection with the proposed merging of radio and cable interests.

When the facts are taken into consideration that cable tariffs to Australia were reduced in February, 1927, and beam wireless to Australia was commenced in April, 1927, you will, I think, agree with me that the result of our last year's work has been satisfactory, and I may add that the result of our working covering the period subsequent to that dealt with in the accounts now before you has also been satisfactory.

You are, of course, conversant with the events which have happened in China. One can only hope that with the cessation of hostilities and the fusion of the parties desirous of forming a Nationalist Government, China will enter on a period of more peaceful and steady progress than has existed for several years past. On previous occasions I have mentioned that negotiations had for some years past been in progress between the Chinese Telegraph Administration and the Great Northern and our Telegraph Companies. It has not been possible to arrive at an understanding, owing to the Peking Telegraph Administration, with whom the companies have agreements covering the whole of China, not having jurisdiction over the various other telegraph administrations which had come into being during the past years of turmoil. Now that there would appear to be some prospect of the telegraph affairs of that country coming under a more unified control, I am hoping that headway will be made in the matter. It has been practicable for the companies to keep the settlement of traffic accounts fairly up to date, but only by the enforcement of cash payment on telegrams handed to us for transmission by offices of the Chinese Telegraph administrations, and by weekly settlements of accounts. These measures would readily be removed as soon as circumstances justifiably permit.

The Eastern Telegraph Co., with which the Eastern Extension Co. is so closely allied, held its annual meeting on Tuesday last, when I gave, as far as was possible, a full account of the important negotiations which have been taking place during the last seven months, and which I hope to see confirmed very shortly. It is difficult for me to go over the ground again without repeating what has already been said, and I therefore propose sending the shareholders of the Extension Co. a full report of the proceedings of the Eastern Co.'s annual meeting, in order that those of them who may not have read the Press reports will have full information as far as I can give it to-day.

It is once again my pleasant duty to record your directors' high appreciation of the able and efficient services rendered by the staff at home and abroad. Following our usual practice, an expression to that effect will be conveyed to them, with which I am sure you would wish to be associated.

I now beg to propose that the report and accounts of the directors for the year ended December 31st, 1927, be, and the same are hereby received and adopted; and that the dividend of 10 per cent., free of income tax, paid for that year, be approved. The resolution was seconded by Lord Inchcape and carried unanimously.

The retiring directors, Sir Charles Stewart Addis, K.C.M.G., and Mr. J. C. Denison-Pender, were re-elected directors, and Messrs. Deloitte, Plender, Griffiths and Co. were re-elected as auditors, at a remuneration of £300.

A hearty vote of thanks was accorded the chairman, the directors, and the staff.

## ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by GEE AND CO., Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.***

*Opposition to the Registration of the following Trade Marks can be lodged up to August 4th.*

LION RADIO RECEIVERS. (Sign.) 491 133. Class 8. Wireless telephonic receiving apparatus. Holt and Lyon, 3, Station Parade, Balham, London, S.W.12; manufacturers. May 5th, 1928.

DEAC. 490 826. Class 8. Electric accumulators and parts thereof. A.F.A. Accumulators, Ltd., 120, Tottenham Court Road, London, W.1; manufacturers. April 25th, 1928. (To be Associated, Sect. 24.)

OHMRAD. 490 158. Class 8. Instruments and apparatus for use in wireless telegraphy and telephony. Naamlooze Vennootschap Ramie Union (a company incorporated under the laws of Holland), 48, Haaksbergerstraat, Enschede, Holland; manufacturers of high refractories for electrical purposes. April 4th, 1928. (By Consent.)

CONCORD-RADIO. 490 509. Class 8. Apparatus and instruments for use in wireless telephony, wireless telegraphy and television, and parts thereof, and not including flexible insulated electric cables and wireless headphone cords, and not including any goods of a like kind to any of these excluded goods. Albert Edward Wilberforce Finch, 22, Swinburne Avenue, Manor Park, London, E.12; importer. April 17th, 1928. Registration of this Trade Mark shall give no right to the exclusive use of the word "Radio."

## NEW COMPANIES.

WILLIAM DUDLEY, LTD.—Cap., £500. To acquire undertaking, assets and liabilities of William Dudley and to carry on the business of wireless engineers and repairers, etc. A director: W. Dudley, Field Side, Thorne, motor engineer.

PHANTOM ORCHESTRAS, LTD.—Cap., £100. Manufacturers, distributors, producers and exhibitors of and dealers in apparatus and instruments for recording and reproduction of sound; electricians, radio engineers, etc. Reg. office: Victory House, Leicester Square, London, W.C.2.

NATIONAL LIGHTING CO., LTD.—Cap., £1 000. To adopt agreement with E. A. Moses, and to carry on business of suppliers and manufacturers of electrical fittings and appliances, etc., carried on by him in London and elsewhere. Reg. office: 36, Farringdon Street, London, E.C.4.

RINGSDORFF CARBONS (ENGLAND), LTD.—Cap., £5 000. Manufacturers of carbon brushes for dynamos, motors and magnetos, and brushes, brush-holders, brush-holder components, contacts, controllers, and contact and controller components, arc lamps, battery and cinema carbons, electric heaters, etc. Reg. office: 66, Victoria Street, London, S.W.1.

FRENCH PHOTOTONE, LTD.—Cap., £250 000. To carry on in France or elsewhere business of manufacturers and producers of and dealers in gramophones, phonographs, electricians; manufacturers of and dealers in apparatus for receiving, transmitting, recording, producing and reproducing sound, etc., to adopt agreements with British Brunswick, Ltd., Ledbury Synd, Ltd., British Phototone, Ltd., and French, British and Foreign Trust, Ltd. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, London, W.C.2. (Public company.)

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

EMBURY, H. and K., 20, Union Street, Newton Abbot, electrical contractors. £21 12s. 6d. June 21st.

FORBES (P. N.), LTD., 33, Archway Road, N., electrical engineers. £22 13s. 2d. June 20th.

JONES, Mr. C. M., 11, Anerley Road, S.E.19, wireless dealer. £12 9s. 8d. June 16th.

LAWS, Mr. H., Woodhorn Road, Ashington, electrical factor. £10 14s. 4d. June 8th.

LEWIS, Mr. A. Gordon, The Old Post Office, Rhymney, wireless dealer. £20 4s. 4d. June 13th.

PARKER, John William Melrose, Avondale Park, Moreton, Birkenhead, wireless engineer. £13 10s. 2d. March 6th.

RAWLINGS AND CO., 39, West Street, Hereford, electrical engineers. £14 18s. 5d. June 21st.

SHEEN ELECTRICAL CO., 37, Sheen Road, Richmond, electrical engineers. £35 12s. 11d. June 13th.

TAYLOR, W. AND SONS, 5, Frederick Road, Pendleton, Manchester, electrical engineers. £17 7s. 6d. June 5th.

TURTON, John W., Palace Entrance, Market Place, Banbury, electrical engineer. £17 6s. 5d. June 18th, and £11 0s. 3d. June 20th.

WALKER AND WALKER, LTD., 5, Harrington Street, Liverpool, electrical contractors. £11 6s. 2d. June 18th.

## Receivership.

LONDON AND PROVINCIAL RADIO CO., LTD.—P. B. Settle, C.A., of Market Street, Colne, was appointed Receiver and Manager on July 17th, 1928, under powers contained in instrument dated August 18th, 1925.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.*]

BUDD, E. M. L., wireless and electrical engineer, trading as the ESSEX COUNTY ELECTRICAL CO., High Road, Woodford Green. A meeting of the creditors of the above was held on July 27th at the offices of Mr. J. Ames, C.A., 49, Leadenhall Street, E.C. A statement of affairs was submitted which disclosed liabilities of £1 251 (bank overdraft £218, trade creditors £558, cash creditor £475) and assets estimated to realise £265, or a deficiency of £986. It was reported that the debtor commenced trading on his own account in June, 1926. He had little or no capital of his own, but his father advanced him £250. Since that date, his father had made further loans, and was now a creditor for £475. During the first year the sales were £1 640, and in the following 12 months they increased to £2 265. In the first period there was a gross profit of £394, and in the second a gross profit of £489. After allowing for wages, however, the trading resulted in a small net loss. An offer was submitted of a composition of 8s. in the £, which was subsequently increased to 10s. in the £, payable as to 4s. in cash, 4s. on September 1st, and the balance of 2s. on March 1st, 1929. After a short discussion, a resolution was passed agreeing to accept the offer.

DAWSON, J. E., manufacturing radio engineer, High Street, Boston, Lincs. A circular has been issued herein by Rice Waite and Marris, solicitors, Boston, stating that this debtor has consulted them with reference to his affairs, and that they have found it necessary to advise him to execute a deed of assignment for the benefit of his creditors in favour of Mr. Frederick Fugill, C.A., of the firm of Hodgson, Harris and Co., of Boston, Hull and elsewhere.

HACKETT AND CO., LTD., electrical and radio engineers, Southport. At the statutory meeting of the creditors in this voluntary winding up, the liquidator, Mr. J. R. Spooner, submitted a statement of affairs which showed ranking liabilities of £1 788 and a deficiency, so far as the creditors are concerned, of £538. A large number of doubtful debts were stated to be included in the assets. Mr. Spooner reported that the company was registered on December 22nd, 1924, with an issued capital of £1 204, all of which was fully paid. During the year to November 30th, 1925, the turnover was £6 888, with a net profit of £385. In the following 12 months the sales increased to £6 953, but there was a net loss of £550. For the 14 months to January 31st, 1928, the turnover was £8 066, with a net loss of £118. Since February 1st last, the sales had been £2 437, with a net loss of £205. It was pointed out that the loss for the 14 months to January 31st, 1928, would have been heavier, but a retail shop was disposed of for £650, and it was believed that a fair profit was made on the sale.

LAY, O. C., trading as the HOME WIRELESS INSTALLATION CO., 2D, Wandsworth High Street, Wandsworth, London, S.W. A meeting of creditors was held recently, in response to a circular letter issued by Mr. Leslie C. Stewart, I.A., of Avenue Chambers, Southampton Row, London, W.C., who submitted a statement of affairs showing liabilities of £510, all due to the trade, and assets (including hire purchase debts £40) estimated to realise £107, less £63 preferential claims, leaving net assets of £44. Mr. Stewart stated that the debtor commenced trading in April, 1922. He then had a capital of £75, of which £50 was borrowed from friends. He had since repaid £40, and £10 was still outstanding. The debtor had borrowed other amounts from friends for the purposes of the business. The cash claims, however, were not included in the statement of affairs, as the creditors were willing to stand aside. Mr. E. Judd, of Corfields Traders Association, enquired what the turnover had been, and Mr. Stewart said the sales has been as follows: 1924, £1 017; 1925, £1 434; 1926, £1 617; 1927, £1 820; and 1928 to date £705. In answer to Mr. C. Latham, of the Wireless and Radio Trades Guardian Association, Mr. Stewart said that the debtor did not realise his position until March last, when he took stock. The deficiency had arisen during the last 15 months The drawings had been at the rate of £3 10s. a week. An offer had been received to purchase the business for a sum which would be sufficient to pay a composition of 2s. 6d. in the £. Replying to further questions, Mr. Stewart stated that an execution had been levied, but the bailiff had been withdrawn on the understanding that the creditors concerned would have the right of re-entry if the composition offered was not accepted. The position disclosed was discussed at some little length, and Mr. Stewart stated that a number of the creditors were sympathetic and were willing to accept the offer of 2s. 6d. in the £. The meeting, however, eventually broke up without any definite resolution being passed.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

CHEDDAR ELECTRIC SUPPLY CO., LTD. By special resolution, July 4th, confirmed July 20th. A. A. Gates, of Christy Bros. and Co., Ltd., Chelmsford, appointed as liquidator. Meeting of creditors at the Winscombe Electric Light and Power Co., Ltd., Electricity Works, Winscombe, Somerset, on Tuesday, August 7th, at 3 p.m.

ELECTRICAL SUPPLIES (LIVERPOOL), LTD. By reason of its liabilities, July 6th. P. S. Booth, 2, Bixteth Street, Liverpool, certified accountant, and R. R. Bailey, 10, Dale Street, Liverpool, chartered accountant, appointed as joint liquidators.

WINSCOMBE ELECTRIC LIGHT AND POWER CO., LTD. By special resolution, July 4th, confirmed July 20th. A. A. Gates, of Christy Bros. and Co., Ltd., Chelmsford, appointed as liquidator. Meeting of creditors at Electricity Works, Winscombe, Somerset, on Tuesday, August 7th, at 2.30 p.m.

### Bankruptcy Information.

BARRACLOUGH, Willie, 45, Owston Road, Carcroft, near Doncaster, wireless and general dealer. Receiving order, July 23rd. Debtor's petition.

CRUMP, Percy Gordon, 44, Wyle Cop, Shrewsbury, wireless and cycle dealer. Receiving order, July 27th. Debtor's petition.

DAVIES, John Arthur, of "Eureka," Church Street, Blaenau Festiniog, Merioneth, electrical contractor. Receiving order, July 24th. Debtor's petition. First meeting, August 9th, 3 p.m., Official Receiver's Office, St. Peter's Churchyard, The Cross, Chester. Public examination, September 28th, 2.15 p.m., Court House, Portmadoc.

JAWETT, Nathan, 58, Bedford Street, London, E.1, electric lamp dealer. Receiving order, July 25th. Creditor's petition. First meeting, August 8th, 12 noon, and public examination, October 19th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

JONES, Edward Denis, Royal Sportsman Hotel, Portmadoc, Carnarvon, electrical engineer. First meeting, August 3rd, 3 p.m., Official Receiver's Office, St. Peter's Churchyard, The Cross, Chester. Public examination, September 28th, 2.15 p.m., Court House, Portmadoc.

KELLY, Stanley Sherzell, 59, North Road, Durham, electrical contractor. First meeting, August 3rd, 12.30 p.m., Official Receiver's Offices, 14, John Street, Sunderland. Public examination, August 21st, 11 a.m., County Court Offices, Old Elvet, Durham.

LAY, Olive Cecil, 83, Burntwood Lane, Wandsworth, London, accumulator specialist, trading as THE HOME WIRELESS INSTALLATION CO., 2C and 2D, High Street, Wandsworth. Receiving order, July 27th. Debtor's petition.

### Order Made on Application for Discharge.

FORD, Percy, 4A, Macdonald's Lane, Corporation Street, Manchester, electrical contractor. Discharge suspended for four months until October 25th.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### July 3rd.

19 280 Siemens Bros. and Co., Ltd., F. Baker and E. A. Petithory. Telephone instruments.
19 303 H. H. Berry. Advertising signs.
19 270 G. F. Danbridge. Coil formers.
19 247 J. Dieux. Electrical gramophone reproduction. (3/1/28.)
19 219 English Electric Co., Ltd. and G. Schroeder. Dynamo-electric machines.
19 222 General Electric Co., Ltd. Power supply apparatus.
19 281 W. E. Goodwin and Siemens Bros. and Co., Ltd. Electrical connectors.
19 290 Hazeltine Corporation. Volume control. (7/7/27, U.S.)
19 269 Igranic Electric Co., Ltd. Variable resistances.
19 270 Igranic Electric Co., Ltd. Coil formers.
19 200 Kendrick Bros. and F. Kendrick. Accumulators.
19 268 L. W. Markham. Loud-speakers.
19 261 Metropolitan-Vickers Electrical Co., Ltd. Covers for transformers.
19 240 B. C. von Platen. Converting mechanical to electrical power.
19 223 S. F. Warren. Electric time switches.

### July 4th.

19 406 Ateliers de Constructions Electriques de Charleroi. Testing for electric networks. (13/6/27, Belgium.)
19 354 Babcock and Wilcox, Ltd. Rivet caulking machine.
19 405 J. R. Beard and Sterling Telephone and Electric Co., Ltd. Electric relays.
19 380 Benjamin Electric, Ltd. Lamp holder adaptors.
19 381 Benjamin Electric, Ltd. Reflector shades.
19 405 N. Blades. Electric relays.
19 390 British Thomson-Houston Co., Ltd. Electric switches. (5/7/27, U.S.)
19 391 British Thomson-Houston Co., Ltd. Refrigerators. (5/7/27, U.S.)
19 359 T. A. Davies. Protective circuits.
19 408 J. N. Dean, B. J. Hargood and H. J. Garnett. Insulating material.
19 434 Etablissements L. Halot. Electric clocks. (6/7/27, France.)
19 431 F. Hammond and B. Leech. Electrolytic deposition of alloys.
19 371 O. D. Lucas. Loud-speakers.
19 409 N. W. MacLachlan. Thermionic valves.
19 425 G. J. Scott and W. H. Scott. Control for electric winches.
19 330 H. J. Sheen. Accumulator charging plant.
19 419 Siemens-Schuckertwerke Akt.-Ges. Geared electro-motors. (4/7/28, Germany.)
19 418 Siemens und Halske Akt.-Ges. Transmitting messages over telephone lines. (20/12/27, Germany.)
19 328 C. Snowden. Device for locking electric lamp holders.
19 361 Standard Telephones and Cables, Ltd. and Western Electric Co., Inc. Signalling systems Western Electric Co., Inc.

### July 5th.

19 497 British Thomson-Houston Co., Ltd. Electric heaters. (5/7/27, U.S.)
19 498 British Thomson-Houston Co., Ltd. Variable transformers. (6/7/27, U.S.)
19 466 Brookhirst Switchgear, Ltd. and J. A. Hirst. Starting, etc., electric motors.
19 505 Electrical Research Products, Ltd. Constant h.f. oscillator. (18/10/27, U.S.)
19 558 G. H. Fletcher, Metropolitan-Vickers Electrical Co., Ltd. and A. Tusten. Arc shields.
19 515 P. Freedman. Arc devices.
19 492 General Electric Co., Ltd. Wire spiralling machines. (20/7/27, Germany.)
19 557 W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. Electric motor control.
19 500 International General Elfctric Co., Ltd. Electrically coating metals.
19 559 Metropolitan-Vickers Electrical Co., Ltd. Fluid-relays.
19 560 Metropolitan-Vickers Electrical Co., Ltd. Fluid turbines.
19 556 Metropolitan-Vickers Electrical Co., Ltd. and Westinghouse Electric and Manufacturing Co., Ltd. Measuring devices.
19 534 Neon Lights, Inc. Thermionic valves. (19/12/27, U.S.)

### July 6th.

19 715 Akt. Ges. Brown, Boveri et Cie. Electric distance relays. (7/7/27, Germany.)
19 695 Associated Telephone and Telegraph Co. Remote control system (6/8/27, United States.)
19 696 Associated Telephone and Telegraph Co. Remote control system. (3/8/27, United States.)
19 719 Associated Telephone and Telegraph Co. Automatic train control system. (6/10/26, United States.)
19 697 Automatic Telephone Manufacturing Co., Ltd. Telephone systems.
19 689 A. C. Bartlett. Electric discharge apparatus.
19 697 C. E. Beal and W. O. Passmore. Telephone system.
19 614 Benjamin Electric, Ltd. Light reflectors.
19 614 British Celanese, Ltd. Artificial filaments.
19 647 British Thomson-Houston Co., Ltd. Electric oil switches. (6/7/27, France.)
19 656 D. F. Campbell and Electric Furnace Co., Ltd. Electric furnaces.
19 578 Credenda Conduits Co., Ltd. and P. W. Davies. Electric heaters.
19 793 J. A. Dorrat. Electrical heating devices.
19 701 English Electric Co., Ltd and J. C. Wilson. Exhibition of dynamo-electric machines.
19 619 J. W. Patrick. Switch for electric irons.
19 689 General Electric Co., Ltd. Discharge apparatus.
19 058 F. B. Killen. Generators.
19 649 A. Kreidler. Electrical measuring instruments.
19 620 J. R. Laird and G. Pate. Insulators.
19 621 J. R. Laird and G. Pate. Resistance elements for electric fires.
19 636 W. E. Marshall. Inductances.
19 703 Metropolitan-Vickers Electrical Co., Ltd. Electrical heaters.
19 740 J. F. Monnot. Commutator manufacture.
19 702 W. Petri. Accumulator grids.
19 711 H. J. Potterton. Telephone-call recorders.
19 592 R. E. Rooke. Electrolytic rectifiers.
19 679, 19 680 E. W. C. Russell and C. B. Sawyer. Piezo-electric crystals.
19 729 A. E. White and E. G. Godfree. Electrical signalling apparatus.

### July 7th.

19 778 W. K. Alford and Igranic Electric Co., Ltd. Radio apparatus.
19 805, 19 806 Almeida Accumulator, Ltd. Galvanic cells.
19 785 F. P. Best and Radio Communication Co., Ltd. Radio direction finders.
19 802 British Thomson-Houston Co., Ltd. X-ray anodes. (15/7/27, U.S.)
19 804 O. Lucas, W. H. Eggington and Lucas, Ltd. Automobile lamps.
19 766 A. N. Patterson. Sparking plugs.
19 745 W. G. Ramsay. Electric booster for steam locomotives.
19 803 Standard Telephones and Cables, Ltd. and Western Electric Co., Ltd. Electric networks.
19 757 J. G. Stirk. Motor generators.
19 758 J. G. Stirk. Electric switches.
19 759 J. G. Stirk. Electric calendars.
19 742 G. Wilkinson. Electric temperature controllers.

### July 9th.

19 919 L. Adam. Telephone system.
19 967 Akt.-Ges. Brown, Boveri et Cie. Effecting synchronism of motors. (8/7/27, Germany.)
19 888 A. C. Bartlett and M.-O. Valve Co., Ltd. Electric discharge apparatus.
19 887 D. A. Christian, and Siemens Bros. and Co., Ltd. Telephone systems.
19 890 W. M. Cranston. Brush holders for electric machines.
19 944 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Method of precipitating metals.
19 945, 19 946 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
19 889 General Electric Co., Ltd. Manufacture of incandescent lamps.
19 890 General Electric Co., Ltd. Brush holders for electric machines.
19 955 K. S. Mills. Electric motors.
19 910 F. H. Rogers (Skala Research Laboratories, Inc.) Transmission of images to a distance.
19 966 Soc. des Etablissements Aera. Compensating device for magnetic compasses. (12/7/27, France.)
19 934 Telefonaktiebolaget L.M. Ericsson. Excess supply meters. (14/3/28, Sweden.)
19 856 M. Wildermann. Batteries.

### July 10th.

20 078 Akt.-Ges. Brown, Boveri et Cie. Quick acting relays. (21/7/27, Germany.)
20 114 Associated Telephone and Telegraph Co. Telephone systems. (19/10/27, Germany.)
20 059 W. E. Beatty (Bell Telephone Laboratories, Inc.). Signalling systems. (9/6/27.)
20 055 S. Brason, J. Edgar, and J. C. Petersen. Electric meters.
19 984 L. J. Busby. Electric lamp holders.
20 066 Chemieproducte Ges. Process for protecting cables against corroding. (13/7/27, Germany.)
19 972 H. Covill and R. Suffling. Safety device for contact arms of tramway cars, etc.
20 093 Eclairage des Vehicules sur Rail. Means for charging batteries. (10/1/28 France.)
20 097 Elektro-Thermit Ges. Process for welding rails.
20 018 General Electric Co., Ltd., and J. H. Jones. Electric light fittings.
20 014 A. Gow. Electrodes.
20 101 A. G. Jefferies. Wireless receiving sets.
20 069 A. C. Marshall and A. S. Priest. Wireless receiving circuits.
20 026 S. A. Pescatore. Devices for protecting ships, etc., from torpedoes.
20 070 G. D. Powell. Electromagnetic devices.
20 085 C. Pressland. Thermionic valve amplifying apparatus.
20 000 H. C. Sanders and Santon, Ltd. Thermostatic controls.
20 001 H. G. Sanders and Santon, Ltd. Plug and socket devices.
20 068 W. H. Scott. Electric distant control apparatus.
20 058 Soc. de Ateliers de Montage et d'Ebenisterie. Electro-acoustical apparatus. (28/4/28, France.)
20 084 Westinghouse Lamp Co. Electrical rectifiers for a.c. (20/7/27, U.S.)

### July 11th.

20 175 A. U. Alcock. Electrical defrosting of meat.
20 167 H. C. Atkins, and A. Reyrolle and Co., Ltd. Electric protective systems.
20 234 J. L. Baird and Television, Ltd. Television apparatus, etc.
20 225 British-Thomson Houston Co., Ltd., F. J. Lane, and R. D. Parry. Electric protective apparatus.
20 227, 20 228 British Thomson-Houston Co., Ltd. Refrigerators.
20 247 British Thomson-Houston Co., Ltd. Electric switches. (11/7/27, U.S.)
20 133 Brookhirst Switchgear, Ltd., and J. A. Hirst. Circuit breakers.
20 212 A. W. and W. V. Butterfield and Mycromet Manufacturing Co. Plug and socket connections.
20 189 F. C. Clauser (O. Löwy). Dry batteries.
20 214 E. Dutt. Storage batteries.
20 173 General Electric Co., Ltd., A. Sherwin, and H. C. Turner. Thermally-operated electric switches.
20 232 Marconi's Wireless Telegraph Co., Ltd. High-frequency signalling systems. (12/7/27, U.S.)
20 220 National Carbon Co., Inc. Vents for battery cells. (23/7/27, U.S.)
20 138 J. Paterson and J. Shirley. Electrode rod, etc., for welding.
20 205 M. G. Scroggie. Radio apparatus.
20 211 Siemens und Halske Akt.-Ges. Telephone line selecting sets. (22/9/27, Germany.)
20 147 Standard Telephones and Cables, Ltd. and E. P. G. Wright. Telephone systems.
20 233 Telefunken Ges. Für Drahtlose Telegraphie. Manufacture of oscillating crystals. (19/7/27, Germany.)

### July 12th.

20 260 A. Arbuckle. Crystal detector for wireless apparatus.
20 360 Automatic Coil Winder and Electrical Equipment Co., Ltd. Coil winding machines, etc.
20 305 A. F. Bulgin and H. J. B. Chapple. Tuning inductance.
20 292 J. E. Calverley and English Electric Co., Ltd. Electromechanical traction equipments.
20 283 F. R. Carling. Coil actuated loud-speaker.
20 302 P. R. Coursey, and Dubilier Condensers Co. (1925), Ltd. Electrical condensers.
20 272 Electrical Improvements, Ltd., L. C. Grant and G. R. Wilson. Electric heating boilers, etc.
20 327 Electro-Mechanical Brake Co., Ltd., and J. H. Williamson. Trucks for tramway vehicles, etc.
20 301 International General Electric Co., Inc. Electric switches. (12/7/27, Germany.)

## Coming Events.

### Tuesday, August 7th.

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting.

Electrical Contractors Association (Derby Branch.)—Ordinary meeting. 5 *p.m.*

### Wednesday, August 8th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—5, South Street. Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting 5.30 *p.m.*

### Thursday, August 9th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East yorks. Branch).—Metropole Hall, Ordinary meeting. 3.30 *p.m.*

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# THE ELECTRICIAN

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# Current Topics.

## South Shields and the National Register.

A PECULIAR position has arisen at South Shields in connection with a firm of electrical contractors carrying out an assisted wiring scheme under the Corporation. An application by the contractors for membership of the National Register of Electrical Installation Contractors, was declined, and though in June, 1926, South Shields Town Council passed a resolution which restricted the placing of orders to registered contractors, a resolution was passed, on July 7th last, rescinding their former resolution. Whether or not the National Register did right in declining the application of the contractors in question is not our concern at the moment, but the remarks made at the Council meeting referred to above are open to considerable criticism. According to Coun. SCOTT, of the South Shields Electricity Committee, "there ought to be free trade for everyone, and if there was work to be done, every contractor, whether he be large or small, should have an equal opportunity to compete." With these views we entirely agree, subject however, to the work of the competing contractors being up to standard. The National Register has no axe to grind; it is not in any way concerned with "rings" and prices, but is merely an organisation formed of electrical contractors, large and small, which restricts its membership to those contractors who can satisfy an executive committee that their installation work complies with certain safety and technical requirements. That such a standard is necessary in the electrical industry, is shown by the many instances of shoddy wiring, and though we agree that there should be no restriction in placing contracts, the work must be up to a certain standard. It would be interesting to know what the circumstances were which, as stated by the chairman, led to the adoption by the South Shields Town Council of the restrictive resolution, and whether those circumstances still exist. We do not for a moment presume to interfere with the domestic concerns of the Corporation, but the reasons as reported in the local Press, for the rescission of the previous resolution would appear to be inadequate. Coun. SCOTT is also reported to have said that "private enterprise should be encouraged in schemes of this sort, and the Electricity Committee could be quite capable of selecting the most suitable tenders." This is a little involved, but if his meaning is, and it be true, that the Committee are technical experts on proper standards of wiring installation work and the methods employed, then South Shields is to be congratulated and the electrical engineer to be envied for the valuable assistance he must have at hand.

## Electric Motors Valuation.

IN a recent re-assessment of premises under the new Rating and Valuation Act, the chief object of which is the relief of productive machinery from rating, there was some considerable doubt as to whether the Act provided relief for electric motors. This doubt resulted in a varied interpretation of the powers given to rating authorities, some of which bodies declined for the time being to exclude motors from valuation, while others gave relief in this respect. The effect of this attitude has been that some users of electrical power found themselves assessed at a much higher figure than others, with the result that protests were lodged, the view expressed being that where electricity is used for power purposes only the equipment for primary transformation or main transmission should be subject to assessment, and that everything beyond the main switchboards should be exempt. A decision on the point in the Leeds district was postponed from time to time, for the local rating authority, realising the ambiguity of the clause relating to productive machinery, had referred the matter to the town clerk, who, upon taking up the matter with the Central Valuation Committee in London, obtained the opinion that while generating and transforming plant was rateable, relief should be given to electric motors. The position is made clear in a letter from the Leeds and District branch of the Federation of British Industries to the "Yorkshire Post," and, acting upon the opinion given above, the Leeds assessment Committee are now adjusting their assessments accordingly. The measure of relief, of course, is dependent upon the extent of the motor installation, but the total sum involved is believed to be considerable.

## The National Radio Exhibition.

WE publish elsewhere in this issue the latest list of exhibitors who will be showing at the National Radio Exhibition, next September, and from this it will be gathered that the Olympia Show is losing nothing of its popularity so far as the radio trade itself is concerned. The new names, which have been added to the list are not many, for with so young an industry and with the continued support of last years' exhibitors, there cannot be more than a few manufacturers of all-British radio equipment not yet included. The radio manufacturing world seems now to have settled down to a stable industry,

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with most of the pioneers still to the fore. Their designs have changed, their prices have dropped, but the characteristics of their good workmanship still remain to make British-made radio apparatus the most reliable in the world. It will be remembered that last year's show was preceded by the introduction of the screened-grid valve, and the exhibition was all the better for the novelty this valve introduced. This year there has not, so far, been any similar happening of the same outstanding interest, but, since there is yet time to develop a new principle, or else to dispense with some of the old ones, perhaps the exhibition will, after all, reveal something new, apart from manufacturing design and portable receivers.

## A German Hope.

THAT Germany is fully alive to the possibilities of electrical illumination as a means for attracting visitors is revealed by the fact that a report is current to the effect that in October next a determined effort is to be made to out-rival both Paris and Vienna. For one week during each month Berlin is to be bathed in a sea of electric light, even shopkeepers entering into the spirit of the campaign with numerous electric signs and floodlights. It is understood that no fewer than 900 searchlights are to be installed, while most of the prominent public buildings will be floodlighted. The purpose of this illumination campaign will be to attract foreign visitors to Berlin, visitors who hitherto have spent their money in either Paris or Vienna. Whether or not this form of attraction will be sufficiently powerful to bring about the desired effect we do not, at the moment, care to anticipate, but, nevertheless, the idea makes strong appeal, and might easily be put into execution in this country, in much the some way as was done in the case of the Hampstead Garden Suburb celebrations.

## American Telephone Development.

THE latest American statistics show that, although there are five times as many telephones per hundred of the population in the United States compared with Great Britain, saturation point is not yet in sight. The gain in telephone installations has ranged, during the past five years, from 700 000 to 770 000, as compared with an annual gain of about 400 000 in pre-war years. There has, however, been a change in the character of the gain. Private branch exchanges and extension stations have increased considerably, but the increases in main stations have decreased. An impression of the volume of work necessary to handle this business may be gathered from the fact that during 1927 it was necessary to make about 4 000 000 new connections and 3 300 000 disconnections to obtain a net gain of 700 000 installations.

## Electrical Trade Comparisons.

THE year which in the Board of Trade Census of Production is regarded as the post war standard is 1924. A comparison between the import and export trade of the first six months of that year and the trade of the corresponding period of 1928, revalued at the prices ruling in the earlier period, establishes a relation between the volume of our trade with the two half-yearly periods, eliminating the factor of price changes. The comparison also furnishes an index of the aggregate effect of the price changes which have taken place during the last four years. On the basis of declared values, the exports both of domestic manufactures and imported goods were considerably lower in the first half of 1928 than in the corresponding period of 1924, while imports reached a slightly higher level in the later period than in the earlier. If allowance be made for price changes, however, the volume of imports was 13·9 per cent. and the volume of domestic exports was 5·3 per cent. greater in the latest half year than in the corresponding period of 1924. In so far as the electrical industry is concerned, a comparison made between overseas trade of this year and 1924, by estimating, as nearly as available data permit, the value which would be put upon imports and exports if the items had the same average value per unit of quantity as was declared for goods of the same description in 1924, we learn that imports of electrical goods and apparatus have increased from £1 374 in 1924 to £2 089 in 1928, taking £1 000 as the index value, while exports for the same period have improved from £1 292 to £2 009. The advance in the use of electricity is shown in figures obtained from the Electricity Commissioners regarding the electrical energy generated by authorised undertakers, and indicate an increase of over 47 per cent. in four years.

## Factory and Workshops Campaign.

THERE will commence next month and continue through October and November, a special lighting campaign which will apply to factories and workshops. The campaign has been planned by the E.L.M.A. Lighting Service Bureau, and will be conducted by the E.D.A. Special literature and advertisements have been drawn up, and as in past campaigns, the Electric Circles and Area Committees throughout the country will play an important part. It is estimated by the organisers of the campaign that as high a figure as seventy per cent. of the factories of this country are badly and inadequately lighted, and in order to reduce these figures, an extensive advertising campaign and system of postal propaganda have been planned. The various trade associations are supporting the E.D.A. in their work, and everything points to a successful issue. One of the purposes of the campaign, fuller details of which will be found elsewhere in this issue, is to create a bigger market for lamps and fittings and general installation work, to say nothing of increasing the consumption of electricity. Our only criticism is that though the launching of this campaign was known to a few some weeks ago, it has only just been given general publicity, in that the explanatory booklets dealing with the campaign, have only a month before the start been circularised throughout the electrical trade. We appreciate that the work involved in these matters is of no small dimensions, but with the experience which the E.D.A. has now acquired in the launching of campaigns, surely the preliminary details of this their latest effort could have reached the trade before now.

## Lighting in Factories.

IF there are any amongst our readers who have not yet appreciated the vast amount of business that can be obtained through this somewhat specialised Campaign, we recommend them to study that portion of the Factory Inspector's Report which deals with lighting. They will see that tests at many factories and workshops gave light measurements of less than 3 foot-candles, while an intensity of 20 foot-candles was considered to be highly gratifying in the few isolated cases in which it was found. It is obvious, therefore, that the field for improving factory illumination is as yet practically untouched. Some interesting examples of increased efficiency due to improved lighting are given in the Report, and, while the lessons which such instances afford are of considerable value, it should be borne in mind that the greatest improvements in efficiency come from increases far beyond the range of those referred to. In some cases an increase from 1 to 3 foot-candles may seem to have achieved a lot, but when the change is from 1 to 20 foot-candles there can be no possible doubt as to the increased efficiency that has been so simply attained. Furthermore, it has been definitely established that the cost of increased illumination of the right kind is but a fraction of the amount that is saved in the way of greater output and reduction in the spoilage of material. In addition to this strongest of all recommendations, there is a fairly widespread and growing predisposition in favour of better lighting in industrial establishments. Many of its advantages are already known to the factory owners. What they do not know is how to get good lighting and how to know whether they have got it or not. It is for the electrical industry to help them to achieve these desirable aims.

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# THE NUMBERING OF ARMATURE WINDINGS.

## Method Best Adapted to Slotted Windings—Confusion in Terminology—Relating Coil Pitch to Back Pitch—Demonstration of System.

By R. D. ARCHIBALD, D.Sc., M.I.E.E.

IN the evolution of the theory of armature winding two methods of treating the subject have been developed, depending on whether a numbered element is (1) a coil side, (2) a complete coil. The first method can be referred to as the classical one, as it was developed in the early days of smooth core drum winding, and a large amount of the literature on armature winding in slotted cores depends on this method alone.

In the smooth core drum the coil sides were numbered in sequence round the periphery of the armature, and rules were formulated for lap and wave windings involving the familiar signs $y_b$, $y_f$, $y_{av}$, signifying back, front, and average pitch, respectively, measured in number of coil sides. The theory developed on these lines, though somewhat elaborate, has served its purpose, and is still adopted in some textbooks of recent origin. Nevertheless, the second method is better adapted to slotted windings, and will probably replace the other in due course.

In the second method a number is given to the upper side of a coil in a slot, the other side, which is a lower side in some other slot, having either the same number accented or no number. The coil span in slots determines the relative positions of an upper and lower side of the same coil, and the winding rules do not include this, but are founded on the commutator pitch or distance round the commutator, measured in segments, between the ends of a coil. It is this distance which determines the type of winding employed.

This method is easier to follow than the older one, but as the latter is employed in many excellent textbooks it is essential to be familiar with it and the difficulties which it

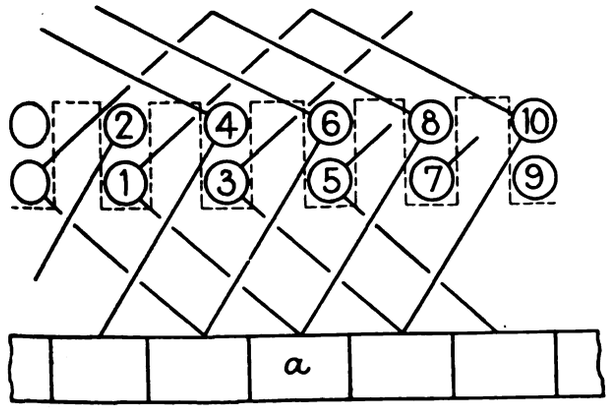


Fig. 1.

may involve. Unfortunately these are rendered much greater by the confusion in terminology which exists at the present time. To take a few examples, the term "coil pitch" in some textbooks stands for the distance measured in slots between the sides of a coil, whereas in others it may mean the distance between the corresponding sides of two coils joined to the same segment. The terms are very confusing in the subject of multiplex windings; thus, an armature with two separate windings joined to alternate segments of one commutator, and usually symbolised by o o may be termed "duplex, singly re-entrant," "simplex, doubly re-entrant," "duplex, doubly closed," "double simplex," "double, singly re-entrant," and so on. Fortunately most authors are careful to define the terms they use, but there is a tendency in some cases for them to avoid the issue by introducing an "author's nomenclature." This is to be very much deprecated unless some consensus of opinion exists on the desirability of new terms in lieu of standardisation of the old.

For the purpose of this article "coil pitch" will mean the distance measured in slot pitches between the sides of a coil and is numerically the same as the number of teeth included by the coil.

In the numbering of the coil sides of slotted armatures by the classical method it is apparent that many authors have not considered it necessary to show any relationship between the back pitch of a coil measured in coil sides and the coil pitch. In certain cases where the importance of this relationship has been realised, an expression has been given which is of no value for lack of a proper system of numbering. In many books a rule for numbering is given which stipulates that the upper coil sides in a slot shall be given odd numbers and the lower ones even numbers, or vice versa. Such a rule is sufficient for the theory of wave and lap windings but cannot be used as it stands for relating coil pitch to back pitch.

For example, if we number the coil sides as in Fig. 1, which shows a portion of a lap winding, a back connection joining

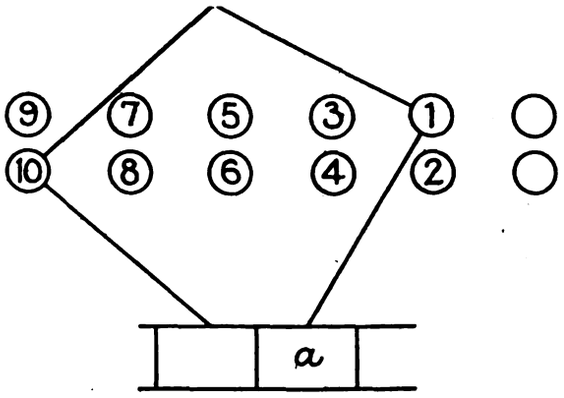


Fig. 2.

coil side 1 to coil side 10 will have a pitch of 4 slots and 9 coil sides, whereas if it joined 2 to 9 it would have the same pitch in slots, but only a pitch of 7 coil sides. This difficulty can only be overcome by adapting the system of numbering to the direction taken by the back connection from a coil side, and a rule for this purpose has been given by C. C. Hawkins in "The Dynamo," Vol. 1.

The rule may be stated as follows:—Let the windings be followed out, commencing from any segment, *a*, Fig 1. Two connectors proceed from the segment to the winding, one to a top coil side and the other to a bottom coil side. If the latter be traced out the bottom coil side is labelled number 1 and the coil side immediately above it is labelled number 2, as in Fig. 1. The numbering is then continued round the armature in the direction taken by the back connection from number 1, in this case from left to right. It will be seen that the outer coil sides have even numbers. If the winding had been traced out via the other connection from *a*, then the side numbered 8 in Fig. 1 would have been numbered 1, and the side immediately below it, or number 7, would have been labelled 2, and the numbering would then have been from right to left as shown in Fig. 2, for the back connection from number 8 in Fig. 1 proceeds leftwards. In this case the outer coil sides have odd numbers.

In both cases, however, the slot pitch is 4 and the back pitch 9. The same rule for numbering must be applied if the back connection joined the sides 2 and 9 and the proper numbering for the two directions of tracing out the winding can be be seen by reflecting Figs. 1 and 2 in a mirror.

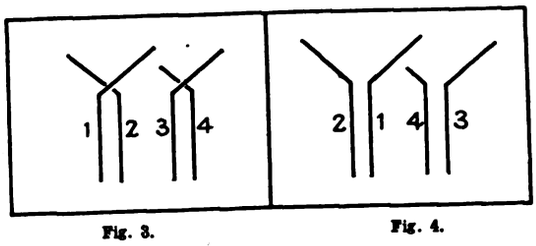


Fig. 3.




Fig. 4.

When this method of numbering is employed the coil pitch in slots and the back pitch in coil sides are related in the following manner:—

$$\text{Coil pitch} = \frac{1}{c}(y_b - 1)$$

where $c$ = number of coil sides per slot and $y_b$ is the back pitch in coil sides. It is then possible to work out a winding by the

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older method and obtain the " throw " of the coil in slots. Although the front pitch $y_f$ appears also to have some relation to the slot pitch this is only the case when $c$ is 2. When $c$ is more than 2 the slot pitch of $y_f$ may vary.

Many winding diagrams show the coil sides on the flat in place of the end-on position. In such diagrams it is necessary to make coil sides, which are in the same slots, appear overlapping, as shown in Fig. 3, in order to obtain consecutive numbering when the rule is applied.

If this is not done the numbering comes out as in Fig. 4, and although the ordinary winding rules for lap and wave winding would apply if Fig. 4 were numbered consecutively, a different rule for numbering would have to be given and different formulæ used for connecting back pitch with coil pitch.

# BOOK REVIEWS.

**The Cable and Wireless Communications of the World.** By F. J. Brown. London: Sir Isaac Pitman and Sons. Pp. ix+148. 7s. 6d. net.

The main object of this book, as explained in the preface, is to give a brief and—to a certain extent—popular description of the principal methods of long distance communication in use at the present time, special reference being made to the history and development of the submarine cable.

Chapter I contains a short historical and geographical summary of the submarine cable since its birth in 1850, and in Chapter II the various cable routes, divided into five systems (geographically) are dealt with in more detail. In Chapters III, IV and V, a description in simple language is given of the manufacture and laying of cables, the maintenance and life of cables, and the technique of cable communication. These three chapters contain some excellent photographic illustrations, and are entirely without the mathematical formulæ and technical terms—familiar only to experts—which are usually found in the text books dealing with this subject.

Chapter VI, on Cable Finance, gives some useful information in less than ten pages, on capital costs, maintenance costs, and traffic charges.

In Chapter VII, which is entitled " The New Type of Cable and Its Problems," a clear but simple description is given of the loaded cable and its uses. We would here suggest that some such word as " loaded " or " inductive " be substituted for the word " new " in the title to this chapter, as it is obvious that the latter word automatically becomes inapplicable with lapse of time.

Chapter VIII discusses the relations between cables and wireless from the business and non-technical point of view, while Chapter IX refers to " Latest Developments of Wireless " (in our opinion, the substitution of " Later " for "Latest" would have been preferable for the reason given above) and is largely financial.

In Chapter X a comparison is made between the working of communication systems when under State control and when under private control; further financial details are given with respect to various kinds of service in Chapter XI. Chapter XII (the last) consists of some general remarks on broadcasting.

This book should be extremely useful for purposes of reference to those interested in long distance telegraphic communication, and at its moderate price should command a wide distribution.

P. G. Ledger.

**Electric Heating.** By E. A. Wilcox. (London: McGraw Hill Publishing Co.) Pp. viii+469. 25s. net.

There is much of interest in this book to readers in this country, but it is primarily intended for American readers, and, naturally, is founded on practice and standards prevailing in that country.

Conduit, wire and cable tables, for instance, are based on the U.S.B.S. and (U.S.) National Electric Code, 1925, with B. and S. gauge wires. Working examples in the text apply these American standards and serve admirably to illustrate the application of the various formulæ employed; but it would be a somewhat tedious operation (though profitable to the student to impress the practical application of the formulæ on his mind) to use conversion factors for practical application with our I.E.E. rules and Imperial Standard wire gauges.

Again, tables of heat losses through walls, are given for American forms of construction with brickwork 4, 8, 12 and 16 in. thick, as against the 4½, 9, 14 and 18 in. brickwork used in this country. The difference is quite appreciable, and it would not be safe to apply these American factors to English practice. Fortunately, the (British) Institute of Heating and Ventilating Engineers have already set up a standard of co-efficients applicable to conditions and temperature ranges in this country.

The American gallon weighing 8·33 lb. is likewise used throughout, so that quantitative water tables and examples would need converting to the Imperial gallon of 10 lb. in order to avoid confusion in the mind of the English reader.

The early chapters, deal, after the manner of, but necessarily more cursorily than text books on physics, with fundamental formulæ and the properties of heating and electricity. The succeeding three chapters cover the suggestions for cooking, water heating, and warming of buildings, while the remaining sixteen chapters treat of ovens, furnace heaters, metal melting and miscellaneous furnaces, arc and resistance welding, metal heaters, temperature measurement and control, thermal insulation and the like.

The book is well written in a masterly and lucid manner, but suffers in attempting to cover so wide a range of subjects within the confines of one volume. The result is analogous to the impressions of the conducted tourist who " did " Europe in ten days, *i.e.*, the obvious is stressed, and space cannot be afforded, to those practical details which mean so much. While full definitions are given of the theory of transmission of heat by radiation, conduction and convection, paragraph 207 (dealing with convection heaters), for instance, informs us that " a convection heater differs radically from a radiant heater."

Again, panel heating—the practical application of which is making such strides in this Continent and which even now is engaging the serious attention of American engineers—is dismissed in eight lines which inform us that " panel heaters consist of self-contained heating units for wall or ceiling mounting, they are covered with mouldings to harmonise with their surroundings and designed for operating at temperatures seldom exceeding 180 deg. F. [*sic*]. Similar heaters have been installed as baseboards in office buildings in this country. Either panel or baseboard heaters naturally afford uniform heat distribution."

Many instances of such platitudes could be cited and the space would better be occupied with practical information. Nevertheless, the book should prove a refreshing reminder to those already conversant with the subject, though the majority of such readers will doubtless have their notebooks, or will know where to put their hands on textbooks and catalogues for the necessary information.

C. Geo. Nobbs, M.I.E.E., M.I.H.V.E.

## BOOKS RECEIVED.

" Studies in Magnets and Magnetism." By R. Wild. (London: A. H. Stockwell, Ltd.) Pp. 70. 2s. 6d. net.

" Electric Heating." By Edgar A. Wilcox. (London: McGraw Hill Publishing Co.) Pp. viii+469. 25s. net.

" Automobile and Radio Batteries." By H. H. U. Cross. (London: Crosby Lockwood and Son.) Pp. vii+128.

" The Tube-Bus Guide to London." By Dr. J. C. Willis. (Cambridge: W. Heffer and Sons.) Pp. vi+170. 6d. net.

" Los Majistrales de Fuerza Electromotriz." By A. E. Salazar. (University Press: Santiago de Chile.) Pp. xiv+133.

" Code for Electricity Meters." 3rd Edition. (New York National Electric Light Association.) Pp. vii+122.

" Alternating Current Power Measurement." By G. F. Tagg. (London: Sir Isaac Pitman and Sons.) Pp. viii+65. 3s. 6d. net.

" Telephone and Power Transmission." By R. Bradfield and W. J. John. (London: Chapman and Hall.) Pp. xi+238. 21s. net.

" List of Members of the Institution of Civil Engineers." Addresses corrected to July 4th, 1928. (Westminster: Institution of Civil Engineers.)

" The Design, Construction and Maintenance of Docks, Wharves and Piers." By F. M. Du-Plat-Taylor. (London: Ernest Benn, Ltd.) Pp. xxv+495. 70s. net.

" An Account of the Principles of Measurement and Calculation." By Norman Robert Campbell. (London: Longmans, Green and Co.) Pp. ix+293. 12s. 6d. net.

" Excavating Machinery, as represented by Power Shovels, Drag Lines and Grabbing Cranes." By W. Barnes. (London: Ernest Benn, Ltd.) Pp. xvi+247. 42s. net.

" Foundations, Methods and Appliances." By W. Simpson. The Glasgow Text Books of Civil Engineering. Edited by G. Moncur. (London: Constable and Co.) Pp. xviii+256. 18s. net.

" Science Abstracts." Secs. A and B. Vol. 31, Part 7, No. 367. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s.: annual subscription, 30s., or 50s. for both sections.

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# WIRELESS MARKETS OF THE WORLD.

## The British Radio Position in Relation to Other Chief Exporting Countries—Effects of Competition in the Home Market—Steady Future Development Indicated—Further Export Effort Desirable—Some Conclusions.

[COMMUNICATED.]

CONSIDERED as a branch of the electrical trade, the wireless industry is already making a very favourable showing compared with many other classes of electrical goods in which the trade is of much longer standing, and superficially considered there are grounds for satisfaction that an industry which is hardly more than five years old should each year be responsible for increasing the electrical exports by more than one million pounds. A more careful examination of the relative position, however, is calculated to modify the first feeling of satisfaction, as Great Britain is only third in the struggle for export markets, and is almost alone in showing a decrease in exports.

### The Principal Suppliers.

As wireless material now forms a separate classification in the official returns of all the principal manufacturing countries, it is possible to attempt a rough estimate of the value of the world's wireless requirements which are supplied from outside sources. In 1926, this trade was mainly supplied by about seven countries, and Table No. 1 gives the total wireless exports of the principal countries for this year. A graphic indication of the relative position of the exporting countries is given in Fig. 1.

TABLE I.—WIRELESS EXPORTS OF PRINCIPAL COUNTRIES FOR 1926.

| Country. | Wireless Exports. £ | Percentage of Total. | Increase or Decrease in 1927. |
|---|---|---|---|
| United States .. | 1 813 000 | 30 | + |
| Germany .. .. | 1 582 000 | 26 | + |
| Great Britain .. | 1 266 000 | 21 | — |
| France .. .. | 845 000 | 14 | — |
| Netherlands .. | 276 000 | 4·6 | + |
| Austria .. .. | 154 000 | 2·6 | + |
| Sweden .. .. | 103 000 | 1·7 | + |
| Denmark .. .. | 7 000 | 0·1 | + |
| Total .. | £6 046 000 | 100·0 | |

The American system of classification for wireless is the most informative of all, as it is divided under six main headings. In the year under review, receiving sets formed 33 per cent. of the total, accessories 28 per cent., components 23 per cent., valves 10 per cent., and transmitting sets 6 per cent. The main markets were, Canada taking 33 per cent., Australia 15 per cent., and Japan 8 per cent.

The German markets are mainly in Europe, Great Britain having been by far the largest buyer each year since the trade started.

British wireless exports are not classified in such detail as the American, and it is only possible to state that valves accounted for 13 per cent. of the total. As far as destinations were concerned, British overseas countries took about 44 per cent. of the total, though it is significant that both the amount and the proportion of American shipments to these markets was greater than our own. Our own trade with Australia was about 23 per cent. of the total, with Japan 10 per cent., and with the Netherlands 5 per cent.

Compared with Germany and the United States, the British wireless position is not too satisfactory, as this country alone amongst the main producing countries of the world has each year an undue proportion of imports. Considering the productive capacity of British manufacturing plant, the imports of wireless apparatus and material can only be described as extraordinarily excessive. In 1924 they actually exceeded the exports, and even in 1925 they were still approximately half the latter.

Every year since the inception of the wireless trade, Great Britain has continued to be the largest buyer of German wireless goods; taking an average over the same period, this country has also been the chief importer of Dutch material; and in the case of France, there are only two other countries who exceed our own purchases in that market. Thanks to the tariff and the strength of the home manufacturing industry, neither the United States nor Germany have the competition in the domestic market that is experienced by British manufacturers.

Apart from the three principal producing countries, it will be noticed from the foregoing table that other competitors are now securing what must be considered as a very considerable share of the world's total trade. The strength of the French position is shown by the fact that in the year under review the exports of wireless material were about twenty times the amount of the imports. The main destinations

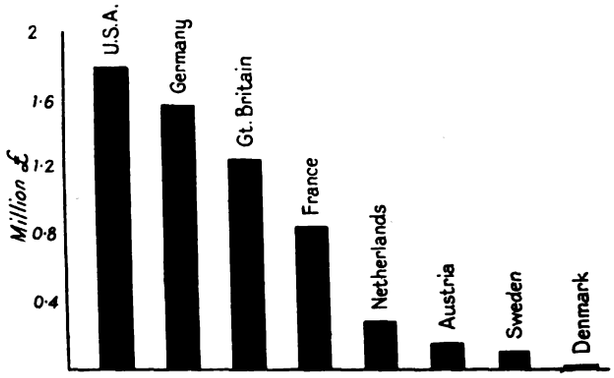


**Fig. 1.—A graphic illustration of the comparative positions of the principal exporters of radio apparatus and material.**

were, Luxemburg taking about 23 per cent., Spain 13 per cent., and Great Britain 10 per cent. of the total.

The main contribution to the wireless requirements of the world made by the Netherlands is, of course, the very important valve trade that is being developed energetically in all the main markets, including competitive countries such as Great Britain, Germany, and France. The steady growth of Dutch wireless exports from £33 000 in 1924 to £72 000 in 1925, and £276 000 in 1926 has been at a much greater rate than the imports. In 1924, imports were three times the exports, in 1925, about two and a half times, but in 1926 export and import figures drew to about the same level. During 1926, France took an exceptionally large proportion, amounting to about 35 per cent. of the whole, Great Britain following with 22 per cent., and Germany with 12 per cent., but these figures are hardly a fair picture of the general position, as during the previous two years Great Britain was by the far the largest importer of Dutch wireless material.

The Austrian wireless exports in 1926 were about double the figure for the previous year. The position of this country is now mainly that of exporter, exports in 1926 having been four times as great as the imports, the chief countries of destination being Germany, which absorbed approximately 21 per cent., Czecho-Slovakia 18 per cent., and Great Britain 11 per cent.

### General Conclusions.

It is unsafe to draw any positive conclusions from the figures available respecting a trade of such recent establishment. It is evident, however, that the total world demand for wireless is bound to increase very considerably with the extension of broadcasting activities in all countries, and the improvement of the service in those countries where it has only so far been established upon an indifferent basis, but the opportunities for trade afforded by this steady growth may to a considerable extent be offset by the concurrent growth in the exports of some of the smaller manufacturing countries, more especially those indicated in Table 1. Italy, for instance, has not yet developed any considerable export surplus, but will undoubtedly do so before very long, and there are other countries which, to a smaller extent, may be expected to expand in the same direction.

In any case, an examination of the position, with Great Britain an indifferent third in the struggle for leadership indicates a position which is far from satisfactory, and shows that much greater effort is needed on the part of the wireless industry in export markets generally.

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# THE FACTORIES REPORT.

## Increased Interest in Industrial Lighting but Standard Still Low—Electrical Accidents Fewer than Fifteen Years Ago—Undue Reliance on Insulating Tape—Dangerous Hand Lamps and Radiators.

IN the annual report of H.M. Chief Inspector of Factories and Workshops for the year 1927 (Cmd. 3 144 : H.M. Stationery Office, 2s. 6d. net), it is pointed out that the number of registered factories has risen from 145 411 to 147 501, while the number of registered workshops has dropped from 121 861 to 117 066, this relative change being typical of a movement which has been going on for many years.

Reports on activity and developments show that in the Southern Division there has been development in electric cable making. From Hull is reported a new process for preserving duralumin parts of aeroplanes by a new electro-metallurgical process, while in the Sheffield area there is a greater demand for steel to take the place of wood in telegraph and power transmission poles. The tendency for industry to develop in and around London and in the South-East of England generally, to which attention was drawn last year, continues.

One of the Electrical Inspectors, Mr. A. L. Sackley, retired during the year on conclusion of his temporary appointment. Mr. K. Preston was appointed Electrical Inspector in February last.

### Machinery Reduces Lead Poisoning.

The chapter on " Dangerous Trades," in dealing with electric accumulator works, states that a number of important works have been remodelled and enlarged, but the structural alterations have involved a good deal of dislocation, and conditions have not always been satisfactory while the work of reconstruction has been in progress.

Mr. Beard (South Birmingham) writes of one very large works :—

> Three-quarters of the cases of poisoning are due to the movement and handling of pasted plates. During the extensions and reorganisation, which have been going on for some time, the flow of work was checked at times, and the stock of pasted plates in transit greatly increased ; this has now ceased and arrangements are in train for a system of mechanical handling which should be of the greatest value in reducing the risk of poisoning. In lug milling this is already partially in operation ; one automatic machine now completes three processes, saves more than two-thirds of the handling, and removes loose dust at the delivery end.

Neglect of minor sources of lead dust often involves danger ; Miss Dunch (North London) forwards the following note :—

> Much attention has been given to the method of dealing with the cloths used by the pasters, as the drying of them appeared to be a cause for accumulation of dust. Paper has now been successfully substituted for the cloths, and it is hoped that this will remove what appeared to be a danger.

One of the most interesting portions of the Report is that dealing with lighting, as it furnishes some useful information as to the possibilities of the forthcoming Factory Lighting Campaign. It records increasing interest in industrial lighting, but generally the standard of illumination is below 3 foot-candles. In some textile processes, readings showed over 20 foot-candles, a standard which was also reached in certain boot and shoe factories. In the engineering trade, however, the standard was low, and of 124 readings taken, 25 were below 3 foot-candles.

The report of the Senior Medical Inspector in dealing with lead poisoning in electric accumulator works says that 58 cases were notified, an increase of six over last year. Twenty-four of these cases, as compared with 14 last year, occurred in work involving exposure to dust from pasted plates, in such occupations as trimming, trucking, and packing, where it is difficult, and in some cases impossible, to control the dust effectively. With the exception of lead burning, which accounted for six cases, as compared with three last year, and casting, with two cases as against six last year, the incidence in other processes remains much the same. One large works have appointed a whole time works doctor. This appointment, following as it does on the establishment of a dental clinic at these works, is clear evidence of the anxiety on the part of the firm to safeguard the health of their workers.

In the Report of the Senior Electrical Inspector, Mr. G. Scott Ram, the number of reportable accidents notified during the year is given as 372, including 27 fatal cases, as against 338 and 17 for the previous year. The increase, he points out, is more apparent than real, being attributable to the figures for 1926 having been abnormally low, on account of slackness due to the coal stoppage. This is indicated by a comparison with the figures for the years 1925 and 1924, 414 with 24 fatal cases, and 433 with 27 fatal cases, respectively. Twenty-three further accidents were investigated, but proved to be non-reportable. Six of these were fatal, but they are not included in the table.

Mr. Ram thinks it is directly due to the influence of the Regulations, combined with inspection, that the number of accidents is actually less than it was 15 years ago, although during that period the generation and use of electrical energy has increased many times over.

Twenty-eight of the accidents occurred on high tension systems, 22 of them being at stations of public supply or traction undertakings. Only four of these were fatal, the disabling injuries in the other cases being chiefly from burns. Most of these accidents occurred to persons carrying out work other than routine operation at switchboards. In the case of seven of the accidents the injured person was knowingly and deliberately taking a risk in working on high tension switchgear close to unprotected live conductors. In seven cases the accident was due to a mistake on the part of the worker or the foreman in thinking that the conductors were dead when they were not.

In one case, a man actually put a spanner on to a live nut at 11 000 V without being killed, although he was badly burned. Another man about to do some work on a switchboard took hold of a 20 000 V conductor, but although severely burned, he recovered from the shock.

In three cases, shocks were received from conductors through a number of layers of so-called high tension insulating tape. Previous reports have referred to fatal accidents through persons relying upon the efficacy of such tapings, and it is pointed out that although tests may show that a single layer of the tape, when new, may resist puncture at several thousand volts, accidents have proved that even a number of layers cannot be relied upon for safety after being wound on the conductor, possibly owing to mechanical strain or the inclusion of moisture.

Three accidents occurred in the course of ordinary operation of switchgear.

In the case of 21 of the fatal accidents the voltage of the shock did not exceed low pressure. Although in ten of the cases the system was three-phase four-wire with earthed neutral, the pressure between phases being from 400 V to 440 V, the shock was received from one conductor to earth, and not between phases. In many of them the circuit in question only comprised one phase and the neutral.

Portable hand lamps again accounted for several fatalities. In one case the lamp was of a type condemned annually in these reports for over 20 years, consisting of a brass fitting directly in connection with the lamp holder. In two cases an ordinary unearthed metal lamp holder on a flexible wire was being used for the purpose of a portable lamp. Fatalities through the use of lamp holders in this way occur with regularity every year. Few persons appear to appreciate the risk which they run in using this handy and easily rigged up device.

### Lamp Holders of Insulating Material.

Three other fatalities were due to live lamp holders. In one case in a tannery, where the floor was always wet, insulated type lamp holders had quite properly been provided, but the engineer, finding that lamps had been stolen from the holders, had removed the protecting insulating skirts in order to attach a lamp lock in the form of a brass ring to the brass barrel of each lamp holder so as to prevent the removal of the lamp. A lamp holder had become live through leakage, and a man going to shift the position of the lamp received a fatal shock.

Advocating the general adoption of lamp holders made entirely of insulating material in respect of the external parts as going far towards eliminating lamp holder fatalities, Mr. Ram points out that such lamp holders have been available for a number of years and are widely used on factory premises for lamps on flexible pendants, as the trouble and cost of

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running a three-wire flexible for earthing a metal holder is thereby obviated.

Two fatalities occurred in the use of unearthed portable electric drills and another in the use of an unearthed portable saw-bench. Another electric tool (chisel) fatality which was investigated emphasised the necessity for the use of properly constructed connector plugs. The one in use was of foreign manufacture and made only intermittent contact. The user, a stonemason, thinking the tool was at fault, started to dismantle it without first switching off, and received a fatal shock.

Another fatality where an electric drill was being used was due to the use of unsuitable connections, consisting of ordinary household flexible joined up by means of an adaptor and part of a lamp holder having live terminals and bare ends of the flexible exposed, and on which the man holding the drill stepped.

A double fatality which occurred in the construction of a new dock was investigated. A steam crane and grab used in loading trucks had a lighting fitting attached to the jib, the wiring passing through tubing attached thereto. The insulation became worn at the mouth of the tube, with the result that the whole crane became alive. Two men handling the grab received severe shocks and a third man who went to the rescue of one of them also received a shock, and together with the man he went to rescue was killed. Four fatalities occurred to persons coming into contact with the trolley wires of travelling cranes.

The danger of working on overhead lines, some of which may be live, was illustrated in the case of two fatalities which were investigated. In one case a new line was being erected on cross arms 18 in. below bare conductors carrying a 400/230 V circuit. One of the men took hold of a live wire and fell 30 ft., breaking his skull. In the other case, the work was being carried out on the actual live conductors, service wires being connected up to the live distributors, 220 V. and neutral. The jointer was secured in position by a strap round his body and the pole. He received a shock and was held rigidly for at least five minutes before the current could be cut off.

Another fatality was of interest in showing how an extremely brief contact may have fatal results. A man in an ironworks was raising an iron rake with which he touched a bare place in an otherwise insulated overhead conductor carrying 230 V alternating; the contact could have been only momentary.

Of the non-fatal low pressure accidents, 30 occurred in the renewing of fuses, 41 at motor control panels, 37 in the use of portable apparatus, 54 with connector plugs and flexibles, 22 in the testing of electrical plant.

## Outdoor Sub-Station Design.

Referring to outdoor sub-station design, the Report points out that some of the early examples appear to have been designed regardless of the safety of the attendants, precautions, adopted as a matter of course in the case of sub-stations in buildings, being ignored, whereas even greater care is necessary by reason of the fact that the plant, being out of doors, may have to be operated in wet and stormy weather. In some cases high tension fuses have been placed too close to the air-break switches by which they are controlled, so that the attendant in renewing a fuse may inadvertently touch the live contacts of the switch.

Owing to the greatly increased power in generating stations, and to the linking up of stations, some of the existing switchgear in sub-stations is proving to be inadequate under fault conditions, especially when near to the generating stations. Explosions of switches are liable to occur.

For the less densely populated areas transforming stations of the kiosk or pillar type are becoming more common. The essential difference between these and the sub-stations proper is that the enclosure, usually of iron, is filled up with apparatus which is operated from outside. In order to operate the switchgear an outer door has to be opened. As in bad weather, the attendant has to stand on wet ground, and moreover may have to work in the dark, it is obvious that protection of live metal when the outer door is opened is even more necessary for safety than in the case of sub-stations operated from within. In both cases high pressure conductors should be completely screened, but whereas in the case of sub-stations in buildings, it is permissible to have open type low-pressure and medium-pressure switchboards, where the operating platform is dry and insulating, such open type gear is dangerous in the case of kiosks operated from outside. Whilst some kiosk type transformer stations are well and safely designed, others have been found where even the high tension conductors are exposed quite unscreened when the door is opened for access to the switchgear.

In the case of small local supplies taken from a high tension system, the cost of an oil circuit-breaker is a serious item and alternative devices less costly, such as ironclad oil-immersed switch-fuses, are under trial. Mr. Swann reports that a number in use in his area appear to be reliable and to give satisfaction, whereas Mr. McColgan (Northern Area) reports a case of one used to tap a supply from a 20 000 V trunk main which failed to clear the heavy kVA on a fault, the apparatus being completely destroyed. Mr. McColgan points out that it is not always realised that the sizes of switchgear and fuses required for controlling a circuit should not be governed merely by the current which the circuit normally takes, but by the heavy kVA which may flow into a fault from the system to which it is connected. This rule applies to low pressure as well as to high pressure gear, the worst conditions being close to, or within the power stations. In one large power station in his area cut-outs of 100 A type are used as the minimum size, with, of course, appropriate size of fuses, on auxiliary power circuits even where the normal load does not exceed 5 A.

## Fuse Replacements by Electricians.

He also refers to the not uncommon practice of allowing non-technical persons to renew fuses or adjust circuit-breakers of motors for lifting machinery. He points out that such adjustments should be carried out by an electrician or other competent person and not left to the crane-man, who may not realise the danger involved by inserting a larger fuse in a motor circuit or altering the overload or time lag setting of a circuit-breaker, and he refers to a mechanical accident so brought about. A travelling electric jib crane was unloading a barge at a dock when the crane hook caught under the coaming of the barge. As the motor kept on winding without the circuit-breaker tripping, the crane was pulled into the dock.

Mr. Brown (Midland Area) refers to the large increase in the output and plant capacity of the power stations in his area, and mentions that several cotton and woollen mills have changed over to electric drive. In two cases generating stations have been constructed. The disadvantage of this method, if provision against breakdown is to be ensured, is that spare plant must be provided at considerable cost, or a stand-by supply from a power supply authority, is needed. In cases where steam is required in the factory process, as in a beet sugar works which he describes, and the exhaust steam can be utilised for the purpose, a generating station on the premises may be fully justified, but he also cites an example where a large paper mill has recently shut down its own station and has effected a considerable saving by taking current from the mains, as the process did not require the whole of the exhaust steam from the turbine.

Mr. Swann (Eastern Area), in describing new generating stations for public supply, refers to a novel feature in one of them, where the turbine plant and the boilers are all in the same room without any wall or division between. This departure from the usual practice indicates the advances which are taking place in methods of boiler firing and the handling of coal and ashes whereby a boiler house need no longer be the seat of uncontrolled dirt and dust. In the case in question powdered fuel is used.

Mr. Swann's area contains many works where special processes, involving the use of high electrical pressures, are carried on, and which require much detailed consideration in order to safeguard the workers, whilst at the same time not putting unnecessary obstacles in the way of manufacture.

Mr. Preston, who took up his duties in the Western Area in May, remarks, in reference to sub-stations, that in many fitted with excellent high tension switchgear of the draw-out truck type, the arrangement is rendered unsatisfactory by the inclusion of other panels of the cubicle type equipped with instrument transformers and fuses which it is impossible to isolate safely, necessitating at times the complete shutting down of the sub-station or the running of serious risks by the attendants. Amongst defects in factory installations he refers particularly to the failure to provide means for isolating the starting apparatus of motors, the use of unsuitable switchgear and inefficient methods of earthing.

Eight prosecutions for breaches of the Electricity Regulations were taken during the year. Convictions were obtained in six cases, fines varying from 10s. to £50, with costs, were obtained. Two cases were dismissed under the First Offenders Act on payment of costs.

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# DESIGNS COMPETITION.

## Industrial Designs of Electrical Interest.

THE public exhibition of works sent in for this year's Competition of Industrial Designs organised by the Royal Society of Arts is being held in the Exhibition Pavilion of the Imperial Institute, London, S.W., until September 1st, weekdays 10 a.m. to 5 p.m. (Sundays 2.30 p.m. to 6 p.m.).

The designs entered for the competition were judged last month, and it is interesting to note that the "Cabinet Maker," published by Benn Brothers, Ltd., offered a prize for a design for a cabinet for a wireless receiving set, under sub-section 5.

The awards were as follows :—

A Prize of £5 5s. to William F. Payne, Bath School of Art. (No. 1036.)

Highly Commended :—

William F. Payne, Bath School of Art. (No. 1038.)

The judges' comment was to the effect that in this sub-section a number of designs were submitted, some of them frankly disguises and others unhappy mixtures. The problem of designing a wireless cabinet had not been approached with the clarity of intention which would have made it possible to incorporate the apparatus in the design in an agreeable manner, and the feeling of the necessity for disguise predominated. The prize-winning design by Mr. William F. Payne, was the nearest approach to a new piece of furniture, new in intention as well as in form ; and another design by the same competitor was highly commended also, for it showed a grasp of the fundamental problem presented.

Another prize offered under this sub-section was that by W. T. Henley's Telegraph Works Co., Ltd., for a design for a show card advertising the Henley wiring system. In this case the judges were unable to recommend that the full prize of £25 should be given, but a prize of £10 was awarded to Percy Bamberger, "Broadway," Chapel Lane, Frodsham, Cheshire. (No. 159.)

This competition attracted only eight entries, not one of which fulfilled the requirements of the competition. None of the designs would make a showcard suitable to "Advertise the Henley Wiring System." In most cases the entrants had a wrong idea of what was wanted, and submitted designs which had no reference to the electric wiring of buildings. Telephones, telegraph wires and switches were introduced. The subject was probably a difficult one, and in a future competition the donors will give an outline of the requirements for a showcard for the subject. Mr. Bamberger's design came nearest to the object to be secured.

Photographs of Mr. Payne's designs are given on page 158.

# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Rating and Valuation (Apportionment) Bill, 1928.

[TO THE EDITOR.]

SIR,—The above Bill, which passed Third Reading in the House of Lords on August 1st, places yet another difficulty in the way of those whose business it is to develop the public supply of electricity in this country.

The relief obtainable, when the provisions of the Bill come into operation, undoubtedly will prove of benefit to a variety of industries, some of which at the present time are prosperous, while others are suffering acute depression.

Although there was considerable criticism of the Government's policy which culminated in the passing of the Electricity (Supply) Act 1926, those engaged in the electricity supply industry rightly decided to do all in their power loyally to support the Central Electricity Board, upon whom devolves the responsibility of carrying out the various schemes adopted in accordance with the provisions of that Act.

The success of the Government's adopted policy will, to a great extent, be prejudiced if existing privately-owned generating stations continue in operation, and if new private stations are brought into being.

The Rating Bill, however, in effect, puts a premium on such stations in that the proposed rates rebate of 75 per cent. to factories will apply to privately-owned stations within those factories, whereas public supply undertakings are specifically excluded from any benefits under the Bill.

To illustrate this point, I would cite the case of two similar factories, one of which receives a supply from a public source —and may, therefore, be said to be working in with the national scheme—and the other produces its own power. The latter will enjoy the benefit of a rates rebate, which is not open to the former.

It would appear, therefore, that the Government, after having passed the Electricity (Supply) Act 1926, are now giving encouragement to private generation, which cannot but prove detrimental to the successful carrying out of their earlier policy.

It is, to say the least of it, discouraging to find that, in spite of representations made to the Ministries of Health and Transport, by a deputation representative of the whole of the electricity supply industry, and after discussion of the matter in both Houses of Parliament, the Bill has been passed without amendment in this respect.

This added difficulty in the way of development of the public supply of electricity, which is already over-burdened with restrictive legislation and regulations, makes it all the more necessary for those concerned to press for relaxation of some of these hampering restrictions.—Yours faithfully,

For THE NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.,
R. P. SLOAN,
Managing Director.

Newcastle,
August 3rd.

# LOOKING BACKWARD.

## Off-peak Supplies for Motors at 1d. per kWh Twenty-Five Years Ago.

FIFTY years ago, in its issue dated August 10th, 1878, THE ELECTRICIAN recorded that :—

A Chinese paper claimed that Kung Foo Whing, a distinguished philosopher, invented the telephone in the year 968 !

The Gaiety Theatre was said to be the first public building in London to be lighted electrically.

Dr. Joule was granted a civil list pension of £200.

A modification of Mance's method of measuring battery resistance was put forward by Dr. Oliver Lodge.

* * *

Twenty-five years ago, according to THE ELECTRICIAN of August 14th, 1903 :—

A record was published of the service of the Electrical Engineers (R.E.) Volunteers in the South African War.

Electric traction with single-phase motors was considered to be an ideal without immediate hope of realisation.

On the year's working of the Post Office telegraphs there was a deficit of £593 505.

Mr. J. Christie, at Brighton, and Mr. E. E. Hoadley, at Maidstone, were giving off-peak supplies for motors at 1d. per kWh.

Appointments announced included those of Mr. H. Bell, who was appointed City electrical engineer of Hull, and Mr. F. Ayton, as borough electrical engineer and tramways manager at Ipswich. Bradford Corporation were advertising for a city electrical engineer at a salary of £600.

There was a net balance of £22 408 on the year's operation of the Glasgow Corporation Telephone Department.

Following amalgamation with Siemens and Halske, the Schuckert Co. made a profit of £6 300. A loss of £769 000 was sustained in the previous year.

Imports of electrical goods during July totalled £108 821.

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Agricultural and General Engineers, Ltd. announce that in order to co-ordinate the Australian interests of their 14 associated companies, they have appointed Mr. A. Simpson, formerly Trade Commissioner in Sydney, to act as their resident chief representative in Australia. Mr. Simpson's appointment will not in any way interfere with any existing agency arrangement.

The Mullard Wireless Service Co., Ltd., have received a letter from Mr. E. A. Dedman (Radio G2NH), in connection with a Mullard O/150 transmitting valve which he purchased in 1923, the filament of which has only just burnt out. It has been in continual use since it was first purchased, first as an oscillator on 440 metres and, later, in successive transmissions on 200, 100, 45, 23 and 8 metres. An interesting feature in connection with this valve is that it was in use at Mr. Dedman's station when he was successful in obtaining the first communication between Europe and South Africa on a wavelength of 23 metres.

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# NEWS IN BRIEF.

THE 27th A.A. Battalion, R.E. (London Electrical Engineers) is in camp at Shoreham, until August 19th.

Northampton Corporation have decided that electric heating and lighting be adopted in the Dallington Park pavilion.

Less than 10 000 sq. ft. of stand space now remains to be allocated for the Heavy Section of the next British Industries Fair.

Eastbourne Electricity Committee seek sanction to borrow £11 175 for provision of electricity showrooms and office accommodation.

Electrical imports into the Irish Free State during June, 1928, amounted to £35 068, as against £23 663 during the same month last year.

A draughtsman, grade III, is required at the Royal Aircraft Establishment, for work in connection with the design of wireless apparatus.

The next annual meeting and conference of the Association of Public Lighting Engineers will be held at Bournemouth in September, 1929.

The question of the industrial electrification of the Belgian Congo is occupying the attention of the Belgian Colonial Council at Brussels.

The Ontario Hydro-Electric Commission is to obtain a power supply of 260 000 H.P. from Paugan Falls for a period of thirty years commencing in October next.

The Anglo-Norwegian telephone service, which was previously restricted in Norway to Oslo, was extended last week to all Norwegian territory south of latitude 64 deg. 30 min.

A profit of £50 000 has resulted from the exhibitions, etc., held in the Kelvin Hall, Glasgow, during the past year, and this amount will be placed to the Corporation's Common Good fund.

Seaham Harbour U.D.C. have adopted an assisted wiring scheme, and a commencement is to be made on the Princess Road housing estate. A loan of £3 000 for this purpose has been applied for.

Guildford Electricity Committee have decided that a working assistant borough electrical engineer be appointed at a salary of £350 per annum, rising by two annual increments of £25 to £400 per annum.

## Wessex Electricity Propaganda.

Mr. A. J. Bridge, of the Wessex Electricity Co., recently addressed a public meeting in the Shipton-under-Wychwood parish hall on the uses of electricity and the cost of installation and supply. On the same occasion there was an interesting exhibition of electrical appliances in the hall.

President Coolidge has appointed three U.S. representatives, including Mr. J. Goldhammer, vice-president of the Commercial Cable Co., to attend the International Telegraph Conference which meets in Brussels on September 10th.

Hull Baths Committee are considering proposed alterations and extensions at the vapour, medical, and electric baths. The plans provide for roughly double the present accommodation of both the electrical section and the light section.

Plymouth Electricity Committee are to consider at an early date whether Devonport Park can be illuminated for a week before the end of the summer in a manner similar to the Plymouth Hoe illuminations during Plymouth Week.

With the fourth of six 34 000 H.P. generators now in operation, the Paugan Falls power plant of the Gatineau Power Company has a total of 136 000 H.P. available. A fifth generator is to be installed, bringing the maximum production up to 170 000 H.P.

Two Carlisle railwaymen, Mr. M. Byrnes and Mr. Z. Putnam, have invented and patented an electrical device to control gates at railway level crossings. The device, it is claimed, operates automatically on an approaching train passing a certain point.

The annual French Radio Exhibition is to be held in the Grand Palais, Paris, from October 25th to November 4th next, as part of the Motor Cycle and Cycle Show. The exhibitors will be limited to members of the Syndicat Professionel des Industries Radioélectriques.

According to a recent investigation in Japan, the undeveloped water power belonging to the five big companies aggregates 645 000 kW. The Tokyo Electric Light Co. has undeveloped power amounting to 150 000 kW; the Daido Electric Power, 170 000 kW; the Toho Electric Power, 80 000 kW; the Nippon Electric Power, 220 000 kW, and the Ujigawa Electric Co., 25 000 kW.

# WORKSHOP LIGHTING.

## Programme of the Factory and Workshop Lighting Campaign.

DURING September, October, and November of this year the electrical industry will engage in an interesting factory and workshop lighting campaign, which has been planned by the E.L.M.A. Lighting Service Bureau, and will be conducted by the Electrical Development Association. The cost of the national operations of the campaign will be borne by the E.L.M.A., the Cable Makers' Association, the Electric Light Fittings' Association (Industrial Section), the Electrical Contractors' Association, and the E.D.A. The reason for the campaign, as given by the organisers, is that 70 per cent. of the factories of this country are badly and inadequately lighted, while the objects are:—(1) to teach factory and workshop executives the elementary principles of correct lighting, and to convince them of the general economic and social advantages of good illumination; (2) in this way to create a demand for better factory lighting, to open a market for the increased sale of lamps, fittings and installation work, and to increase the consumption of electricity. The E.D.A. Area Committees, Electric Circles, and district officers will take part in the campaign, while five successive direct mail letters and educational publications will be sent to various factories and workshops throughout the country.

### Committees to Direct the Campaign.

The direction of the campaign will be in the hands of the following committees:—(*a*) General Purposes Committee, consisting of two representatives of E.L.M.A., E.D.A., C.M.A., E.L.F.A. (Industrial Section), and E.C.A.; (*b*) Publicity Sub-Committee; (*c*) Sales Sub-Committee; and (*d*) Technical Sub-Committee. The General Purposes Committee at its first meeting appointed Lt.-Col. W. A. Vignoles as chairman, and Mr. J. L. H. Cooper, of the E.L.M.A. Lighting Service Bureau, as secretary. A meeting of each Electric Circle is to be called as early as possible, at which the campaign will be explained by Area Officers or others detailed for the purpose.

It is desired that lecture demonstrations be organised by each Electric Circle during the period of campaign, the lectures to be given either by a member of the staff of a Lighting Service Bureau or some other competent person. Factory owners and officials should be invited to attend these lectures, as well as everyone connected with the industry. It is suggested that these lecture demonstrations should be arranged in the works of a local manufacturer if the necessary permission can be obtained. Application for the services of a lecturer should be made to the E.D.A. as early as possible.

Direct mail postal communications will be sent to 100 000 factories and workshops on the following dates:—(1) September 10th, letter and booklet, "Electric Lighting for Factories and Workshops." (2) September 24th, letter emphasising the advantages of good lighting. (3) October 8th, Industrial Lighting Supplement by arrangement with the "Illustrated London News." (4) October 15th, letter and booklet, "Better Factory and Workshop Lighting Pays," and (5) October 29th, final letter summarising the previous communications with a final appeal for better lighting. With these letters post cards will be included, giving a list of booklets on various aspects of factory lighting. On these postcards the recipient will be asked to indicate those booklets, etc., which he wishes to receive. It is extremely desirable that all concerned should follow up the national advertising with personal letters, directed to those connected with local industries.

In order to ensure that those called upon to plan schemes for the better lighting of factories and workshops, shall put forward similar proposals, a standard campaign specification is being prepared and will be circularised throughout the industry.

The journals which will carry appropriate advertisements of the campaign will include "The Times" Engineering Supplement, the "Manchester Guardian Commercial," the "Chemical Trades Journal," the "Industrial Chemist," the "Leather Trade Review," the "Iron and Coal Trades Review," the "Board of Trade Journal," the "Railway Gazette," the "Engineer," "Engineering," the "Implement and Machinery Review," the "Pottery Gazette," the "Milk Industry," "Industrial Management," the "Brewing Trades Review," "Members Circular," the "Foundry Journal," the "Laundry Journal," the "Iron and Steel Industry," the "Textile Mercury," the "F.B.I. Bulletin," the "Chamber of Commerce Journal," the "Shipbuilding and Shipping Record," and the "Cabinet Maker."

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# PERSONAL.

GUILDFORD Electricity Committee have appointed Miss Nancy Dickinson as manageress of the showroom at a salary of £200 per annum.

Mr. D. S. Baddeley has resigned his position as resident engineer and manager with Crompton Parkinson, Ltd.

The marriage was solemnised on Tuesday of last week of Lieut. Francis V. du Pasquier, R.N., and Miss Mary K. S. Miles, at St. Peter's Church, Cranley Gardens. The bridegroom is the son of Mr. A. E. du Pasquier, of the Metropolitan-Vickers Electrical Co., Ltd.

The marriage of Mr. W. G. Harrold, of Kobe, Japan, to Miss Christine Russell Kilburn Scott, third daughter of Mr. E. Kilburn Scott, consulting engineer, was solemnised on July 31st at St. James's Church, Piccadilly, London, W., by the Rev. W. Gerald Elliott, Rector of St. Ninian's, Glasgow.

Blackpool results in connection with examinations of the Lancashire and Cheshire Institutes include: Senior electrical engineering: First year, first class: Harry Foden; second class, Fred Bishop and T. G. Richmond; course not completed, Thomas A. Hodgkinson and L. C. King; second year, first class, Harry Carpenter, Sydney Eastham, James F. Haslam; second class, P. Massey and John Pickard.

Mr. John Waddell, general manager of the D.P. Battery Co., Ltd., who has been with them for 33 years, and who is one of the earliest engineers who have specialised in battery engineering, has been elected a director. Previous to joining the company on its inception, he was manufacturing batteries at the works of Johnson and Phillips, Ltd., at Charlton, from 1889.

Estate of the gross value of £9 115, with net personalty £9 000, was left by the late Mr. A. R. Bennett, formerly general manager and chief engineer of the National Telephone Co., for Scotland, Cumberland and Westmorland, who died on May 24th, aged 78 years. He gave £100 to the Institution of Locomotive Engineers, £2 10s. thereof to be used annually as a premium to the author of a meritorious paper by a member, associate or student, and the balance of the income to their benevolent fund, and £50 to the benevolent fund of the Institution of Electrical Engineers.

A suggestion that the salary of the electrical engineer, Mr. E. G. Okell, should be stabilised at £900 per annum, rising by two annual increments to £1 000 a year, came before the Plymouth Town Council at its meeting last week. The chairman of the Electricity Committee, Alderman Miller, said Mr. Okell had been with the Corporation for 28 years, during which time the output had increased from about 800 to 22 800 kW. Eventually, by 36 votes to 20, the matter was referred back to the committee, with instructions to stabilise Mr. Okell's salary at £900 a year as a compromise.

Mr. E. S. New, sales manager of the D.P. Battery Co., Ltd., who has been with the company for 27 years and was for 8 years previous to this engaged in the manufacture of secondary batteries, has been elected a director of the company. Mr. New founded the Accumulator Makers' Association in 1912, acted as secretary from 1912 to 1924, and is President for the current year; has represented the accumulator makers on the B.E.A.M.A. Council, since 1912, and also represents them on the F.B.I. Council, British Electrical and Allied Industries Research Association and Electric Vehicle Committee.

The Board of the Brazilian Traction, Light and Power Co. announce that Sir Alexander Mackenzie, owing to the condition of his health, has found it necessary to resign the presidency of the company and to give up the active direction and administration of the company's affairs. He has agreed to remain on the Board and to act in a consulting capacity. On the recommendation of Sir Alexander, the Board has elected Mr. Miller Lash as president of the company and of the subsidiary companies operating in Brazil. Mr. H. H. Couzens, who is resident in Brazil, will continue as executive Vice-President, and will have full charge of and authority over the operations and staff in Brazil, and Mr. A. W. K. Billings, also a Vice-President resident in Brazil, will, as heretofore, continue in control of the company's hydraulic construction and concessions.

## Obituary.

MR. WILLIAM LUND, on June 19th, at Hull, Mass., aged 87 years. He was a native of Bradford and a pioneer inventor in the electrical field. He retired from business in Philadelphia ten years ago.

# IN PARLIAMENT.

## Further Inquiry to be held in regard to Nottinghamshire Electricity Order.

THE Special Orders Committee of the House of Lords last week considered the East Nottinghamshire Electricity Special Order, 1928, which had been confirmed by the Minister of Transport. The Order, if approved, will authorise the Derbyshire and Nottinghamshire Electric Power Co. to supply electricity for all purposes in a large area in Nottinghamshire in which there are collieries with their own generating stations. The Butterley Co., Ltd., the Bolsover Colliery Co., Ltd., and the Mining Association of Great Britain opposed the granting of the Order, with a view to securing adequate protection of the colliery companies' mains.

On behalf of the Butterley Co. it was stated that no supply of electricity having been obtainable from the Power Co. on economic terms in Ollerton, the Butterley Co. constructed a generating station for supplying the colliery and the village. The Power Co. were seeking to take advantage of an urban development created solely by the Butterley Co. A non-statutory undertaking ought not to be deprived of protection merely because it was non-statutory. Similar arguments were advanced on behalf of the Bolsover Colliery Co., Ltd., and Mr. R. F. Parker (of Sharpe, Pritchard and Co., Parliamentary agents), representing the Mining Association, said the fact that protection was not afforded the colliery companies by the Electric Lighting (Clauses) Act was due to the fact that that Act was passed before it became the common practice to operate collieries by electricity.

Mr. W. A. Clark (of Kennedy and Co., Parliamentary agents) said colliery companies had not the statutory obligations and restrictions of a statutory undertaking, and should not have the same protection. The Power Co. had many applications for a supply of electricity in the area covered by the Order, and the local authorities in that area were becoming impatient.

The Committee announced that they would report to the effect that there ought to be a further inquiry by a select committee of Parliament.

## The Cable-Wireless Merger.

The House of Commons on August 2nd discussed the report of the Imperial Wireless and Cable Conference.

Mr. W. J. Baker said there had been a definite campaign of newspaper, insurance, financial and banking interests, in order to force the Government to surrender its beam service. The report was a fitting conclusion to a disgraceful campaign of treachery and knavery.

Sir John Gilmour (who was chairman of the Conference) said the situation which had arisen was due to competition between wireless and the cable companies, and had nothing to do with State ownership or private enterprise. In putting the recommendations of the Conference into effect, the Government believed they were acting in the best interests of the public generally and the users of the service. The views of the Dominions were generally favourable to the plan.

Sir Robert Hutchison considered the scheme the best which could be devised. It would be, he believed, a great step towards the defence of the Empire. Had the fight between beam wireless and cables continued, cables would have gone under, and the Government were wise to approach the subject before violent battles were fought between the two systems, in order to preserve the cables, which were absolutely necessary to secrecy for commercial and defence purposes.

Sir Hamar Greenwood said Mr. Baker's references to treachery and knavery would have a deplorable effect in the Dominions. The overwhelming fact was that we had a united Empire endorsing the report, and he hoped the Mother of Parliaments would support the Overseas Dominions in advocating the transference to private enterprise of these services, which, with the exception of the beam, were declining.

Mr. L. C. Amery, Secretary for the Colonies, said as for the suggestion that the proposed merger was a capitalistic attack on the interests of the Empire, the whole business arose because a State-owned cable belonging to the Dominion of Australia suffered from the competition of the State-owned beam service. The conclusion to which the Conference came was that the only way of dealing with the problem in a manner that would control the cables and allow the fullest expansion and development of wireless was to have a single unitary working control of the whole system.

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# SELLING LINES.

AMONG the newest lines introduced by Philips Lamp, Ltd., is a lightning arrester for wireless receivers, which is claimed to be entirely independent of any outside agency for its successful working. It consists of a tube, filled with a rare gas, and is equipped with an adjustable spark gap, both being enclosed in a weather-proof glass container surmounted by a porcelain cowl. A galvanised iron bracket is provided for wall fixing. Terminals are fitted at the upper and lower ends for aerial and earth connections. The advantages claimed for this arrester may be summarised as follows: it requires no daily "switching over," in that it is entirely automatic; small electrostatic capacity, thus having practically no effect upon tuning adjustments, etc.; extremely low leakage loss; the whole apparatus weather-proof for continual exposure out of doors; and the device is claimed to give safety against high voltage discharges and supply voltage contacts.

St. Helens Cable and Rubber Co., Ltd., have produced a new connector box moulded from non-hygroscopic, flame-proof material to a neat design, and having a highly polished cover. The base has dividing partitions of insulation material between each terminal. The boxes can be supplied with the cover either in black, brown or cream, so that a selection can be made to match surroundings or to harmonise with any existing colour scheme. One wood screw only is required to secure the base to the wall or ceiling. A moulded bakelite milled screw holds the cover in position after wiring is completed. Provision is made in the cover of the box to provide for the entry of various sizes of cable. This is done by the moulding of four recesses on the inside of the cover, which can be cut to accommodate various sizes of cable. Ample space is provided inside the box to enable a multiplicity of connections to be carried out without overcrowding. The terminals, which are moulded in the base, will take 4-3.036 in. strands if necessary. The boxes can be used with any non-metallic system of wiring.

Petters, Ltd., have sent us particulars of their latest type of lighting plant for house lighting. Radiator cooling is employed in place of a separate water tank, the set thus occupying less space than the standard equipment. The plant is made in two sizes, 1 and 1½ kW. The switchboard is of a type similar to that used in the Alpha lighting sets. The whole plant, with the exception of the battery, is mounted on a heavy cast iron baseplate. The dynamo is direct coupled to the engine shaft, and the radiator fan is driven by belt. The switchboard is mounted on the dynamo, and is provided with starting switch for motoring the engine at starting, automatic cut-in and cut-out, shunt regulator, two fuses, and ampere meter, the whole being encased in an aluminium cover. The dynamo is of the shunt wound battery charging type. The battery fitted with acid-tight lids is supplied complete with acid, insulators, separators, connectors, hydrometer, and necessary wooden stand.

## A New Portable Receiver.

The latest addition to the range of receivers offered by the Marconiphone Co., Ltd., is a portable model weighing 30 lb. The instrument is described as Model 53 and is entirely self-contained. The controls are greatly simplified, there being but one for tuning and one for volume, while a single switch provides a choice of wave-lengths between 280–550 or 1 000–2 000 metres. There are no coils to change. A new form of edge control dial facilitates rapid adjustment, a calibration chart being supplied for certain of the main British and Continental stations. The loud-speaker is a modified type of cone, while a full-sized high tension battery, also a new type of unspillable accumulator, effect a decided economy in the cost of charging and replacements. Although local circumstances have a considerable influence on the range, the conservative figures of 70–150 miles for main British stations and 150–400 miles for Daventry (5XX) will usually be exceeded. It is claimed that continental transmissions from Langenberg, Hilversum, Radio-Paris, etc., are also available under normal conditions.

A notable addition to the range of speciality switches produced by C. Donovan and Co., Cornwall Street, Birmingham, is a new single- or double-pole flame proof lighting switch, intended specifically for use at petrol stations, garages, factories, and in any conditions in which it is necessary to guard against the possibility of danger from fire. The switch is mounted in a cast-iron case, which is machine joined, and arrangements are provided for sealing the outer cover to prevent the switch being tampered with by any unauthorised person. The dimensions are 4½ in. diameter, with a projection of 2 in. The flange is exceptionally wide, and the dolly and working parts are properly earthed. A sample of this new switch has been included in the Home Office Museum of industrial appliances.

In view of the increasing popularity of bakelite fittings and accessories, particularly among the public, government departments and the railway companies, it is interesting to note that a new and attractive bakelite accessory has been introduced by the General Electric Co., Ltd., in the form of a bakelite bell, made in two sizes with 3 in. and 4 in. round and sheep gongs respectively. The base and cover of the bell are made of bakelite, and the frame is an armature iron pressing. The terminals are completely enclosed in the bell box, being of the pillar type fitted with cheese-headed screws. The bell is provided with rubbing contacts fitted with gold-silver points. To prevent the armature being pulled out of alignment the contact spring is bent over on the bell frame to anchor the armature. The hook and eye method of fixing the cover to the base has been superseded by a cover not rivetted into the bakelite. It is made in four types.

The new G.E.C. bell, made in bakelite.

The Runbaken Magneto Co. have introduced an automatic switch which they claim to be a fuse displacer, in that it may be used in place of the orthodox fuse with perfect safety. The switch may be used for domestic or industrial purposes, and can be set for any overload up to 12 A. In appearance it is a porcelain mounted box, measuring 4 in. by 3 in., with a small porcelain handle protruding. It is fitted with magnetic blow-out, and the trip action operates on the "toggle" principle.

Among the cooker control units which are manufactured in such a way as to be ready for fixing and connecting, is an ironclad unit by J. H. Tucker and Co., Ltd. The case, made from cast iron, is provided with a hinged cover fastened by means of a wing nut, while an opening is also provided for inserting a plug. The unit, rated at 30 A up to 250 V, is made up of a 30 A double-pole parallel U-type switch arranged with an external operating handle, interlocked with the case cover; two 15 A single-pole H.O.-type porcelain fuse units; one 15 A single-pole under-type tumbler switch, earthed to the case and operated externally; one 15 A 2-pin socket; one batten lampholder mounted inside the case, an opening being provided in the lid to permit of inserting the lamp; a 5 A single-pole cut-out for the pilot lamp and two china terminal blocks. Alternative arrangements to the 15 A single-pole switch and socket are a 5 A switch and socket, or a 5 A switch and 3-pin 5 A socket.

## ELECTRICALLY-PROPELLED LAUNCHES.

Now that motor boating is becoming so popular on our waterways, it is not improbable that in certain directions electricity will be increasingly utilised for propulsion purposes. As a beginning we understand that a number of these launches are being constructed by J. W. Brooke and Co., Ltd., of Lowestoft, for the Great Yarmouth Corporation.

The launches, which will be used on the new Yarmouth artificial pleasure waterways, are 20 ft. long, with a beam of 7 ft. 6 in. and draught of 18 in.

Single 1½ H.P. 40 V d.c. motors by Metropolitan-Vickers are used for propulsion, and are operated by waterpoof drum-type controllers with forward, reverse and neutral positions. Current is supplied from 40 V Exide batteries, which will be charged at a waterside charging station. The propulsion machinery gives a travelling speed of 4 to 5 miles per hour.

The current price list for Vicma and Vinazo wires and cables has been issued by W. T. Henley's Telegraph Works Co., Ltd.

We have received from Siemens Electric Lamps and Supplies, Ltd., revised catalogue No. 2.125 dealing with "Zed" fuse material, which supersedes catalogue No. 2.120.

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# LEGAL INTELLIGENCE.

## Injunction Brought by Marconi Co. Against Alphian Wireless in Regard to Patents.

IN the Chancery Division, on July 25th, Mr. Justice Maugham had before him an action brought by Marconi's Wireless Telegraph Co., Ltd., against Alphian Wireless, Ltd., of Mortimer Street, London, W., to restrain infringement of three letters patent.

Mr. Geoffrey Tookey, for the Marconi Co., said the defence had been struck out through the defendants' failure to comply with an order for discovery of documents. He asked for an injunction to restrain defendants from infringing plaintiffs' letters patent, an inquiry as to damages and payment by defendants of any sum found due, delivery up or destruction of infringing articles, and costs.

The Judge said he had come across many cases in which the article could be altered so as to remove any infringement.

Mr. Tookey said these were wireless receiving sets, and manufactured in a particular way, so that to reconstruct them would mean making a new article. With regard to a suggestion by the Judge that it might be cheaper for them to reconstruct than to destroy, Mr. Tookey said the removal of a part might or might not make the article cease to infringe, but it would not be easy for anybody else to replace that part, and the article would then infringe again.

The Judge said plaintiffs would have the judgment for which they asked, and costs of the inquiry would be reserved.

### Cable Trenches.

Mr. Justice Romer, in the Chancery Division on July 20th, on the motion of Miss Jessie Evans, of Frensham, Surrey, granted an injunction restraining the Farnham Gas and Electricity Co., Ltd., from digging a trench in Grange Road, Frensham, for the laying of electric cables, so as to cut through the anchor roots of her Scotch fir trees within a distance of 10 ft. of the trees.

Mr. Swords, for the company, said they had a statutory right to dig trenches in the road, and all they had to do was to see that no more damage was done than was necessary. His Lordship gave facilities for a speedy trial of the action, and the plaintiff gave a cross undertaking in damages.

### Diversion of Electricity.

At Marlborough Street (London) Police Court recently, Mr. Harry Posolsky, of London, W., was sentenced to two months' imprisonment in the second division for fraudulently causing electricity to be diverted for consumption. On behalf of the prosecutors, the Charing Cross Electricity Supply Co., Ltd., it was stated that defendant, having his supply cut off, obtained electricity by means of a flex attached to another customer's electrical apparatus on the same premises. Recognizances were fixed with a view to an appeal.

### False Pretences Charge Dismissed.

A charge of obtaining credit for £23, the value of a wireless set, by false pretences, from Miss A. Maud Edwards, wireless dealer, of Taunton, was brought against Mr. William Bailey, metal dealer, of Okehampton, at Taunton Borough Police Court, last week.

Prosecutrix stated that on July 10th Bailey came into her shop and inquired about the purchase of a wireless set. He arranged to take a four-valve set at £23, and subsequently took the set, paying a small deposit. Witness visited Okehampton, but was unable to find any sign of the shop which defendant stated he had there.

Bailey told the magistrates it was his honest intention to pay for the set. He produced letters, including two from magistrates, which gave him a good character.

The magistrates dismissed the case on payment of the costs and restitution of the set to Miss Edwards, the chairman stating defendant had "sailed very near the wind."

### Butt-Welding Patents.

On July 19th the Rose Street Foundry and Engineering Co., Ltd., succeeded in an action brought in the Chancery Division, before Mr. Justice Eve, against the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., for an injunction to restrain infringement of a patent relating to improvements in welding and more particularly in what is known as butt-welding. Prior to the invention covered by the patent, the relative rates of speed of approach of the two electrodes during the flashing period, and the actual welding or butting stage were controlled by the hand and eye of the operator. The improvement claimed was one which provided means for automatically controlling the pre-arranged speed of approach during both periods and a pre-determined period of increase. The invention was accurately and sufficiently disclosed and claimed in the specification and drawings.

The nature and the manner in which the invention was to be performed were in his lordship's opinion clearly made manifest and its utility had been completely established. The objections founded on prior publication, prior user and prior common general knowledge had not been established. The plaintiffs were entitled to the injunction they claimed, and inquiry as to damages, delivery up of the infringing machines and costs down to and including judgment.

### The Revocation of Electricity Special Orders.

A decision of considerable importance to electricity supply companies was given on July 25th by a King's Bench Divisional Court, consisting of the Lord Chief Justice (Lord Hewart), Mr. Justice Acton, and Mr. Justice Branson. A rule *nisi* for a writ of *certiorari* had been obtained by the Leicestershire and Warwickshire Electric Power Co., calling on the Minister of Transport to remove into the High Court a Special Order made by the Electricity Commissioners in respect of Polesworth and district. Arguments were heard by the Court on the point whether the Order was *ultra vires* and should be quashed. The Polesworth Order authorised the Pooley Hall Colliery Co. to supply electricity to an area included in the Atherstone Order previously granted to the Power Co. The Power Co.'s contention was that the Order granted to them could not be revoked, and that the Minister had no authority to confirm the revocation by the Commissioners of one Special Order by making another Order.

The Solicitor-General, Sir Boyd Merriman, K.C., said that as the Power Co.'s powers in the area concerned were not sufficiently used, an inquiry was held by the Commissioners, who then made the Polesworth Order transferring to the area of supply of the Pooley Hall Colliery Co. the certain places mentioned in the Order.

Mr. Wilfred Green, K.C., for the Power Co., submitted that a company which was granted a Special Order was entitled to retain its powers under the Order until they were taken away by Act of Parliament.

The Lord Chief Justice, giving judgment, said it was contended that clause 12 of the Polesworth Order made by the Electricity Commissioners was *ultra vires*. The Atherstone Order was made in 1922, and the Polesworth Order in 1927, the latter Order giving the Pooley Hall Colliery Co. powers of supply in a specified area, and excluding from that area the Electric Power Co. To a certain extent the latter Order revoked the previous one, and the question was whether one Special Order could revoke another. The applicants for the rule contended that the Electricity Commissioners had exceeded their jurisdiction. Referring to Section 26 of the Electricity Supply Act, 1919, Lord Hewart said it was apparent that the Section did not confer on the Commissioners power to revoke a Special Order, though they had power to revoke a Provisional Order. It was obvious that this section was a difficult section, and it was deplorable that a matter which could have been made perfectly clear should have been left in any sort of obscurity, especially where the subject matter of the controversy involved such a question as taking away or diminishing acquired rights. He saw no repugnancy between the notion that the Electricity Commissioners had power to revoke antecedent Orders and the notion that when they proceeded to their work there must be finality about it, subject to a statute. He was reluctant to think that this Act or any Act of Parliament ought to be construed as depriving individuals of acquired rights of value to them without using unambiguous language for that purpose. The Electricity Commissioners, in making this Order, exceeded their jurisdiction, and the rule would be made absolute.

Mr. Justice Acton and Mr. Justice Branson concurred, and the rule was made absolute, with costs in favour of the Power Co. against the Minister of Transport.

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Dartmouth T.C. recently made an application to the Urban Electric Supply Co. for more favourable terms for electricity supply than those offered by the company. The company have withdrawn their offer, in view of the fact that a serious increase in the valuation of their Dartmouth property is under consideration.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

FIFE COUNTY COUNCIL.—Electric light and heating installation at Kirkcaldy Sheriff Courthouse, for the District Committee of Fife County Council. Specification, etc., from the Burgh Electrical Engineer, Kirkcaldy.

NEW HARROGATE HOSPITAL, KNARESBOROUGH.—Electric light installation, bells and telephones. Forms of tender, etc., from Messrs. Elcock and Sutcliffe, 21, Northumberland Avenue, London, W.C.2.

FORFAR INFIRMARY, August 11th.—Electric lighting work, in connection with extension of the infirmary. Specification etc., from Mr. D. Watterson, 34, Castle Street, Forfar, or, from the Joint Secretaries; deposit £1 1s.

SALFORD CORPORATION, August 11th.—Re-wiring portion of the Municipal Offices, Regent Road, Salford. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 13th.—Supply of electric cable and wire. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, London, S.W.1.

DUNDEE CORPORATION, August 13th.—Electric lighting work in administrative block, Ashludie Sanatorium. Particulars and specification from Mr. George Baxter, city engineer, Dundee; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of one 20 000 kW turbo-generator, with condenser and auxiliaries. Specifications, etc., from City Electrical Engineer; deposit £2 2s.

SALFORD CORPORATION, August 13th.—Supply and erection at Agecroft power station of two water-tube boilers, with stokers, fans, motors, pre-heaters, grit catchers, coal chutes, ash chutes, and chimneys complete, each with a minimum normal evaporative capacity of 65 000 lb. of water per hour. Specification from City Electrical Engineer; deposit £2 2s.

ISLINGTON (LONDON) BOROUGH COUNCIL, August 14th.—Supply and installation of lead battery, to drive 3½–4 ton Edison refuse collecting vehicle, offers to include allowance for old battery. Further particulars from Cleansing Superintendent, Liverpool Road, N.1.

MANCHESTER CORPORATION, August 14th.—Sand-drying plant, for the Tramways Department. Specification from General Manager and Engineer, 55, Piccadilly, Manchester; deposit £1 1s.

PORTLAND URBAN DISTRICT COUNCIL, August 15th.—Manufacture, laying and erection of underground mains, overhead mains, transformers and meters. Specifications etc., from Mr. R. A. Colenutt, clerk to the Council; deposit £3 3s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., August 16th.—Supply and erection of steam boiler and feed pump, etc., at Forest Products Research Laboratory, Princes Risborough, Bucks. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

STRETFORD URBAN DISTRICT COUNCIL, August 16th.—Supply and laying of about 9 200 yards of 33 000 V underground transmission lines. Specifications, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

SWINDON CORPORATION, August 18th.—Supply and erection of: (1) one storage battery; and (2) three turbine driven boiler feed pumps. Specifications, etc., from Messrs. Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, London, S.W.1; deposit £2 2s. for each section.

CLITHEROE CORPORATION, August 20th.—Overhead wiring in the Cattle Market. Plans and specifications can be seen at the office of the Borough Engineer.

BERKHAMSTED GUARDIANS, August 21st.—Electric light installation at the institution. Particulars from the clerk, Mr. A. Brooke Turner.

MANCHESTER CORPORATION, August 22nd.—Twelve months' supply of electric cooking ranges. Specification (No. 224) from Mr. H. C. Lamb, Electricity Dept., Town Hall, Manchester; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, August 22nd.—(1) re-wiring fire alarm systems at Caterham Mental Hospital; and (2) electric lighting installation in shore and pier buildings at Long Reach Hospital, Dartford; deposit £1 in respect of each work.

BIRMINGHAM ASYLUMS COMMITTEE, August 25th.—Electric lighting and power installation at Winson Green Mental Hospital, Lodge Road, Birmingham. Specification, etc., from City Engineer, Council House, Birmingham; deposit £5.

HARROGATE CORPORATION, August 25th.—Supply of two 2 500 kVA transformers, and supply and erection of 11 000 V switchgear and 30-ton travelling crane. Specification from Borough Electrical Engineer.

BRISTOL GUARDIANS, August 30th.—Supply of electrical fittings for six months. Particulars from clerk, Mr. Thomas S. Lamb, St. Peter's Hospital, Bristol.

MANCHESTER CORPORATION, August 31st.—Supply, and placing in position at various sub-stations, of eight 250 kVA, eight 500 kVA and two 125 kVA static transformers. Specification (No. 225), etc., from Mr. H. C. Lamb, Electricity Dept., Town Hall, Manchester; deposit £1 1s.

STANDING JOINT COMMITTEE FOR DEVON, September 1st.—Supply of police accoutrements for three years, including electric lamps. Tender forms, etc., from the Chief Constable of Devon, Exeter.

LLANTARNAM URBAN DISTRICT COUNCIL, September 3rd.—(1) High and low-tension switchgear; (2) transformers and (3) overhead and underground mains. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

ST. PANCRAS (LONDON) BOROUGH COUNCIL, September 4th.—Supply and erection of 15 000 kW generator, condenser and auxiliaries, at King's Road generating station. Specification, etc., from Electricity Offices, 57, Pratt Street, London, N.W.1; deposit £1.

STEPNEY (LONDON) GUARDIANS, September 6th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1. Stamped, addressed envelope to be sent.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of two water tube boilers having normal evaporative capacity of 260 lb. per sq. in. Specifications, etc., from City Electrical Engineer; deposit £2.

BATH, CLUTTON, MIDSOMER NORTON AND RADSTOCK JOINT HOSPITAL, September 17th.—Installation of 134 lighting and heating points. Specification can be seen at the offices of Mr. A. J. Pictor, 14, Queen Square, Bath.

### Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

STATE ELECTRICITY WORKS, MONTEVIDEO, August 10th.—Supply of 20 equipments for transformer stations. (Reference B.X. 4 505.)

BULAWAYO MUNICIPALITY, August 14th.—Water tube boiler, with chain-grate, turbo-alternator, spray cooling equipment and circulating waterpiping, and three-panel switchboard with three generator panels. Contract M. 1928. (Reference A.X. 6 454.*)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, August 14th.—Supply and erection of overhead and supply and laying of underground distribution mains and services in Blackrock, Booterstown, Monkstown, Sandycove and Dalkey, in the county of Dublin. Specifications, etc., from Secretary, 60-62, Upper Mount Street, Dublin; deposit £5.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., August 14th.—(1) Supply of a.c. motors and starting pillars; (2) paper cables and terminal and joint boxes; and (3) rubber cables. Forms of tender from the Company's Offices, 25, Buckingham Palace Road, London, S.W.1; fee £1 1s. for each specification; not returnable.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 14th.—Supply of 50 kW switchgear, and steelwork, for Arapuni electric power scheme, section 274. (Reference B.X. 4 477.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 14th.—Junction apparatus for manual telephone exchanges. (Reference B.X. 4 486.)

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CAPE TOWN MUNICIPALITY, August 15th.—Supply of l.t. switchgear for the new Pavilion, Muizenburg. (Reference B.X. 4 562.)

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, August 15th.—Supply of (*a*) house service single-phase a.c. meters; (*b*) house service combined fixed and variable charge type prepayment single-phase a.c. meters; (*c*) power meters, three-phase, three and four wire; (*d*) house service meters as in (a) and (*b*), but mounted on meter board, with distribution fuse or fuses for one distribution circuit, and alternatively for two distribution circuits, for alternatively (*a*) one year and (*b*) two years. Tenders to the Secretary, 60-62, Upper Mount Street, Dublin.

SOUTH AFRICAN RAILWAYS AND HARBOURS, August 16th.—Telegraph line material, including cross arms, copper binders, copper tapes, insulators, spindles and bare copper wire. (Reference B.X. 4 611.)

VICTORIAN ELECTRICITY COMMISSION, August 20th.—Supply and delivery of 66 000 V transformers and spares. (Reference B.X. 4 541.)

MADRAS GOVERNMENT, August 21st.—(A) Penstocks and valves; (B) turbines; (C) alternators; (D) transformers; (E) switchgear, protective gear, etc., in connection with Glen Morgan hydro-electric scheme. Specifications, schedules, etc., from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4. Fee 5s. (not returnable) for each schedule.

IRISH FREE STATE ELECTRICITY BOARD, August 22nd.—Supply and erection of approximately 32 kiosk and 13 pole type transformer stations, with switchgear and transformers (10 000/380-220 V) in various towns. Conditions of contract, specification, etc., from Mr. P. J. Dempsey, secretary; deposit £5.

STATE ELECTRICITY WORKS, MONTEVIDEO, August 22nd.—Supply of metal filament lamps. (Reference B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

JOHANNESBURG MUNICIPALITY, August 30th.—Street lighting switches. (Reference B.X. 4 584.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of tramcar tyres and street lighting time switches.

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of six 10 kVA induction voltage regulators for 400/200 V supply (contract No. 4). (Reference B.X. 4 617).

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 700 tons of steel tramway rails, 2 000 pairs of fish plates, 5 000 steel tiebars and 12 manganese steel leg crossings (Contract No. 13). (Reference A.X. 6 632*.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 1 000 kVA and 250 kVA transformers. (Contract No. 8). (Reference B.X. 4 618.)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cords for indoor installations. (Reference B.X. 4 590.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. Reference A.X. 6 538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21). Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

CAPE TOWN MUNICIPALITY, September 4th.—Supply of 1 000 kW converter set (specification No. 427/1928). (Reference B.X. 4 604).

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 6th.—Motor-driven milling, pipe screwing, grinding and planing machines, etc. (Reference A.X. 6 592.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th.—Supply of 338 000 metres of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (Contract No. 310). (Reference B.X. 4 585.)

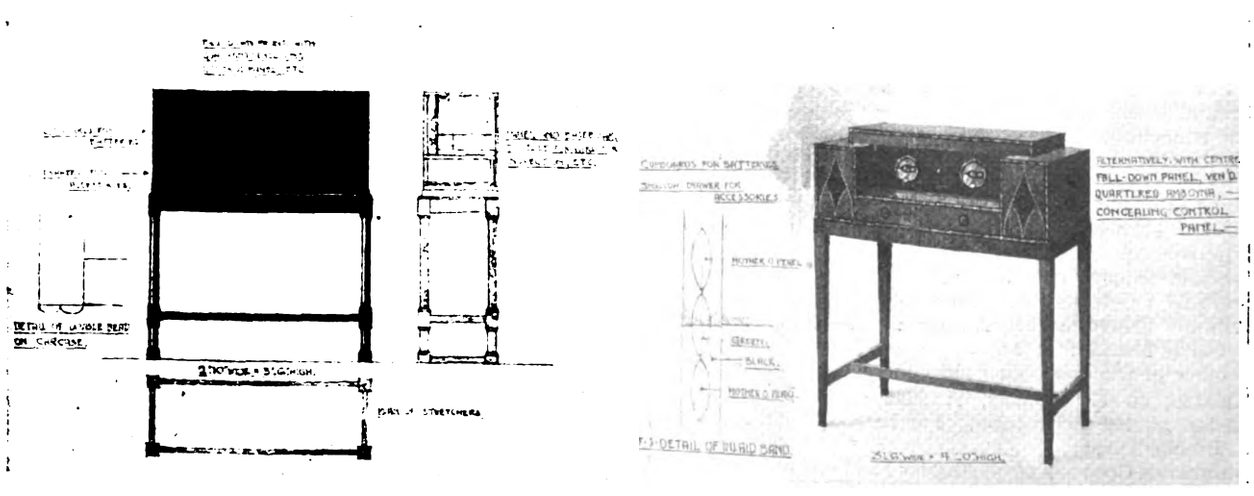
VOLKSRUST (S. AFRICA) MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 17th.—Supply of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, with junction and terminal boxes. (References B.X. 4 608.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 19th.—Supply of lead covered conductors, for 250 V. (Reference B.X. 4 607.)



*ON the left is shown the wireless cabinet which was awarded the prize offered by the "Cabinet Maker" in the Designs Competition held by the Royal Society of Arts. The cabinet on the right, also for a wireless set, was highly commended, the designer being the same in each case. The remarks made by the judges in connection with the competition will be found on page 152, together with details as to where and when the winning designs may be seen.*

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-stations. (Reference B.X. 4 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, erection, etc., of mechanical step grates and accessories, for Yallourn power station. Specification (No. 28/48), etc., from the Agent-General, Victoria House, Strand, London, W.C.; charge £1 1s. for three copies, returnable under certain conditions.

## Tenders Accepted.

RYDE CORPORATION.—C. Langdon, electrical work at Esplanade Pavilion, £49 15s. 6d.

BRECON CORPORATION.—Coppage and Sons, electrical installation in the Guild Hall, £99.

INVERNESS CORPORATION.—Pirie and Co., engineering work in connection with electricity scheme, £5 359.

RUGBY URBAN DISTRICT COUNCIL.—British Insulated Cables Ltd., supplies of service cable, £293 6s.

LONG ITCHINGTON PARISH CHURCH.—Midland Electric Light and Power Co., electric light installation, £70.

SOUTHAM RURAL DISTRICT COUNCIL.—Midland Electric Co., wiring houses for electric light, £7 5s. per house.

ST. NEOTS GUARDIANS.—Beds, Cambs. and Hunts Electricity Co., electric light installation at the institution, £160.

NEWCASTLE-ON-TYNE CORPORATION.—Clarke, Chapman and Co., Ltd., electrification of 65-ton crane on quayside, £497.

PALESTINE ELECTRIC CORPORATION.—General Electric Co., Ltd., supply of hydro-electric plant for Jordan power house.

CROYDON CORPORATION.—E. J. Hayes, electric lighting installation in one of the blocks of the Borough Hospital, £150.

HINCHLIFFE MILL CO-OPERATIVE SOCIETY, HOLMFIRTH.—R. A. Singleton, electrical work in connection with erection of a bakery.

HIS MAJESTY'S OFFICE OF WORKS.—Siemens Electric Lamp and Supplies, Ltd., 10 months' supply of Siemens standard gasfilled and vacuum lamps.

WOODSTOCK CORPORATION.—Woodstock Power Syndicate, Ltd., public lighting by electricity from September 15th, 1928, until April 22nd, 1929, £104 12s. 5d.

READING GUARDIANS.—Callas, Sons and May, electric light installation in four blocks of infirmary, £421. Seven other tenders received, highest £1 275.

METROPOLITAN RAILWAY CO.—International Combustion, Ltd., substitution of pulverised fuel system for twenty stoker-fire boilers at Neasden power station, £200 000.

BELFAST CORPORATION.—Bell and Crowe, electric light installations in Fane Street and Mersey Street public elementary schools, £440 3s. 2d. and £456 respectively.

WOKING URBAN DISTRICT COUNCIL.—Woking Electric Supply Co., electrical installation at Council houses at Anchor Hill, £8 15s. per house for eight points (recommended).

MANCHESTER EDUCATION COMMITTEE.—A. E. Sudlow and Co., alteration of electrical installation at Education Offices; Seddon and Sons, electric light installation at Cheetham Municipal School.

LONDON COUNTY COUNCIL.—R. C. Cutting and Co., lightning conductor installation on Hornsey Rise Estate, £464. Also tendered: W. J. Furse and Co., £531; J. W. Gray and Son, £564; F. W. Gray and Co., £875.

LEEDS CORPORATION.—Supply of cables: W. T. Henley's Telegraph Works Co., Ltd., £1 895; Enfield Cable Works, Ltd., £850; Macintosh Cable Co., Ltd., £1 236; and Greenwich Cable Works, Ltd., £2 000 16s. 3d.

CANTERBURY CORPORATION.—Brush Electrical Engineering Co., Ltd., 3-phase 50 cycle turbo-alternator, having maximum continuous rating of 1 875 kW; Babcock and Wilcox, Ltd., two 15 000 lb. boilers. The two contracts amount to £23 487.

HASTINGS CORPORATION.—Stirling Boiler Co., Ltd., feed pump, £298; Ferguson, Pailin, Ltd., switchgear, Broomgrove, £90; l.t. switchgear, £149; and switchgear panel, Grove sub-station, £885 10s. 6d.; Ferranti, Ltd., transformers, and l.t. cubicles; Ruston and Hornsby, Ltd., boiler, dust destructor, £302.

LEICESTER CORPORATION.—English Electric Co., Ltd., for switchgear and cabling, £1 370. Howard Ljungstrom Preheaters (Land), Ltd., supply of four preheaters at central generating station, £9 000. Ferguson, Pailin, Ltd., supply of switchgear (ironclad type), £23 672. Hackbridge Electric Construction Co., supply of one 1 000 kVA transformer, £395 (all recommended.)

DURHAM COUNTY EDUCATION COMMITTEE.—Simm and Richardson, electric light installation at Nettlesworth new Council school, £80; and electric light installation in connection with remodelling at Thornley Council School, £135; F. Reid, Ferens and Co., electric lighting installation at Fishburn new Council school, £74 12s., and electric light installation at Blackhall colliery school, £297 8s.

LONDON COUNTY COUNCIL.—Electric Power Installation Co., wiring and fittings for electric lighting of Dockhead, Bermondsey, fire brigade station, £156. Also tendered: Alpha Manufacturing and Electrical Co., Ltd., £198 (not including automatic switch); Stegman and Co., £199; Power Contracts, Ltd., £201; V. E. Bacon, £212; Fordham Electrical Engineering Co., Ltd., £217; M. J. T. Thomas and Co., £217; A. V. Gifkins and Co., Ltd., £229; A. Hawkins and Sons, £235; Smethurst and Co. (London), Ltd., £265; Whitbys, Ltd., £290; G. W. Cross, £300; W. Davey, £357; J. Vigor, £596.

BEDFORD CORPORATION.—Siemens Bros. and Co., Ltd., cables from 12 500 kW set to switchboard, £120; C. A. Parsons and Co., Ltd., supply and erection of insulated copper strip for connecting current transformers, etc., on alternator, £187; W. H. Allen, Sons and Co., Ltd., runway for handling condenser cover, £23, and supply and erection of Rotwell tanks, £205; Beds Engineering Co., supply and erecting of trolley wires for overhead crane, £72 5s.; British Thomson-Houston Co., Ltd., e.h.t. switchgear, £278 15s.; J. G. Statter and Co., Ltd., l.t. switchgear, £134 10s.; British Electric Transformer Co., Ltd., modification of works transformer, £49 10s.

MANCHESTER CORPORATION.—Twelve months' supply of stores and materials: Ever Ready Co. (Great Britain), Ltd., flashlamps; British Insulated Cables Ltd., box compound; Simplex Conduits, Ltd., conduit and accessories for wiring; Baxendale and Co., Ltd.; S. Gratrix, Jnr., and Bros., Ltd.; Wholesale Fittings, Ltd.; J. Russell and Co., Ltd.; W. E. Beardsall and Co., Ltd.; R. O'Brien and Co.; Underwood (Manchester), Ltd.; J. C. White; F. G. Ride and Co.; Falk, Stadelmann and Co., Ltd.; Berry's Electric, Ltd.; R. H. Dent; Drake and Gorham, Ltd.; Sloan Electrical Co., Ltd.; Downes and Davies, incandescent electric lamps; British Insulated Cables Ltd., W. Lucy and Co., Ltd., Scholes and Jagger, Ltd., Siemens Bros. and Co., Ltd., Sykes and Dyson, Ltd., fuse boxes; Doulton and Co., Ltd., Gaskell and Grocott, W. Kent, J. Macintyre and Co., Ltd., Metro-Vick Supplies, Ltd., insulators; Forrest and Sym, Hardy and Padmore, Ltd., W. Lucy and Co., Ltd., J. Needham and Sons, Ltd., Siemens Bros. and Co., Ltd., Sykes and Dyson, Ltd., service boxes; British Insulated Cables Ltd., Forrest and Sym, Sykes and Dyson, Ltd., Vono Co., Ltd., trifurcating boxes; British Electric Transformer Co., Ltd., General Electric Co., Ltd., auto-transformers and auto-balancers; Hawkins Bros. and Co., Ltd., F. G. Ride and Co., tinned copper and pure tin fuse wire.



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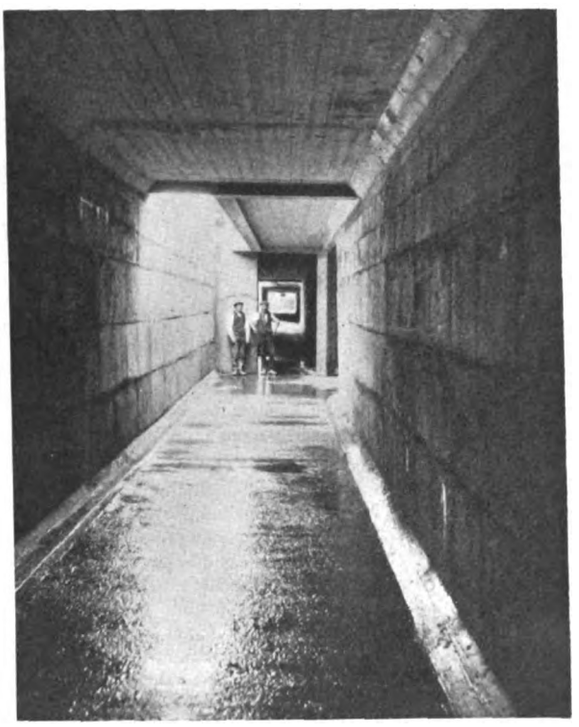
# ELECTRICITY SUPPLY.

## A.C. Supply for Kensington and Knightsbridge—Port Elizabeth Extensions—Overhead Lines and Newnham—New Assisted Wiring Scheme at Birmingham—15 000 kW Extension at Poplar—Supply in Northern Ireland.

BARNES U.D.C. are converting 14 public gas lamps in Rock's Lane for electric lighting, at a cost of £500.

The inhabitants of Penrhyndendraeth, Merionethshire, are considering the question of adopting electric street lighting.

Windsor Corporation have agreed to the Windsor Electrical Installation Co.'s proposed change of the system of supply from d.c. to a.c.



*NOT often is it possible to illustrate other than the surface buildings of a large power station, but the accompanying photograph gives an impression of the reinforced concrete culverts through which the condenser circulating water will flow from the cooling towers back to the condensers at the New Longford power station, Coventry. The culverts are now filled with water, and thus mark a further stage towards the completion of this station for which the contract is in the hands of the British Thomson-Houston Co., Ltd., Rugby, all the work being carried out to the specification of Mr. Geo. Tough, city electrical engineer and manager.*

Port Elizabeth (South Africa) Municipality propose to raise a loan of £400 000 to be expended upon extensions of the electricity supply undertaking.

The Yorkshire Electric Power Co. have announced their intention to apply for a Special Order to supply electricity in the High Peak district, including Castleton, Hope, Edale, Bamford, Hope Woodlands, Derwent, Aston, Thornhill, and Brough and Shatton.

Newnham U.D.C., after hearing Mr. Ellis, secretary and general manager of the West Gloucestershire Power Co., with reference to an electricity scheme for the town, have at his suggestion decided to consider the erection of overhead lines for the proposed supply.

Marylebone (London) Electric Supply Committee recommend that representations be made to the London County Council urging that consent should be given to the original proposal of the Borough Council that the pressure of a.c. supplies in Marylebone should be 240 and 415 V.

London County Council have consented to a proposal of the Kensington and Knightsbridge Electric Lighting Co. to instal an a.c. distribution system at 230 V single-phase and 400 V three-phase, at first in addition to, and subsequently in substitution for, the existing direct current supply at 200 and 400 V.

Par, Tywardreath and St. Blazey districts have been canvassed by the St. Austell and District Electric Lighting and Power Co., who propose shortly to extend their services to those places. In reply to complaints as to delay in carrying out the extensions, it is stated that a substantial portion of the equipment is now on order.

Coleraine U.D.C. have received a letter from the Ministry of Finance with reference to the Council's renewed application for a loan for electricity works. The Minister is not prepared to consider the application for the loan for electricity purposes until the commitments of the Council for public health purposes are definitely ascertained.

Birmingham Electric Supply Committee have adopted a new scheme of assisted wiring, which will enable certain classes of consumers to have their premises wired and equipped on a quarterly instalment plan. Work at the new Hams Hall station will be speeded up in several directions during the next few weeks, with the object of getting the work substantially advanced before next winter.

Middlesex Education Committee recommend that the county architect be authorised to arrange for the replacement of the existing gas lighting at the Southgate County School by electric lighting, at a cost of £550; that the electric lighting and heating apparatus at the Acton and Chiswick Polytechnic be re-modelled at a cost of £295; and that the electric lighting installation at the Hendon County School be overhauled, £85.

At a meeting of Barnstaple T.C. last week it was announced that the Council in Committee had considered a letter from Mr. Rider in which he expressed the opinion that the proposal to instal a further 300 kW Diesel set was one which should be approved by the Council, and said he hoped it would be the beginning of the displacement of the whole of the steam plant and the use of oil engines in its place. The Council resolved that the scheme be adopted at an estimated cost of £8 500, and that application be made to the Electricity Commissioners for sanction to the necessary additional loan of £3 000, making a total of £36 000.

At a meeting of Belfast Corporation last week Ald. Byrne urged an extension of the electricity mains to Andersonstown. Coun. R. Henderson, M.P., inquired what steps were being taken in regard to negotiations for supplying Bangor and other areas with electricity. Coun. G. Gray urged that extensions should be carried out to Cregagh. Coun. Hall-Thompson, chairman of the Electricity Committee, said that with regard to Bangor, negotiations were proceeding. With reference to a supply to Andersonstown, the canvass had not yet been completed, but he felt justified in saying the demand would be complied with.

The Electricity Commissioners intimated to Birkenhead Corporation that they are not yet in a position to issue formal sanction to the borrowing of the sum of £34 646 for rotary converting equipment, transformers, switchgear, supply, and laying of an additional main to Wallasey and a feeder from Bentinck Street Station to the Singleton Avenue sub-station, but the works are approved generally. They will raise no objection to the immediate placing of orders for the works. The electrical engineer is to put the matter in hand forthwith. The town clerk has been directed to make formal application to the Electricity Commissioners for approval of the proposed arrangement with Wallasey relative to the supply of electricity in bulk to Birkenhead.

Poplar (London) Electricity Committee has been informed that the sanction of the Electricity Commissioners to the 15 000 kW extension and to the borrowing of £157 500 for this purpose is likely to be received shortly. The London and Home Counties J.E.A. has approved the Council's application. The borough electrical engineer, Mr. J. H. Bowden, has submitted a scheme for carrying out the extensions, and the Committee deem it advisable in putting down the new plant to preserve the continuity of the design of the first instalment of plant erected in the new station, embodying at the same time any improvements which experience in operating have dictated. Manufacturers of the plant already installed have made concessions on their original tenders, amounting to over £2 500. The Committee are informed that the placing of these orders by private treaty will in itself result in a considerable saving to the undertaking.

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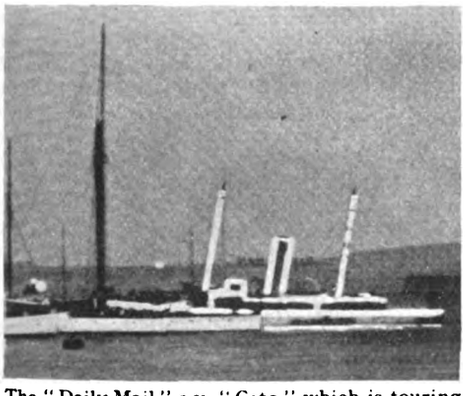
# ELECTRICAL NEWS IN PICTURES.

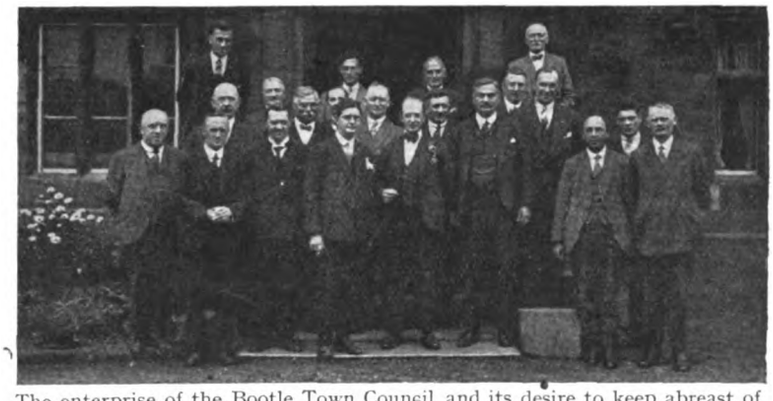
[*Photo*: "*Western Mail.*"]

The Conference of the British Medical Association was this year held at Cardiff, and by way of celebrating the occasion, the south front and clock tower of the City Hall were floodlighted. The illuminations were continued last week in order that residents in neighbouring towns might have an opportunity of seeing the effects. The thoroughness of the scheme and the beauty of the buildings will be appreciated from the above photograph.

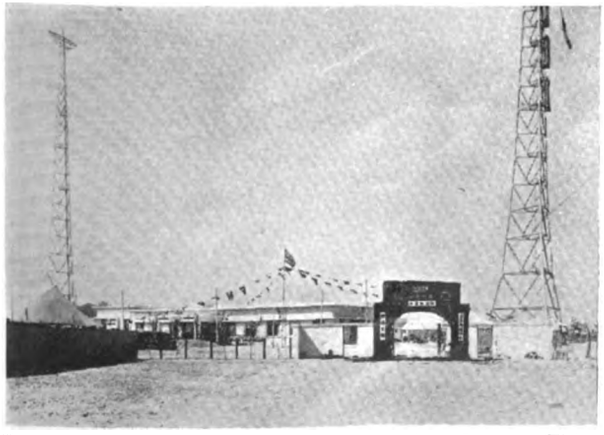
Mr. E. F. Hetherington, who has been appointed as engineer and manager of the West Midlands Joint Electricity Authority, in succession to Mr. S. T. Allen, who will shortly take up his new appointment as Central England Engineer, under the Central Board.

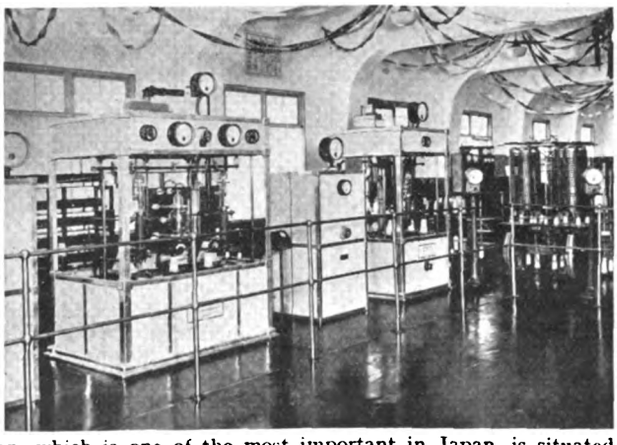


The "Daily Mail" s.y. "Ceto" which is touring the holiday resorts giving broadcast concerts by means of radio receiving equipment and a public address system. She is seen here in her usual nightly "dress" outlined in electric light. It is reported that the amplified programmes may be heard without distortion over many miles.



The enterprise of the Bootle Town Council, and its desire to keep abreast of modern improvements, was exemplified last week when some fifteen members of the Council and officials visited the Strowger Works of the Automatic Telephone Manufacturing Co., Ltd., Liverpool. Having witnessed demonstrations of several modern telephone, signalling, and electric service appliances, the visitors made a tour of both the main factory, at Milton Road, and the Victor Works, at Broad Green. Before leaving, the party were entertained to tea in the company's club house, Broad Green Hall.





Two views of the Osaka broadcasting station, Japan. This station, which is one of the most important in Japan, is situated 500 miles from Tokyo, where its transmissions are clearly heard. The transmitter is of the Marconi type, giving power of 10 kW to the aerial, which is suspended on masts 250 ft. in height. The station contains three studios, one for foreign music, one for Japanese music and the third for lectures. A large battery is also maintained to ensure broadcasting if the ordinary electricity supply should fail. The picture on the left shows part of the mast and entrance to the station, while the right-hand photograph shows the valve equipment.

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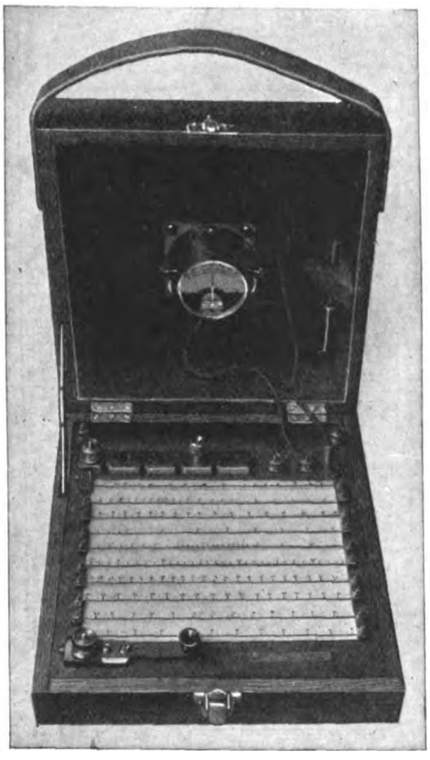
# A NEW INSTRUMENT.

## Details of a New Resistance Measuring Equipment.

THE latest addition to the range of measuring instruments offered by Messrs. Price and Belsham is a new resistance measurer, with scale reading from 0·0 to 10 000 Ω. The instrument is simple in design, and calls for very little calculation. The complete range of resistances is obtained by means of a plug and three sockets. A slider attached to the end of a flexible wire, which forms part of the component, has been carefully designed so that it can be moved along the slide wire almost involuntarily in response to the movements of the galvanometer incorporated in the instrument. When this galvanometer deflects to the right the slider should be moved in the direction of the arrows provided on the scale until zero is obtained, and *vice versa*. All sections of the bridge wire are stretched by a special process to ensure that each section is at the same tension, and consequently of exactly the same resistance. The key and contacts are arranged so as to first bring the battery into circuit before the galvanometer, in order to avoid the effect of any capacity in the resistance being measured. This is really a Wheatstone Bridge with a scale calibrated to read direct in ohms when used against the standard resistance which forms an integral part of the instrument.



Illustrating the new instrument by Messrs. Price and Belsham.

The galvanometer, we understand, contains a special winding, while the whole component is mounted on an anti-vibratory fitting. A small dry battery is provided in a clip in the lid of the case. Should this run down it can, of course, be replaced, or in case of emergency any battery of suitable voltage may be connected to the two terminals provided. The standard resistances have ample provision for air cooling, and are, we are informed, checked against N.P.L. Standards. The base of the instrument is ebonite, and the whole mounted in a strong but light oak box with oiled finish, and provided with a leather handle for carrying. The instrument measures about 11 in. by 11 in. by 4 in. when closed. The makers state that this type of instrument has been used in an experimental form in their works for many years for checking the resistance of the coils used in their other instruments. It is intended to appeal to the mains engineer, and it is claimed that in many cases this one instrument will be all that he will require. In certain cases the ends of the cable can be connected direct to the heavy terminals on the measurer, thus saving the need for leads and the consequent calculations. If the 4 V battery included in the set is not sufficient owing to the resistance of the fault, an external source of current at a higher voltage may be connected to the battery terminals.

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Stepney (London) Electricity Supply Committee propose authorising the borough electrical engineer to instal wiring for the supply of electricity to tenants in Grove Buildings, Newman's Buildings, St. George's House, Shadwell Industrial Buildings, and houses comprising Montague Place and Old Montague Street.

# BUSINESS ITEMS.

AS from August 6th the address of Mr. Harry Moss is 178, Manningham Lane, Bradford, instead of 82, Leeds Road. The telephone number remains the same.

The new showroom which was recently opened at the premises of C. Donovan and Co., Birmingham, has among its features a water-gauge suction tester for demonstrating the comparative merits of various suction cleaners. This tester consists of two vertical lengths of glass tube, filled with coloured water, connected by a short loop of rubber tubing at the base, and paralleled on the right-hand side by a scale marked in inches, up to 40. At the top of the right-hand tube is fitted a rubber attachment into which the nozzle of the cleaner is pushed. The cleaner is switched on, and the level of the water on the right-hand side gives a reading in inches. By this method a difference in the suction power of various cleaners is revealed.

An addition to the Strowger automatic telephone network at Torquay and Paignton, South Devon, inaugurated by the British Post Office some three years ago, was made by the opening, on July 28th, of a third exchange to serve the northern suburb of St. Marychurch. The exchange is located in the Post Office Telephone building, and has a present capacity for 1 000 lines and provision for ultimate expansion to 2 200. The system is 4-digit, with 4th wire metering; the first selectors being located at Torquay Main Exchange. The automatic apparatus room is on the ground floor, the equipment comprising :—4 and 5 rotary lineswitch units each equipped with 90 switches, 1 selector trunk board, 1 special apparatus rack, 1 M.D.F., 1 4-bay meter rack, 1 fuse board, 1 link frame, 1 service observation rack, and 1 supervisory rack. The equipment is by the Automatic Telephone Manufacturing Co., Ltd.

The new offices and showrooms of the Welwyn Garden City Electricity Supply Co., Ltd., in Bridge Road East, adjoining the sub-station, were opened on July 30th. This makes the final stage in a scheme for the centralisation of the company's activities, as the showrooms, offices, works and transforming equipment are now located in one building. The main building, which has not been largely affected by the extension, contains the transforming plant, by which the supply is stepped down from 30 000 V to 3 000 V, and then from 3 000 to 240 and 415, at which it is used. Welwyn Garden City is an important junction in the North Metropolitan Company's area, from here meet high-pressure lines from Brimsdown, Hertford and Luton. Supply is available from Brimsdown, Willesden, Barking or Luton, so that the risk of a complete breakdown is remote. Part of the main building is occupied by equipment for which the North Metropolitan Co. is responsible, and the other is occupied by the local company's equipment. The wing facing Bridge Road East contains the showrooms and offices, and the company will be able to demonstrate hot-water heaters, cookers and other appliances. The other wing comprises the workshops and stores. Some idea of the rapid growth of the Garden City undertaking is afforded by the fact that the consumption has increased by 50 per cent. in the last year, and a corresponding increase is likely during the present year. Welwyn Garden City's consumption per head of population is 245 kWh, while no fewer than 400 houses have electric cookers installed.

A corner of the new showroom opened by C. Donovan and Co.

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# ELECTRICAL WORKSHOPS.

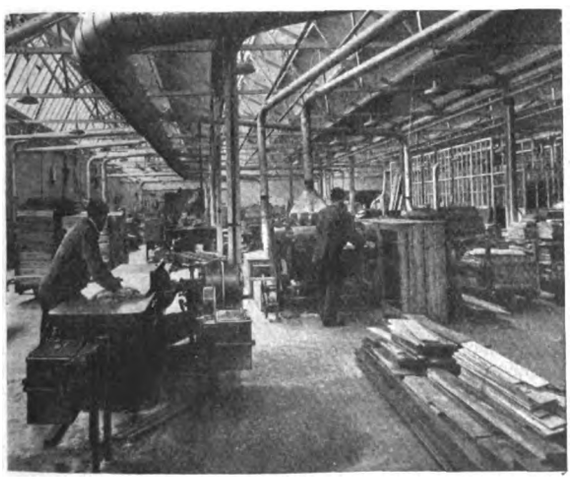
## Details of New Electrical Installation in Shop Fitting Factory.

ONE of the largest shop-fitting factories in Great Britain has recently been erected by Boots, Ltd., in Nottingham. The business of this well-known firm of chemists has expanded rapidly in recent years and the opening of numerous branches has necessitated the erection of this factory to supply the shop fittings.

The contract for the electrical plant driving the wood-working machinery was placed with the General Electric Co. ,Ltd., the motors and control gear being manufactured at the company's Witton Works.

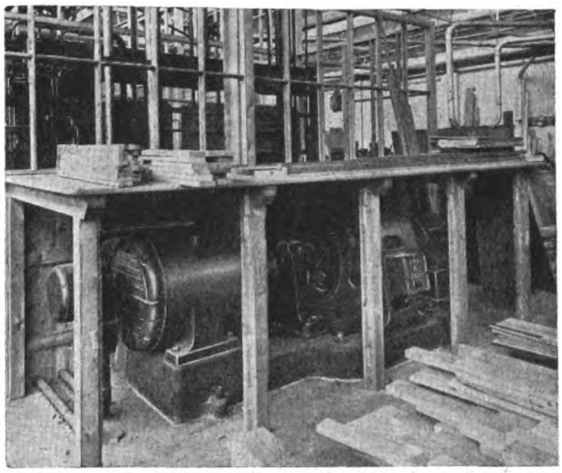
The installation comprises upwards of eighty " Witton " motors with total capacity of nearly 700 H.P. It is interesting to note that practically the whole of these motors are direct-coupled to the machines, in spite of the fact that certain of them run at a speed of 3 900 revs. per min. Power is received from the Nottingham Corporation supply mains at 11 000 V three-phase, 50 cycles, and this is stepped down to 400 V for use in the factory by means of a 300 kVA transformer. The majority of the motors are connected to this supply, but those which run at 3 900 revs. per min. are connected to a supply of a higher frequency, which is obtained by means of a frequency changer. This set consists of an auto-synchronous " Witton " motor direct coupled to a 30 kW alternator generating at 400 V three-phase, 66⅔ cycles. The auto-synchronous motor has an input of 100 kVA and is capable of correcting the power factor of a load of 200 kW from 0·78 to 0·95 lagging current. Further corrections are possible when the set is running light. The frequency changer is started by means of an auto-transformer starter. The high speed motors are used for driving planing machines, three 5 H.P. motors being direct coupled to the cutter blocks of 15 in., 20 in., and 24 in. hand feed planers respectively, each being controlled by a star-delta starting panel. A 20 H.P. and a 15 H.P. motor drive a double planing and thicknessing machine, the first motor being direct-coupled to the top cutter block, while the bottom cutter block and feed gear are belt driven by the smaller machine.

Among the machines driven by motors connected to the 50-cycle supply is a 6-cutter moulding machine which cuts the four sides in one operation in addition to beading the timber. This machine, which is capable of speeds up to 150 ft. per min., is driven by a 40 H.P. slip-ring motor. A mechanical interlock is fitted between the rotor starter and the oil circuit breaker, which prevents the current being switched on when the rotor starting handle is in other than the " off " position. There are several sanding machines which produce a smooth surface on the wood in the finishing processes in this factory, the principal of which is the 40 in. three drum endless bed sander.



**(Right). A 30-in. double surfacer driven by 15 H.P. and 20 H.P. " Witton " motors. (Left). A 24-in. hand feed surfacer driven by a 5 H.P. motor of the same make.**

This machine is driven by two 5 H.P. and one 7½ H.P. squirrel cage motors running at a speed of 1 500 revs. per min., direct coupled to the sanding drums through sliding couplings, thus allowing for the oscillation of the drums. The other sanding machines consist of 14 in. and 15 in. horizontal belt sanders, a 9 in. edge sander, also an overhead automatic variable stroke belt sander. These are all driven by 5 H.P. squirrel cage motors running at 1 500 revs. per min. A continuous feed glue jointer cuts tongues and grooves in planks previous to glueing. It is gear driven by a 7½ H.P. motor which is floor mounted. Among the numerous saws is a 36 in. by 6 ft. 6 in. double cross cut saw driven by a 10 H.P. squirrel cage motor coupled to the counter-shaft. Another machine used for sawing timber is a



**A 30 kW frequency changer, 400 V, three-phase, 50/66⅔ cycles, 1 000 revs. per min.**

swing cross cut saw, which is driven by a 5 H.P. motor running at 1 000 revs. per min. This motor is mounted as part of the saw frame and swings with the saw, the belt automatically tightening as the saw is pulled forward. Other machines driven by " Witton " motors include a 36 in. horizontal type power feed resaw with vertical feed for sawing timber, 18 in. by 12 in. vertical flitch frame for cutting planks to workable dimensions, a high speed straight line edging saw with the motor mounted direct on the saw spindle, 15 and 25-spindle dove-tailing machines, and tenoning, boring and recessing, automatic chain, chisel mortising and trenching and grinding machines, also apparatus for setting the wood working tools.

Apart from the plant in the factory the apparatus for the extraction of chips from the wood-working machinery is also interesting. Fans driven by 25 H.P. and 30 H.P. slip-ring motors draw the chips from the different machines through vents and discharge them into the boiler house, where they are used for generating steam for the timber drying stoves.

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## HIGHLAND ENTERPRISE.

ONE of the earliest electricity supply undertakings in the Highlands of Scotland is that at the Burgh of Grantown-on-Spey, where the enterprise of a local contractor, Mr. George Anderson, was instrumental in the installation in 1900 of a generating plant and battery for supplying light and power to his own premises and to a few local shops. In time the supply was extended to two churches, the local hospital, and to shops and private consumers, the generating plant being increased in capacity to meet these additional requirements. Later, the statutory lighting of the public streets called for a further extension of the supply, and a formal agreement was executed between the Town Council and Mr. George Anderson for the lighting system to be extended so that it would be available for private consumers in the Burgh. This agreement was made for 15 years and expired in 1927 when the Town Council called in Mr. Frank Anslow, of Walter Dixon and Co., consulting engineers, of Glasgow, to advise them upon the future lighting of the town. As a result of his advice, it was decided to enter into a new contract with Mr. Anderson, one condition of which was, that the generating plant should be extended to meet the growing demands.

A new battery has been installed by the Chloride Electrical Storage Co., Ltd., and a new generating plant was ordered from the General Electric Co., Ltd. This installation consists of a 3-cylinder Ruston and Hornsby vertical crude oil engine direct coupled to a 96 kW generator.

The Burgh of Grantown-on-Spey has approximately 1 660 inhabitants, the consumers at present connected numbering approximately 200. With the new plant installed, and with the extensions to the distribution system, it is anticipated that this number will be considerably augmented in the near future.

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# RADIO EXHIBITION.

## List of Exhibitors and Stand Numbers at the National Radio Exhibition.

WE give below the latest list of exhibitors at the National Radio Exhibition, which is to be held from September 22nd to 29th, at the New Hall, Olympia, London. The numbers following upon the names of the exhibitors represent the stand numbers :—

Messrs. Atalanta, Ltd. (271) ; C. Creswick Atkinson (8) ; the Automatic Coil Winder and Electric Equipment Co., Ltd. (150 and 151) ; the Automatic Radio Manufacturing Co. (274) ; Axuel Time Switches, Ltd. (263) ; the Baird Television Development Co., Ltd. (11, 13 and 14) ; Messrs. A. Baker (172) ; Bakelite, Ltd. (160) ; the Beaver Electrical Co. (2) ; the Bedford Electrical and Radio Co. (35) ; Belling and Lee, Ltd. (220 and 221) ; Benjamin Electric, Ltd. (171) ; George Bowerman, Ltd. (213) ; the Bowyer-Lowe Co., Ltd. (51) ; Brandes, Ltd. (118) ; the British Ebonite Co., Ltd. (38) ; the British General Manufacturing Co., Ltd. (10) ; the British Radio Corporation, Ltd. (141) ; the British Thomson-Houston Co., Ltd. (86 and 101) ; S. G. Brown, Ltd. (155 and 156) ; Brown Bros., Ltd. (177 and 178) ; the Brownie Wireless Co. of Great Britain, Ltd. (104) ; A. F. Bulgin and Co. (203 and 204) ; Bullphone, Ltd. (42) ; Burndept Wireless, Ltd. (112 and 113) ; Burne-Jones and Co., Ltd. (96) ; Messrs. C. F. and H. Burton (184 and 185) ; Cahill and Co., Ltd. (176) ; the Camden Engineering Co., Ltd. (152) ; the Carborundum Co., Ltd. (130) ; the Carrington Manufacturing Co., Ltd. (107) ; Catesbys, Ltd. (25) ; the Cantophone Wireless Co. (253) ; the Celestion Radio Co. (19 and 20) ; the Chloride Electrical Storage Co., Ltd. (33, 40 and 241) ; H. Clarke and Co. (Manchester), Ltd. (161) ; the Climax Radio Electric, Ltd. (80) ; E. K. Cole, Ltd. (48, 49 and 50) ; the Collinson's Precision Screw Co., Ltd. (91) ; the Cooks' Wireless Co., Ltd. (254) ; A. C. Cossor, Ltd. (116, 117, 231 and 250) ; Curry's, Ltd. (275, 276 and 277) ; D. X. Coils, Ltd. (223) ; Dayzite, Ltd. (248) ; Thos. De la Rue and Co., Ltd. (235) ; A. J. Dew and Co. (181 and 182) ; William Dibben and Sons (109) ; the Dianoid Battery Co., Ltd. (245) ; Donotone Loud-Speakers (216 and 217) ; the Dubilier Condenser Co. (1925), Ltd. (102 and 103) ; Messrs. C. S. Dunham (257).

### Further Exhibitors.

Messrs. J. Dyson (1) ; the Eagle Engineering Co., Ltd. (139) ; the East London Rubber Co. (167 and 168) ; J. J. Eastick and Sons (218 and 219) ; the Econasign Co. (242) ; Edison Bell, Ltd. (129) ; the Edison Swan Electric Co., Ltd. (43) ; the Electramonic Co., Ltd. (44) ; Messrs. Ellison and Hillman (169 and 170) ; Empire Electric Co. (247) ; the Enterprise Manufacturing Co. (237 and 238) ; the Ever Ready Co. (Great Britain), Ltd. (44A) ; the Electron Co., Ltd. (42A) ; Falk Stadelmann and Co., Ltd. (159) ; Fellows Manufacturing Co., Ltd. (36, 37, 64 and 65) ; Ferranti, Ltd. (84 and 85) ; the Formo Co. (140) ; Messrs. G. Forster (3) ; the Fuller Accumulator Co. (1926), Ltd. (158) ; A. W. Gamage, Ltd. (148 and 149) ; Gambrell Bros., Ltd. (27 and 108) ; Garnett Whiteley and Co., Ltd. (115) ; the General Electric Co., Ltd. (28, 29, 46, 47 and 225) ; Messrs. Goodmans (269A) ; J. L. Gottlieb and Co., Ltd. (52 and 92) ; R. F. Graham and Co. (212) ; Graham Amplion, Ltd. (30 and 31) ; the Graham-Farish Manufacturing Co. (119) ; Halycon Wireless Co., Ltd. (16, 17 and 18) ; the Hart Accumulator Co., Ltd. (95) ; Hart Collins, Ltd. (15) ; Hart Bros. Electrical Manufacturing Co., Ltd. (215) ; W. J. Henderson and Co., Ltd. (258) ; Hoare and Jagels, Ltd. (82) ; Hobday Bros., Ltd. (173 and 174) ; Houghton-Butcher (Great Britain), Ltd. (136 and 137) ; A. H. Hunt, Ltd. (273) ; Messrs. Norman Huntley (264) ; the Igranic Electric Co., Ltd. (53, 54 and 75) ; J. R. Wireless Co. (228) ; Messrs. Jackson Bros. (105) ; the Jewel Pen Co., Ltd. (261) ; the Junit Manufacturing Co., Ltd. (93) ; K.T.B. Manufacturing Co., Ltd. (239) ; S. Kalisky (Aldgate), Ltd. (132) ; S. A. Lamplugh, Ltd. (81 and 106) ; Langham Radio (55 and 74) ; Lectre Linx, Ltd. (236) ; E. J. Lever (Trix), Ltd. (255 and 256) ; S. W. Lewis and Co., Ltd. (244) ; Lissen, Ltd. (57, 58, 71 and 72) ; the Lithanode Co., Ltd. (226) ; W. and T. Lock, Ltd. (229 and 230) ; the London Electric Stores, Ltd. (208) ; the London Electric Wire Co. and Smiths, Ltd. (110) ; London Metal Warehouses, Ltd. (79) ; the London Radio Manufacturing Co., Ltd. (209 and 210) ; L. McMichael, Ltd. (128) ; M.P.A. Wireless (21 and 22) ; the Mainten Manufacturing Co. (206) ; the Marconiphone Co., Ltd. (59, 60, 61, 68, 69, 70, 232 and 233) ; Messrs. C. D. Melhuish (240) ; Metro-Vick Supplies, Ltd. (32 and 41) ; Mic Wireless Co. (9) ; the Mullard Radio Valve Co., Ltd. (88, 89, 90, 97, 98, 99, 133 and 267) ; New London Electron Works, Ltd. (45) ; Newton Bros. (Derby), Ltd. (243) ; Oldham and Son, Ltd. (125 and 126) ; the Ormond Engineering Co., Ltd. (138, 162 and 163) ; Messrs. E. Paroussi (272) ; Partridge and Mee, Ltd. (147) ; Messrs. Peto and Radford (67) ; Peto Scott Co., Ltd. (142 and 143) ; Philips Lamps, Ltd. (94 and 122) ; the Portable Utilities Co., Ltd. (144) ; W. G. Pye and Co. (87 and 100) ; R. I. and Varley, Ltd. (56, 73 and 222) ; Radi-Arc Electrical Co. (1927), Ltd. (6) ; Radio Service (London), Ltd. (207) ; Redfern's Rubber Works, Ltd. (123) ; Rees Mace Manufacturing Co., Ltd. (268) ; Regent Radio Supply Co. (62) ; Louis H. Reid and Co. (214) ; Rialton Radio (Prop., H. and S. Scott, Ltd.) (268A) ; Ripaults, Ltd. (24) ; Rooke Bros., Ltd. (76, 77) ; the Sel-Ezi Wireless Supply Co. (12) ; Selectors, Ltd. (23) ; Selfridge and Co., Ltd. (269, 270) ; Sells, Ltd. (246) ; the Shore Manufacturing Co., Ltd. (39) ; Siemens Bros. and Co., Ltd. (164 and 165) ; the Standard Wet Battery Co. (7) ; Messrs. A. W. Stapleton (211) ; A. J. Stevens and Co. (1914), Ltd. (83 and 131) ; Stratton and Co., Ltd. (34) ; the Sun Electrical Co., Ltd. (179 and 180) ; Sylvex, Ltd. (175) ; the Telegraph Condenser Co., Ltd. (121) ; the Telsen Electric Co., Ltd. (5) ; the Tonex Co. (266) ; the Trelleborg Ebonite Works, Ltd. (224) ; the Triumph Cabinet Works, Ltd. (T. H. Cossor and Sons) (205) ; the Truphonic Wireless Co. (134 and 260) ; the Tudor Accumulator Co., Ltd. (249) ; Turner and Co. (234) ; C. A. Vandervell and Co., Ltd. (114) ; Messrs. Walker Bros. (154) ; the Watmel Wireless Co., Ltd. (157) ; the Webb Condenser Co. (124) ; the Western Wireless Co. (262) ; Westinghouse Brake and Saxby Signal Co., Ltd. (78) ; Whiteley, Boneham and Co., Ltd. (120) ; Whittingham Smith and Co. (4) ; Messrs. Wilkins and Wright (153) ; Williams and Moffat, Ltd. (265) ; Wingrove and Rogers, Ltd. (111) ; and Messrs. Wright and Weaire, Ltd. (251 and 252).

# DOMESTIC STANDARDS.

## New Standard Specification for Domestic Equipment.

THE British Engineering Standard Association has just issued a new Specification (B.S. Specification No. 317-1928) for hand-shield and side-entry pattern three-pin wall plugs and sockets (two-pin and earth type) for domestic purposes. This specification is issued at an opportune moment, coming as it does so soon after the discussion at the recent Electrical Contractors' Association Conference at Cheltenham on "Earthing as a Safeguard to the Public." Mr. W. R. Rawlings, in presenting his paper on this subject, urged that three-pin plugs should be used in all parts of a house, since in the average home there was always the possibility of a person making contact between earth and some metal which had become alive due to defective insulation of the wiring system.

The I.E.E. Wiring Regulation No. 96B requires that "if the conditions are such that a person touching any metal liable to become alive should the insulation become defective is liable to be simultaneously making contact with earth, such metal shall be earthed." This new British Standard Specification enables this regulation to be complied with by the provision of a range of standard sizes of three-pin plugs and sockets of such design and robustness as to conform to the best practice in modern wiring installations. The specification is very similar to B.S. Specification No. 73-1927, which deals with 2-pin plugs and sockets. The two specifications are arranged in the same general form and the standard ratings are the same, viz., 2, 5, 15 and 30 A. The principal features of the specification are the fixing of dimensions to secure interchangeability and the fixing of such other dimensions as are necessary in order to secure a reasonable degree of soundness in design and construction. Certain tests are prescribed, such as that for current-breaking capacity, and the materials to be employed in the manufacture of the plugs and sockets are specified. Finally, details are given regarding the dimensions of the gauges to be used by the manufacturer to check the interchangeability of the parts.

The Specification (No. 317-1928) may be obtained from the Publications Department, B.E.S.A., 28, Victoria Street, London, S.W.1. Price 2s. 2d., post free.

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The T.B.T. Electric Co., Ltd., have issued a new booklet dealing with three-phase transformers from 5 to 1 000 kVA. The same company have also published lists No. 38 concerning d.c. motors, No. 39 dealing with a.c. motors, No. 36 describing battery charging rotary converters and motor generators, and list No. 40, entitled "Some Reasons Why."

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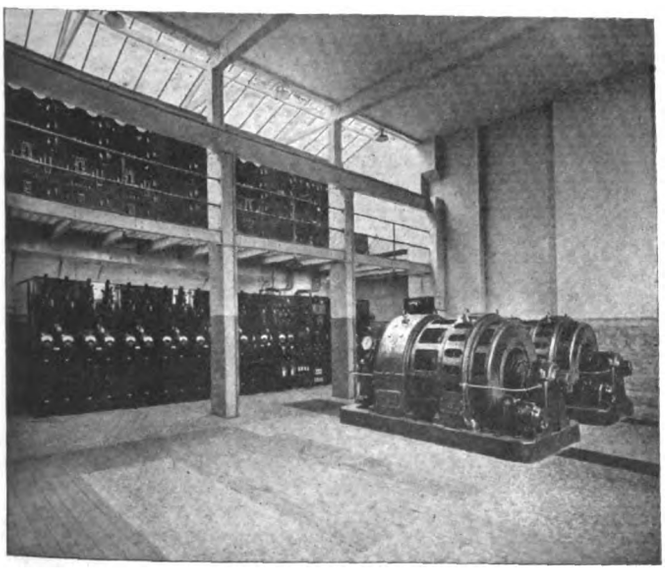
# BATTERSEA EXTENSIONS.

## Surface Condensing Plant at the Lombard Road Generating Station.

CONTINUING our description of the extensions at the Lombard Road generating station of the Battersea Corporation which were opened last month, we give below a detailed account of the condensing and other plant, together with some particulars of the Lavender Hill sub-station.

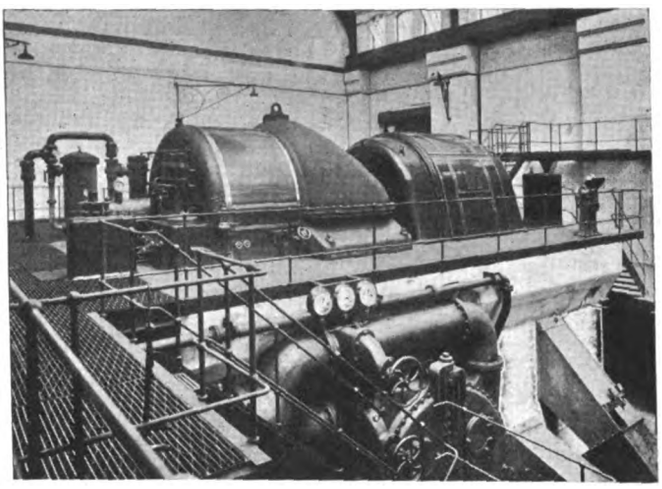
The surface condensing plant was manufactured by Hick, Hargreaves and Co., Ltd., being designed to condense 119 000 lb. of exhaust steam per hr. and maintain a vacuum of 29 in. at the exhaust inlet to the condenser, with a barometric pressure of 30 in. when supplied with circulating water at a temperature of 55 deg. F. The amount of circulating water required is 798 000 gall. per hr., and the cooling surface of the condenser is 14 500 sq. ft. The condenser shell is of circular form, 15 ft. between tube plates, and 8 ft. 6 in. over flanges, with tube plates 9 ft. 2¾ in. diameter; it has a large rectangular exhaust opening of approximately 56 sq. ft. area. The condenser is provided with four supporting feet of ample strength to carry the weight which is taken by spring supports. Adjustment is provided on these supports to enable the load to be taken up uniformly in such a way that the exhaust branch of the condenser is lifted up parallel to the exhaust branch of the turbine. The air and other incondensable gases are withdrawn from the condenser by a "Hick-Breguet" ejectair. The condensate is discharged by the extraction pump, first through an ejector heater, and thence to low pressure and high pressure feed heaters, which are supplied with steam tapped from two branches on the main turbine at absolute pressures of 4·9 and 29·8 lb. per sq. in. respectively. The final temperature of feed at discharge to the hot well is 190 deg. F. From the hot well the condensate passes through a physical de-aerating plant, and thence to the suction of the boiler feed pump. This ensures that, on reaching the boiler, the feed has its oxygen content reduced to less than 0·1 cc. per litre. A fifty-ton overhead electric travelling crane, by Herbert Morris, Ltd., has been installed. It has a span of 68 ft., and is capable of taking an overload of 50 per cent.



The switchboards at the Lavender Hill sub-station.

It is equipped with three d.c. motors, of 25 H.P. capacity for hoisting, 10 H.P. for cross traverse, and 16 H.P. for travelling. The hoisting speed with full load is 5 ft. per min., and with 20 tons, 12½ ft. per min. The crane is also fitted with special slow hoisting control, to give 1 and 2 ft. per min. The crab traverse with full load is 50 ft. per min., and the main bridge travel with full load 100 ft. per min. The light hook speeds with slow gear are 2 ft. per min., either hoisting or lowering. A slow speed traverse of 10 ft. per min. is given with full load, and of 15 ft. per min. with light load. The main travel slow speeds of which the crane is capable are 15 ft. per min. with full load, and 20 ft. per min. with light load.

The extensions to the generating station necessitated increasing the capacity of the circulating water system, and it was decided to arrange for a new intake from the river, the intake being situated at a distance of 300 ft. from the river wall to enable water to be obtained at all states of the tide. A tunnel, 5 ft. internal diameter, was driven to connect the intake chamber with a screen chamber, which is also connected to a suction chamber on the bank of the river. The screen chamber is 15 ft. external diameter; 36 ft. 6 in. deep. In this chamber there are installed two band type screens of F. W. Brackett and Co.'s manufacture, each screen being capable of passing 1½ million gallons of water per hour under minimum immersion conditions. The existing pump-house has been modified



A general view of the new turbo-alternator at the Lombard Road generating station.

to allow for the installation of a pump of Worthington Simpson's make, having a capacity of one million galls. per hour and being driven by an electric motor. The construction of the tunnel, together with suction and screen pits and pipework to the engine room, was carried out by the Foundation Co., Ltd.

The Lavender Hill sub-station is equipped with automatically controlled motor converters, and is laid out to accommodate four 750 kW automatic converters; at present, however, only two of these equipments have been installed. Both machines, with the necessary control apparatus, were manufactured and installed by the General Electric Co., Ltd. The incoming supply is from two 6 600 V feeders, while there are six outgoing feeders supplying a 460-490 V network. The h.t. switchgear is of the steel plate cubicle type. It is situated on a gallery. Inverse time limit overload and reverse power protection is provided. The d.c. switchboard is situated under the gallery. Six of the panels control the outgoing feeders, while on the remainder of the panels is mounted the control relays and protective apparatus for the d.c. side of the motor converters. The control of the outgoing feeders is effected by means of auto-reclose circuit breakers, while the various classes of fault against which the machines are protected are: low a.c. voltage (e.h.t.), broken or reversed phase; a.c. overload (e.h.t.); earth leakage (e.h.t. or l.t.); reversed polarity; faulty start; failure to parallel; failure of field; overspeed; reverse current; and d.c. overload. Should any emergency arise, alternative control methods are provided by means of which the machinery in the sub-station can be manually-operated.

## I.E.E. GOLF COMPETITION.

The Scottish Centre of the I.E.E. announce with regard to the proposed annual golf competition in aid of the Benevolent Fund that it was fully anticipated that the preliminary stages of the competition would have been completed by the end of May. As, however, there were many members who had not had an opportunity of entering owing to pressure of business and the fact that the month was being so much taken up with other important functions, as well as the I.E.E. Summer Meeting in June, it was considered advisable to forego the preliminary stages of the competition and the committee have now decided to hold a one-day competition on September 11th. The competition will be played over East Renfrewshire Golf Course and luncheon will be served at 12.45 p.m., so that the first couple can move off at 2 p.m. Tea will be served at 5.15 p.m., when the winner of the Benevolent Fund Cup will be announced. The winning players of those who have already sent in returns will require to play in this competition.

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# COMPANY NEWS.

## Quiet Market in Electrical Securities—The Cable-Wireless Merger—First Ordinary General Meeting of Electro Trust—Electricity Supply Companies' Dividends—Directors' Reports—New Companies Registered.

BUSINESS in the market for electrical shares—supply, transport, equipment and telegraph—has again shrunk to small dimensions, and few changes in quotations have to be recorded. Cable telegraph shares have receded slightly, Eastern ordinary stock being back at 250. Marconi's Wireless are better, but International Marine have lost last week's improvement. Callenders and Henleys are each 1s. 3d. down; Metro-Vickers at 32s. 6d. have improved 1s. 3d. Yorkshire Electric Power ordinary shares are 6d. up, and London and Suburban Traction "A" debenture stock has risen another point to 85.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927 Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/- | 38/- | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/- | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 47/6 | 47/6 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 25/- | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10⅜ | 10⅜ | 10⅜ | 6/13/9 |
| (c) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 31/6 | 31/6 | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) .. | 27/6 | 27/6 | 52/- | 18/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 35/- | 34/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk... | 120 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb... .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102⅜ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 70⅜ | 70½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 80 | 80 | 98⅜ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 85 | 84 | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101¼ | 49 |
| 5 | ,, ,, 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 67½ | 67½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 75 | 75½ | 66½ | 12½ |
| 4½ | ,, ,, 4% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 25/6 | 25/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord .. | 85/- | 85/- | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109⅜ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/1½ | 28/1½ | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 83/9 | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st. Pref. .. .. | 25/7½ | 26/1½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord... .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/- | 20/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/9 | 28/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 38/6 | 38/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 112/6 | 113 9 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40 - | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 23/9 | 23 9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 32/6 | 31/3 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6 | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½ | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 77½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 250 | 253 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 65½ | 64½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25 | 25⅝ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38 | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 66 3 | 65/- | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 50 - | 51/6 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25 | 25⅛ | 23 | 11/3/6 |

(a) 1s. 7⅞d. per share. (b) £8 8s. 6·66d. per cent. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. ·912d. (g) 1s. 7·223d. ‡Including 1s. bonus.

CHATHAM AND DISTRICT LIGHT RAILWAY CO.—Directors have decided not to pay an intm. div. on pref. shs.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qtrly. div. 44 c. on ord. shs. of no par value notified.

FRENCH PHOTOTONE, LTD.—During last week subscriptions were invited for 600 000 ord. shrs. of 5s. each.

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Intm. div. 3½ p.c. (same as last year) will be payable on Aug. 22.

WAYGOOD-OTIS, LTD.—Intm. div. at rate of 5 p.c. p.a., less tax (same as last year) on ord. shs., will be payable on Aug. 15.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—Div. on common shs. $1¾ p. sh. for qrtr. ended Sept.

TYNESIDE ELECTRICAL DEVELOPMENT CO., LTD.—Intm. div. at rate of 6 p.c. p.a. on pfd. ord. shs., payable, less tax, on Aug. 31.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—Intm. div. at rate of 6 p.c. p.a. (same rate as last year) will be payable on Aug. 14.

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS, LTD.—Intm. div. 2½ p.c., less tax, agst. 1½ p.c. last year, will be payable on Aug. 31.

NORTHERN OHIO POWER AND LIGHT CO.—Regular qtrly. divs. of 1½ p.c. and 1¾ p.c. will be payable on Oct. 1 on the 6 p.c. and 7 p.c. pfd. stk., respectively.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Intm. divs. of 4 p.c. (same rate as last year) on ord. shs. and 2½ p.c. on 5 p.c. pref. shs. are announced.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. of 8d. p. sh. less tax (same rate as last year) on acct. of standard div. on ord. cap., will be payable on Sept. 1.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Intm. divs. at rate 7 p.c. p.a. on 7 p.c. 1st pref. shs., 6 p.c. p.a., on 6 p.c. 2nd pref. shs., and 6 p.c. p.a. on ord. shs., all less tax, payable August 31.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Gross operatg. results for June, 1928, $133 599, increase $6 991; net, $111 967, increase $6 707. Total net earngs. for half year ended June, $652 034, increase $6 154.

ROTHESAY TRAMWAYS CO., LTD.—Receipts for 1927, £19 299, agst. £19 720. After provisn. for exes., including deb. int. and £3 306 for renewals, blce. is £2 355, includg. £1 315 brt. in. Div. on pref., 5 p.c. Fwd., £1 855.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION CO., LTD.—Estim. net earngs. (after deductg. London office exes.) for May, 1928, $19 600 Mexican, inc. $10 800 over May, 1917. Total net earngs. from January 1, $102 000, inc. $94 200.

UNION FINANCIÈRE D'ELECTRICITÉ ET DE TRANSPORTS.—This trust, which has been formed by the Soc. Générale de Belgique, and which has a nom. cap. of 270 000 000 fr., will absorb the Rotterdam Tramways, the Vicinaux Belge, the Sofia (Bulgaria) Tramways, Electricité et Hydraulique, etc.

BRIDGWATER AND DISTRICT ELECTRIC SUPPLY CO., LTD.—A statemt., published for informatn. only, gives particulars of the objects and cap. of the co. The authorised cap. is £130 000, and 52 657 7 p.c. pref. and 19 982 ord. £1 shs. have been issued. All debs. will be paid off on January 31 next.

TYNESIDE TRAMWAYS AND TRAMROADS CO.—Net receipts for half year ended June 30, 1928, £1 116, plus £385 int. from investments, less int. on bank overdraft, and blce. brt. fwd., £81, and £300 transferred from special res. make total £1 882. Deductg. £1 822 int. on mtges., loan, etc., leaves blce. £60. Traffic receipts decreased £1 054.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—A circular sent to sh. and deb. stkhdrs. on Tuesday states that progress to the present date has been satisfactory. Negotiations with Federated Malay States Govt. regardg. supply of power in bulk to the town of Ipoh have been completed, the arrangmts made involving the subscriptn. at par by the Govt. of 75 000 of the unissued ord. shs. of £1 each.

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MONTEREY RAILWAY, LIGHT AND POWER CO.—Deficit for 1927, after paymt. of int. on "A" deb. stk., secured notes, currt. acct., and makg. provisn. for renewals and obsolescence, $94 965, agst. $98 830. Tramway dept. made further progress in revs. and passengers carried, in spite of paving works and jitney competitn. Four additional cars were placed in service in Dec. Light and power dept. reports satisfactory growth in business and economies in fuel consumptn. by new 6 000 kW turbo generator.

COSTA RICA ELECTRIC LIGHT, POWER AND TRACTION CO., LTD.—Net pft. in Mexico for 1927, £23 284. Debit blce. on pft. and loss acct. at Dec. 31, 1926, was £18 632. Deductg. from this the pft. for 1927, after charging all exes. and service of debs., amts. to £938, leavg. a debit blce. on pft. and loss acct. of £17 693. Slight improvemt. in net earngs. in Mexico has been offset by increased exchange losses. Pfts. are still seriously affected by the failure of municipality of Vera Cruz to meet bills for public services.

THE CABLE-WIRELESS MERGER.—The directors of Marconi's Wireless Telegraph Co., Ltd., have issued a copy of a letter which has been sent to an inquirer and which states that there appears to be some misapprehension as to the nature of the scheme for a merger between the company and the Eastern and Associated Cable Cos. The merger proposals do not provide for the liquidation either of the cable cos. or the Marconi co., and the rights of the hldrs. of shs. in the Marconi Co. in a liquidation or winding up do not come into question. An offer will be made by the merger co. to acquire the shares of the cable cos. and the Marconi Co. in exchange for shs. of the merger co.

ENFIELD CABLE WORKS, LTD.—The directors have issued a statement to the effect that they have come to the conclusn. that it is in the co.'s interests that the fin. year should, in future, be made to coincide with the calendar year. The present acc. period will accordingly be extended until Dec. 31 next and will cover 18 mos. Trading since date of the last accts. has bn. of a satisfactory nature and they have, therefore, declared a second intm. div. of 15 p.c. wh. will be payable, less tax, on Aug. 11. This intm. paymt., with the intm. div. of 5 p.c. declared in Feb. last, aggregates a payment at rate of 20 p.c. for the 12 mos. to June 30, 1928, equivalt. to total div. declared in respect of each of three precedg. years on the ord. cap. of £250 000.

BENN BROTHERS, LTD.—Net pft. for year ended June 30, 1928, £44 627, agst. £37 553 for previous year. An allocatn. of £1 500 is again made to leasehold reserve and £10 891 (agst. £10 000)to general reserve. After providg. for div. on the £72 882 pref. cap. created and issued as a bonus of 50 p.c. to the ordinary shhldrs. last year, the directors propose to maintain the ord div. at 17½ p.c. The dfd. cap. of £750 in 1s. shs. created and issued last year receives a div. of 3s. 6d. p. sh. and £19 356 is carried fwd., agst. £18 756 brt. in. In announcing the distributn. of a 50 p.c. bonus in pref. shs. last year, the chairman hinted at the possibility of a lower rate of ord. div. No alteratn. of this kind has proved necessary, and the divs. now recommended are equivalent to 20½ p.c. upon the paid-up cap. of a year ago, the best distributn. ever made by the co.

## Company Meetings.

SWANSEA AND MUMBLES RAILWAY AND PIER CO.—At the annual meeting held last Saturday under the presidency of Mrs. Olga Daniell, the report, which recommended dividends of 4½ per cent. on the preference shares, and 7½ per cent. on the ordinary shares, was adopted. Mr. H. C. M. Daniell, referred to the satisfactory relations prevailing between the company and its tenants, the South Wales Transport Co., and said the electrification of the system was proceeding, and would be completed in a very few weeks. This would be a great benefit to the public as well as the shareholders. At the annual meeting of Swansea and Mumbles Railways, Ltd., which followed, dividends of 4½ per cent. on the preference and 9⅜ per cent. on the ordinary shares were approved.

ELECTRO TRUST, LTD.—Mr. J. M. Balfour, presiding at the first ordinary general meeting last week, said those responsible for the formation of the company felt that the great development presently taking place in the use of electricity should provide many opportunities for a company which specialised in electrical securities, more especially if such a company had Continental affiliations which would enable it to participate in European issues which, not being dealt with in this country, were not generally accessible to British investors. That company was accordingly organised, in the hope that it would provide a medium whereby investors in this country would be enabled to participate in such business. It was decided that they could not do better than associate the company with the Banque pour Enterprises Electriques of Zurich, generally known as the Electrobank. They made a most satisfactory arrangement, by which the bank would offer the company participations in business undertaken by it, and it also acquired for cash a very substantial interest in the company's ordinary stock. A considerable proportion of the profits realised during the period under review had been derived from investments obtained through Electrobank, while others which they still held showed very satisfactory unrealised profits. The whole capital of £300 000 had been issued, and 15s. per preference and ordinary share called up. The balance of profits on completed realisations amounted to £9 000, which, with a balance on premium account of £911, had been carried to capital reserve. They had temporary loans amounting to £95 165. On the credit side, investments at or under cost amounted to £339 624, which was below their present market value. Revenue was £11 955, and net revenue, after deducting management expenses, interest and income tax, was £6 006. Dividends on preference shares amounted to £5 251, leaving a balance of £755, which it was proposed to carry forward. The report and accounts were adopted.

## New Companies.

ANEMOSTAT, LTD.—Cap., £11 500. Mechanical, electrical and consulting engineers, etc. Reg. office: 57, Bishopsgate, London, E.C.2.

MADDOCK AND SONS, LTD.—Cap., £1 000. Electrical engineers, etc. Reg. office: 23, Albany Street, Regents Park, London, N.W.1.

SPAVEN BROS., LTD.—Cap., £500. Electrical engineers and contractors, electricians, etc. Reg. office: 9, Forster Square, Bradford.

BUSWELL AND SWEENEY, LTD.—Cap., £2 000. Electrical and general engineers, etc. Reg. office: 55, Newhall Street, Birmingham.

BRITISH STERNHIDE, LTD.—Cap., £7 000. Manufacturers of rubber insulating materials, etc. Reg. office: 1/3, Stanley Street, Liverpool.

ACME WRINGERS, LTD.—Cap., £100 000. Mechanical and electrical engineers, etc. Reg. office: 97, David Street, Mile End, Glasgow, S.E.

R. F. STEDMAN AND CO., LTD.—Cap., £2 000. Manufacturers and merchants of wireless apparatus, etc. Solicitors: Moore and Shepherd, Bradford.

A. SMETHURST, LTD.—Cap., £100. Electrical and mechanical engineers, etc. Reg. office: St. Michael's Chambers, 126, High Street, Southampton.

MELDONS, LTD.—Cap., £5 000. Manufacturers of and dealers in wireless loud-speakers, wireless accessories, etc. Solicitor: E. Irwin Miller, Walsall.

MEREDITH AND HILL (EXPORT), LTD.—Cap., £100. Electrical and general engineers, etc. Solicitors: R. A. Rotherham and Co., 8, Bailey Lane, Coventry.

WILLIAM G. THOMAS, LTD.—Cap., £1 000. Engineers, manufacturers of wireless apparatus and accessories, etc. Reg. Office: London Road, Kingston-on-Thames.

TAYLOR, WHITING AND TAYLOR, LTD.—Cap., £4 000. To acquire business of electricians carried on by P. Whiting and D Taylor, at Oakes Yard, St. Peter's Street, Derby.

F. H. SOWDEN, LTD.—Cap., £1 000. To acquire business of electrical and mechanical engineer carried on by F. H. Sowden at Silver Cross Works, Alpha Street, Leeds.

UNIQUE FITTINGS, LTD.—Cap., £1 000. Manufacturers of, agents for, or dealers in electrical and other fittings, vacuum cleaners, etc. Reg. office: St. George's Hall, Bradford.

W. H. DIXON AND CO., LTD.—Cap., £5 000. Manufacturers of and agents for lamps of all kinds, electric fittings and stores, etc. Reg. office: 18 and 19, Waterhouse Lane, Hull.

H. B. PARKINSON PRODUCTIONS, LTD.—Cap., £100. Makers and distributors of wireless, telephonic and telegraphic apparatus and accessories, etc. Reg. office: 21, Mincing Lane, London, E.C.3.

SUPER-ELECTRIC HEATERS, LTD.—Cap., £3 000. To acquire business of manufacturers of electrical heating apparatus, etc., carried on by G. W. Close and A. E. Ormondroyd at Lever Street, Wolverhampton.

MAGNETO AND ACCUMULATOR CO. (BIRMINGHAM), LTD.—Cap., £1 000. To acquire business of magneto and accumulator manufacturers, repairers and salesmen now carried on at 227, Broad Street, Birmingham.

HERBERT E. TAYLOR AND CO., LTD.—Cap., £30 000. To acquire business of electrical engineers, fitters, etc., carried on by H. E. Taylor and E. Morse as "H. E. Taylor and Co." Reg. office: 7, Queen Street, Norwich.

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## ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by* GEE AND Co., *Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.***

*Opposition to the registration of the following trade marks can be lodged up to August 11th.*

WEINAF. 490 585. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Aktiebolaget Nordiska Armatur-Fabrikerna (a joint stock company organised under the laws of Sweden), Norrlandsgatam 15, Stockholm, Sweden; manufacturers. April 19th, 1928. (To be Associated, Sect. 24.)

"MEEGAM." 489 054. Class 8. Wireless telephonic apparatus and parts thereof. M. Saragoussi et Cie, 23, Rue Meslay, Paris, France; manufacturers. March 2nd, 1928.

RAJAR. 486 216. Class 13. Electric lamps (ordinary). Amalgamated Photographic Manufacturers, Ltd., 3, Soho Square, London, W.1; manufacturers. November 25th. 1927. (To be Associated, Sect. 24.)

"SELF-REGENEX." 488 724. Class 8. Electric accumulators and batteries. L'Eclairage Portatif Société Anonyme (a joint stock company organised under the laws of France), 33, Rue Madame de Sanzillon, Clichy (Seine), France; manufacturers and merchants February 21st, 1928.

APEX. 489 378. Class 8. Electric cells and batteries (not for medical purposes). Elektro-Chemische Fabrik Alfred Baehr Gesellschaft Mit Beschrankter Haftung (a joint stock company organised under the laws of Germany), 19, Lindowerstrasse, Berlin, N.39, Germany; manufacturers. March 12th, 1928. (By consent.)

MAGNATONE. 491 397. Class 8. Aerials, for use in wireless telephony. Sparklets, Ltd., Prana Works, Angel Road, Upper Edmonton, London, N.18; manufacturers. May 12th, 1928. (To be Associated, Sect. 24.)

MAGNATONE. (Sign.) 491 398. Class 8. Aerials for use in wireless telephony. Sparklets, Ltd., Prana Works, Angel Road, Upper Edmonton, London, N.18; manufacturers. May 12th, 1928. (To be Associated, Section 24.) Registration of this trade mark shall give no right to the exclusive use of the words "Encircles the World," the device of a map of the world, or of the device of a wireless aerial wire.

"THERMALATOR." 490 146. Class 11. Electrically heated applicators, for curative or surgical purposes. William Edward Holder, trading as Thermalator Co., 4, Manchester Street, London, W.1; manufacturer of and dealer in electrical appliances April 4th, 1928.

*Opposition to the registration of the following trade marks can be lodged up to August 18th.*

ASPIROPULSATIT. 492 460. Class 11. Electrical pulso-massage apparatus for surgical or curative purposes. Oreste Sinanide, 53, Sloane Street, London, S.W.1; medical practitioner. June 16th, 1928.

DAVID. (Sign.) 489 428. Class 13. Electric fittings and accessories for heating, lighting, cooking, and cleaning appliances; conduits and conduit fittings; and cooking utensils all being goods of ordinary metal included in Class 13. Chesterton Jones and Co., Ltd., 44 and 45, Littleton Street, Walsall, Staffordshire; manufacturers. March 14th, 1928.

LEWCOS. 484 601. Class 8. Apparatus for use in connection with wireless telegraphy and telephony, but not including accumulators, electric coils, ammeters, voltmeters, fitted electric switchboards, and resistances, and not including any goods of a like kind to any of these excluded goods, and not including cables and flexibles for electrical purposes. The London Electric Wire Co. and Smiths, Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.1; manufacturers. October 4th, 1927. (To be Associated, Sect. 24.)

*Opposition to the registration of the following trade marks can be lodged up to August 25th.*

EDNA.—490 311. Class 6. Electric vacuum cleaning machines, and electric fans, being parts of machinery. George John Whites, trading as the Edna Electric Vacuum Cleaner Co., 91, Moorgate, London, E.C.2; merchant.—April 11th, 1928.

ORION GOLD.—484 650. Class 8. Electrical apparatus, but not including photographic apparatus, enlarging and projecting apparatus, cinematographs or accessories for talking machines, and not including any goods of a like kind to any of these excluded goods. Magyar Wolfram-Lampa Gyar Kremenezky Janos Reszvenytarsasag (a joint stock company organised under the laws of Hungary), VI, Vaci-ut 99, Budapest, Hungary; manufacturers. October 5th, 1927. (To be Associated. Sect. 24.)

DELTA.—489 228. Class 8. Electric dry cells and batteries. Falk, Stadelmann and Co., Ltd., 83 to 93, Farringdon Road, London, E.C.1; manufacturers. March 7th, 1928.

VENUS (Sign.)—489 731. Class 8. Electrical dry batteries. William Stanley Cleland, trading as Cleland and Co., 20, High Holborn, London, W.C.1; importer of electrical goods. March 21st, 1928.

CELEBRITONE.—491 264. Class 8. Gramophones, wireless telephonic instruments and gramophone records. Saul Harris, 15, Great Ducie Street, Manchester; merchant. May 9th, 1928.

PENVILLE.—492 598. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. George Culver, Ltd., Optical Works, White Lion Street, Pentonville, London, N.1; manufacturers. June 21st, 1928.

*Opposition to the registration of the following trade marks can be lodged up to September 1st.*

HYTON. 489 048. Class 8. Apparatus and parts thereof for use in wireless telegraphy and telephony, but not including electric storage batteries and accumulators, and not including any goods of a like kind to any of these excluded goods. Frederick Boyd, 17, Albert Street, London, N.W.1; manufacturer.—March 2nd, 1928.

"LIONIUM." 490 347. Class 8. Rectifiers for a.c. Blackwell's Metallurgical Works, Ltd., The Albany, Oldhall Street, Liverpool; manufacturers.—April 12th, 1928.

STARIC. 490 992. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching, but not including detector crystals. Construction D'Appareillages et Specialities Electriques (a societé anonyme organised under the laws of France), 78, Rue Fondary, Paris, France; and 10 and 12, Ludgate Hill, London, E.C.4; merchants.—May 1st, 1928.

ORALAC. 492 715. Class 1. Varnish for insulating purposes. The London Electric Wire Co. and Smith's Ltd., 7, Playhouse Yard, Golden Lane, London, E.C.1; manufacturers.—June 25th, 1928.

RADIO COMMUNICATION CO., LTD. (Sign). 492 195. Class 8. apparatus for use in connection with wireless telegraphy and telephony. Radio Communication Co., Ltd., 34 and 35, Norfolk Street, Strand, London, W.C.2; manufacturers.—June 7th, 1928.

THISTLE. 491 066. Class 8. Wireless telephonic receiving apparatus. Laurence Bell, 33, George Street, Edinburgh; manufacturer.—May 3rd, 1928. (By consent.)

RUSTON. 490 713. Class 18. Electric lighting plants. Ruston and Hornsby, Ltd., Sheaf Ironworks, Waterside South, Lincoln, engineers.—April 23rd, 1928. (To be Associated. Sect. 24.) Advertised before acceptance, the applicants alleging distinctiveness.

LOZALIT. 492 123. Class 16. Electrical insulators made of baked clay. The Sprenger Corporation, Ltd., 30, Norfolk Street, Strand, London, W.C.2; merchants.—June 5th, 1928.

NONOX.—489 368. Class 18. Electric lighting installations for vehicles, ships, and aircraft. Magnetos Lucifer Société Anonyme (a corporation organised under the laws of Switzerland), Route de St. Julien, 14, Carouge, near Geneva, Switzerland; manufacturers. —March 12th, 1928. (To be associated. Sect. 24.)

SILVASHEEN. (Sign). 487 354. Class 5. Wire. John Rigby and Sons, Ltd., Adelphi Wire Mills, North George Street, Salford, Manchester; wire manufacturers.—January 7th, 1928. Registration of this trade mark shall give no right to the exclusive use of the word "Silvasheen."

## METAL AND CHEMICAL PRICES.

**TUESDAY**, August 7th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 5 0 | — | 5s. od. |
| Electro Wirebars | ,, | £69 5 0 | — | — |
| H.C. Wires, basis | per lb. | 9 15/16 d. | — | — |
| Sheet | ,, | 10 1/8 d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0 15/16 d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2 d. | — | — |
| Sheet ,, | ,, | 9 1/2 d. | — | — |
| Wire ,, | ,, | 9 1/2 d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | 5s. od. | |
| *Lead Pig*— | | | | |
| English | per ton | £22 10 0 | 5s. od. | — |
| Foreign or Colonial | ,, | £21 2 6 | 2s. 6d. | — |
| *Tin*— | | | | |
| Ingot | per ton | £213 7 6 | — | £1 7 6 |
| Wire, basis | per lb. | 2s. 9 1/2 d. | — | 1/2 d. |
| *Aluminium Ingots* | per ton | £95 0 0 | — | 10s. od. |
| *Spelter* | ,, | £24 12 6 | — | — |
| *Mercury* | per bottle | £21 0 0 | 10s. od. | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2 1/2 d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3 1/2 d.
*Rubber*—Para fine, 11 1/2 d.; plantation 1st latex, 9 7/16 d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

### LEAD MARKET REPORT.

James Forster and Co. state the lead market was slightly easier in the week, but firmness again set in on Thursday.

Closing prices on August 3rd were £21 1s. 3d. for August, £2 3s. 9d. for September, £21 6s. 3d. for October and £21 7s. 6d. for November, 3s. 9d. per ton higher on the week.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BENNETT, Leslie Norman, 13, North Street, Herne Bay, radio and electrical engineer. £10 19s. 6d. June 28th.

BYRN, S. H., 14, Queen Street Arcade, Cardiff, wireless dealer. £13 10s. 2d. June 20th.

FORBES (P. N.), LTD., 33, Archway Road, Highgate, electrical engineers. £21 4s. 1d. June 29th.

HAMILTON, H. D. S., 13, Otley Road, Harrogate, wireless dealer. £15 2s. 6d. June 28th.

HARRIS, Edward James, 108, Leahurst Road, Lewisham, wireless engineer. £23 9s. 5d. June 29th.

HERTS RADIO CORPORATION, LTD., 71, Bromsgrove Street, Birmingham, radio engineers. £17 8s. 4d. June 14th.

HOWE, John M., 38, Cathedral House, Long Millgate, Manchester, electrical engineer. £14 4s. June 28th.

HUDSON, J., 182, Undercliffe Street, Bradford, electrical contractor. £19 4s. June 26th.

KINGSMILL ART METAL AND ELECTRICAL CO., LTD., 142B, Fulham Road, South Kensington, electrical engineers. £14 15s. 10d. July 4th.

MAILE, William Henry, 97, High Street, Huntingdon, dealer in wireless parts. £21 5s. 3d. June 19th.

MATTHEWS, Richard, 56, Wigtown Road, Well Hall, Eltham, electrical engineer. £10 2s. June 26th.

MILLS, Frederick Albert, 161, Dudley Road, Birmingham, electrical engineer. £26 10s. June 25th.

ROBINSON, G., 65, Ipswich Street, Stowmarket, wireless dealer. £20 17s. 6d. June 20th.

ROWNTREE (E.) AND CO., 86, Manchester Road, E. 14, electrical contractors. £20 18s. 4d. June 21st.

STRONG, Mr., 6, Narrow Wine Street, Bristol, wireless dealer. £16 13s. 11d. June 22nd.

## Bill of Sale.

HAYES, Herbert John (trading as HERBERT J. HAYES AND Co.), North End Chambers, 78, North End, Croydon, electrical engineer. Dated July 17th, filed July 24th. £215.

## Deeds of Arrangement.

CLAYTON, William Leslie, trading as W. L. CLAYTON AND CO., 66, King Richards Road, Leicester, electrical engineer. Dated July 19th, filed July 24th. Trustee, S. W. Chawner, Allen House, Newarke Street, Leicester, I.A. Liabilities unsecured, £1 088; assets, less secured claims, £747.

DAWSON, Joseph Edward, High Street, and 20 West Street, Boston, wireless engineer. Dated July 27th, filed August 3rd. Trustee, F. Fugill, National Provincial Bank Chambers, Market Place, Boston, C.A. Secured creditors, £1 082; liabilities unsecured, £2 927; assets, less secured claims, £1 793.

FORSHAW, Thomas, 75, Poulton Street, Kirkham, wireless dealer. Dated July 19th, filed July 25th. Trustee, R. O. Griffith, 44, Cannon Street, Preston, I.A. Liabilities unsecured £556; assets, less secured claims, £200.

## Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an*—followed by the date of the Summary, but such total may have been reduced.*]

BERRY'S ELECTRIC (1928) LTD., London, W., electrical engineers. Registered July 21st, £100 000 convertible notes secured by Trust Deed dated July 12th, 1928; charged on a sinking fund to be created out of profits and to be paid yearly to the trustees.

BOWERS AND BARR, LTD., Great Yarmouth.—Registered July 13th, £300 charge to E. V. Barr, 11, Trafalgar Road, Great Yarmouth, amusement caterer; charged on 61, South Howard Street, Great Yarmouth. *——. May 31st, 1927.

BRITISH INSULITE, LTD., Rochdale.—Registered July 12th, £1 000 debenture, to G. N. Hampshire, Guys Cliffe, Deganwy; charged on land and building at Belfield Road, Rochdale; also general charge.

BUDLEIGH SALTERTON ELECTRIC LIGHT AND POWER CO., LTD.—Registered July 10th, £2,000 debenture, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on land at Budleigh Salterton and all other freehold and leasehold property; also general charge. *£5 000. December 31st, 1927.

CHEAP ELECTRIC POWER CORPORATION, LTD., London, E.C.—Registered July 19th, series of debentures for £100 000 present issue, £12 000; general charge; also registered July 19th, series of debentures for £100 000, present issue, £8 000; general charge.

GLANTAWE ELECTRIC SUPPLY CO., LTD., Swansea.—Registered July 10th, £1 000 debenture to T. J. Davies, Maesydere, Abercrave; charged on land and buildings, plant, etc., at Ystradgynlais and Abercrave, also general charge.* £4 000. December 31st, 1927.

HARRIS, WILLIAMS (MANUFACTURERS), LTD., London, E.C.—Registered July 12th, £2 000 debenture, to H. S. Sutherland, Chislehurst, Carmel Road, Darlington, and another; general charge.

HICKS (MONEY), LTD., London, S.W.—Registered July 18th, £400 debentures; general charge.

KEMP (J. T.), LTD., Nottingham, electrical equipment manufacturers. Registered July 19th, £300 debentures, to Clementina M. Kemp, 15, Rolleston Drive, Lenton Sands, Nottingham, widow; general charge.

MAYBROOK ELECTRICAL CO., LTD., London, E.C.—Registered July 17th, £1 000 debenture, to H. L. Faulkner and another, 17, Warham Road, Croydon, merchants; general charge. *£1 000. June 7th, 1927.

THREE SPIRES ELECTRIC, LTD., Coventry.—Registered July 19th, £700 debenture, to F. C. Brown, 54, Kensington Road, Coventry; general charge.

## Satisfaction.

E. G. S. CO., LTD., Newcastle-on-Tyne.—Satisfaction registered July 16th, £6 000 registered October 2nd, 1918.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.*]

DAWSON, J. E., manufacturing radio engineer, High Street, Boston, Lincs. In response to a circular letter issued by Rice, Waite and Marris, solicitors, Boston, a meeting of the creditors of the above was held on August 1st at the Assembly Rooms, Boston. Mr. J. Tait, a creditor for £365 cash advanced, was elected to the chair. Mr. F. Fugill, C.A., of Messrs. Hodgson, Harris and Co., Boston, submitted a statement of affairs which disclosed ranking liabilities of £2 904. Of that amount £2 622 6s. 1d. was due to unsecured creditors and £282 to a partly secured creditor. The latter was the bank, their claim being £349, and as security they held life policies of the estimated surrender value of £67. In addition there was a building society who were creditors for £1 015, and they held a charge on property valued at £1 800. The assets were estimated to realise £1 793, less £23 for preferential claims, leaving net assets of £1 770, or a deficiency of £1 134. The assets consisted of book debts, £253; stock, £600; plant and machinery, £100; life insurance policy, £25; motor car, £30; and surplus from fully secured creditors, £785. It was stated that the debtor started trading in Boston after being demobilised from the Army in 1919. A balance sheet was prepared as at March 31st, 1927, and it showed that the capital account was in credit. The present position was attributed largely to a severe illness which the debtor had last year, which necessitated his being away from the business for about three months. No offer was submitted, and it was decided to confirm the deed of assignment which had already been executed to Mr. Fugill. The following are creditors: Dawson, Mrs., Boston, £470; Handley, —, Boston, £422; Tait, J., Boston, £365; Marconiphone Co., Ltd., £124; Houghton, Butcher and Co., £150; Cook's Wireless Co., Ipswich, £174; Chloride Electrical Storage Co., Ltd., Manchester, £81; Selectors, Ltd. £45; Ellison and Hillman, Leeds, £93; Peck, F., Boston, £41; Webber, J. M. and Co., Ltd., £46; Gilbert, C., and Co., Croydon, £47; Langham Radio Co., London, £29; Accessories Co., Edinburgh, £38; Willowbrook & Co., Birmingham, £34; Hunt, A. H., Hull, £52.

## London Gazette, etc.

### Bankruptcy Information.

GREIG, Alexander, and WISELY, John, trading as the WIRELESS AND ELECTRICAL ENGINEERING CO., 39, Bridge Street, Aberdeen. T. D. Galbraith, Chartered Accountant, 87, St. Vincent Street, Glasgow, has been elected trustee. Creditors' meeting at the office of the trustee, 87, St. Vincent Street, Glasgow, on Tuesday, August 14th, at 11 a.m.

LAY, Oliver Cecil, trading as THE HOME WIRELESS INSTALLATION CO., 2C and 2D, High Street, Wandsworth. First meeting, August 16th, 11.30 a.m., 29, Russell Square, W.C.1. Public examination, October 11th, 11 a.m., Court House, Wandsworth.

### Notice of Dividend.

WITHAM, Percy William, 139, Bournemouth Road, Parkstone, Dorset, electrical engineer. First and final dividend, 4s. 3d. per £, payable August 4th, 102, High Street, Poole, Dorset.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### July 12th.

20 340 H. J. Küchenmeister. Selenium cells. (16/7/27, Germany.)
20 361 R. May. Electrical gramophones etc.
20 251 Midland Metal Spinning Co., Ltd., and F. P. Webster. Electric cooking utensils.
20 285 C. L. Peters and Siemens Bros. and Co., Ltd. Automatic telephone systems.
20 348 H. J. J. M. de Regnauld de Bellescize. Heterodyne receiving systems. (13/7/27.)

### July 13th.

20 434 A. C. Spark Plug Co. Ammeters. (13/7/27, U.S.)
20 432 K. A. R. Bosscha. Tubes for radiography, etc.
20 456 Carborundum Co. Manufacture of carbon electrodes. (19/7/27, U.S.)
20 392 Consulting and Radio Service, Ltd., and N. Turner. Electrical sound-reproducing device.
20 452 F. G. Creed, Creed and Co., Ltd., and R. D. Salmon. Electric telegraph receiving apparatus.
20 420 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
20 414 J. Fiddes. Recording means for electromotors.
20 468 H. G. Hughes, J. S. C. Salmond. Thermionic valves.
20 419 F. H. Johnson and H. C. Turner. Eddy current brake.
20 387 F. W. Lanchester. Winding armatures for dynamos, etc.

### July 14th.

20 524 Butlers, Ltd., and A. Reeves. Electric lamps for vehicles.
20 519 Ceag, Ltd., G.I. Harris and T. Knoyle. Electric safety lamps for miners.
20 495 L. E. T. Evans and E. Harvey. Telephones, etc.
20 510 J. Y. Johnson (I.G. Farbenindustrie A.G.). Production of magnetic cores of high permeability.
20 518 International General Electric Co., Inc. Dynamo-electric machines. (16/7/27, Germany.)
20 542 J. G. Malcolm. Galvanic batteries.
20 516 Metropolitan-Vickers Electrical Co., Ltd. Measurement of electrical quantities. (14/7/27, U.S.)
20 474 M. L. Turner. Electric safety systems for railways.

### July 16th.

20 581 A. E. Angold, F. Barrell, and General Electric Co., Ltd. Automatic control of electric apparatus.
20 631 R. L. Aspden. Tuning devices for radio circuits.
20 583 British Thomson-Houston Co., Ltd. Apparatus for interconversion of mechanical and electrical oscillations. (18/7/27, U.S.)
20 579 H. S. Cowx. Electromagnetic make and break movements, etc.
20 582 H. W. Cron, and General Electric Co., Ltd. Electric coupling devices.
20 615 D. D. M. Eastwood. Electric remote control devices.
20 562 J. A. Franck and F. A. Cortez-Leigh. Current collecting shoe for electric trains.
20 621 E. Gérard. Emergency devices for working plants supplied with electric energy.
20 572 J. F. Gregory and S. A. Walsh. Magnetic intensifying unit for radio reception, etc.
20 594 S. Grey and C. Jarrott. Means of reducing effect of currents on adjacent conductors.
20 614 W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. Electric cut-outs.
20 547 D. Leonard and W. Thomas. Aerial conductors for wireless signalling.
20 637 E. C. R. Marks (Batterien und Elemente-Fabrik system Zeiler Akt.-Ges). Soldering conductors to batteries.
20 636 E. C. R. Marks (International Code Machine Co.). Electric coding machine.
20 569 Metropolitan-Vickers Electrical Co., Ltd. Remote metering systems. (15/7/27, U.S.)
20 619 Metropolitan-Vickers Electrical Co., Ltd., and G. Wall. Electricity meters, etc.
20 546 R. Nettl. Electric lampholders, etc.
20 657 C. R. O'Brien and A. N. D. Smith. Accumulators.
20 573 D. S. S. Steuart. Speaking tubes for telephones, etc.
20 574 D. S. S. Steuart. Telephone receivers.
20 556 Telefunken Ges. fur Drahtlose Telegraphie. Apparatus for ascertaining position of ships. (15/7/27, Germany.)

### July 17th.

20 774 Almeida Accumulators, Ltd., and L. A. Levy. Batteries.
30 715 A. D. Anderson and Weldrics (1922), Ltd. Electrodes for arc welding.
20 761 E. H. B. Anderson and Sir C. A. Parsons. Geared turbine installations.
20 738 British Thomson-Houston Co., Ltd. Electric filter circuits. (19/7/27, U.S.)
20 740 British Thomson-Houston Co., Ltd. Electrical apparatus. (22/7/27, U.S.)
20 741 British Thomson-Houston Co., Ltd. Electric control systems. (26/7/27, U.S.)
20 755, 20,756 Chloride Electrical Storage Co., Ltd., and H. Dean. Accumulators.
20 730 T. C. Christianson, and Metropolitan-Vickers Electrical Co., Ltd. Switchgear.
20 737 C. S. Franklin and E. Green. Aerials for wireless telegraphy, etc.
20 732 W. M. Geary. Electric motor controllers.
20 685 S. J. Harley. Electric distant recording systems.
20 719 Igranic Electric Co., Ltd., and D. Sinclair. Radio receiving apparatus.
20 742 L. Mellersh-Jackson (Soc. Italiana Pirelli). Electric cables.
20 731 Metropolitan-Vickers Electrical Co., Ltd. Vacuum pumping apparatus. (3/8/27, U.S.)
20 725 Steatit-Magnesia Akt.-Ges. Insulators. (20/10/27, Germany.)
20 728 E. Treibmann. Combination electrode for unipolar high frequency curative treatment.
20 676 A. G. Westmoreland. Adjustable brackets for telephones, etc.

### July 18th.

20 850 S. G. Brown. Apparatus for transmission, etc., of sound.
20 825 A. D. Constable and A. E. Frankling. Switches.
20 902 J. Evans. Colour television, etc.
20 844 R. J. Finch, J. and E. Hall, Ltd., and F. H. Pernet. Electric control devices.
20 806 H. D. Fitzpatrick (Maatschappij tot Vervaardiging van Berkeli Patenten van Andere Verktuigen). Electric welding.
20 856 D. E. C. Foster, S. H. Munro, and W. White and Co. Switches.
20 891 C. S. Franklin. High frequency feeders, etc., for radio aerial systems.
20 875 O. Gerhardt. Electrical apparatus for generating high frequency currents.
20 843 J. and E. Hall, Ltd., and F. H. Pernet. Starting switches for motors.
20 905 B. Hesketh. Loud speakers.
20 906 B. Hesketh. Switches.
20 873 L. Mellersh Jackson (Soc. Italiana Pirelli). Electric cables.
20 894 Metropolitan-Vickers Electrical Co., Ltd. Electric circuit interrupters. (27/7/27, U.S.)
20 895 Metropolitan-Vickers Electrical Co., Ltd. Elastic fluid turbines.
20 883 L. M. Myers. Television.
20 830 Oliver Pell Control, Ltd. Swivelling supports for sound producing devices.
20 815 F. R. Pendergast, S. E. Sheerman, and United Electrical Co. (Birmingham), Ltd. Electric fuse units.
20 816 C. P. Seckham. Electric junction boxes.
20 907 J. G. Simpson. Oscillatory circuit.
20 889 G. Somajni. Motor control systems. (19/7/27, Italy.)
20 827 G. F. A. Stone. Contact plugs, etc.
20 881 A. F. Sykes. Electrodeposition of metals, etc.
20 904 P. D. Tyers. Method of deriving d.c. from a.c.

### July 19th.

20 923 M. I. Cobley and J. E. Fisher. Instrument for finding ship's position at sea.
20 904 Federal Telegraph Co. Phonograph and pick-up apparatus. (5/11/27, U.S.)
20 936 W. P. Fraser and S. C. W. Smith. Switches.
20 971 I.G. Farbenindustrie Akt.-Ges. Production of magnesium by fusion electrolysis. (15/2/28, Germany.)
20 973 Keller Mechanical Engineering Corporation. Electrical control of planers, etc. (19/7/27, U.S.)
20 989 P. Lepine. Apparatus for electric farming, etc. (19/7/27, France.)
21 012 Marconi's Wireless Telegraph Co., Ltd. Transmission systems for signalling systems. (20/7/27, U.S.)
20 991 E. C. R. Marks (Apex Electrical Manufacturing Co., Ltd.) Clothes washing machine.
20 972 Maschinenfabrik Oerlikon. Limit current relays for controlling switching operations. (19/8/27, Switzerland.)
20 956 J. Neale. Railway signalling, etc.
21 011 F. Pavlan. Variable condensers. (21/1/28, Austria.)
20 961 G. D. Powell. Apparatus for electrical reproduction of gramophone records, etc.
20 993 Trico Products Corporation. Antenna. (27/7/27, U.S.)
21 030 P. D. Tyers. Portable wireless receiving apparatus.

### July 20th.

21 085 Associated Telephone and Telegraph Co. Telephone systems. (17/3/27 U.S.)
21 106 E. W. Baker, and Tyer and Co., Ltd. Electric interlocking for railway signalling systems, etc.
21 143 W. E. Beatty (Bell Telephone Laboratories, Inc.). Motion picture and sound reproducing apparatus.
21 129 W. E. Beatty (Bell Telephone Laboratories, Inc.). Vibration damping devices.
21 034 C. H. Brown and C. C. Woollard. Electrically controlled life-saving apparatus for bathrooms.
21 097 W. H. Egginton, J. Lucas, Ltd., and O. Lucas. Motor vehicle electric lamps.
21 100 E. Flegler and W. Ragouski. Cathode ray oscillographs. (1/8/27, Germany.)
21 101 E. Flegler and W. Ragouski. Cathode ray oscillographs. (22/7/27, Germany.)
21 108 O. Fulton. Electrical transmission of pictures, etc.
21 117 O. Fulton. Control of electric current impulses for remotepicture transmissions, etc.
21 086 International General Electric Co., Inc. Insulators. (20/7/27, Germany.)
21 087 International General Electric Co., Inc. Elastic fluid turbines. (21/7/27, Germany.)
21 088 International General Electric Co., Inc. Plugs for electrically heated apparatus. (21/7/27, Germany.)
21 136 E. Kelsen. Electrolytic manufacture of metal sheets, etc. (25/7/27, Austria.)
21 098 J. Lucas, Ltd., and O. Lucas. Motor electric vehicle lamps.
21 120 Metropolitan-Vickers Electrical Co., Ltd. Vacuum light seals. (30/7/27, U.S.)
21 060 A. W. Newland and J. Sabel. Electric water heater.
21 091 J. R. Pullon. Electric light holders.
21 095 Schiele and Bruchsaler Industriewerke Akt.-Ges. Releasing device for electric switches. (20/7/27, Germany.)
21 064 T. S. Spillman. Telephone systems.
21 090 L. Thurm. Optical device for radio kinematographic transmitting apparatus. (21/7/27, France.)

### July 21st.

21 172 W. S. Beatty (Bell Telephone Laboratories, Inc.). Synchronous motors.
21 205 J. W. Coldman. Electric lift.
21 208 O. I. H. Ekman, and Telefonaktiebolaget L.M. Ericsson. Automatic circuit breakers for fire alarm systems.
21 201 G. W. M. Fletcher. Devices for actuating electric switches.
21 206 General Electric Co., Ltd., and T. E. Ritchie. Mounting for electric light reflectors.
21 209 A. E. Honey and J. Stone and Co., Ltd. Electric lighting installation for railway vehicles, etc.
21 146 A. Horstmann and Horstmann Gear Co., Ltd. Time switches.
21 181 Landis and Gyr Soc. Anon. Induction measuring instruments. (30/8/27, Switzerland.)
21 166 M. Urbinati. Transformers. (25/7/27, Italy.)

### July 23rd.

21 324 J. Anderson. Treatment of electric cables.
21 264 P. Baxter. Electrical reproduction of talking machine records.
21 241 F. F. and J. J. Brewer. Blocks for electric switches, etc.
21 271 British Thomson-Houston Co., Ltd., J. H. Butcher, A. P. Young, and L. B. Ault. Apparatus for reproducing and transmitting sound.
21 272 British Thomson-Houston Co., Ltd., and L. B. Ault. Diaphragms for acoustic devices.
21 289 L. E. Currah, Igranic Electric Co., Ltd. Television apparatus.
21 330 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
21 337 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric fuses.
21 213 L. Eglinton. Illuminating road surfaces, etc.

## Coming Events.

### Monday, August 13th.

Electrical Contractors' Association (Hastings Sub-Branch).—Ordinary meeting.
Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 7 *p.m.*

### Tuesday, August 14th.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.
Electrical Contractors' Association (Leicester Branch).—Corridor Chambers. 2.30 *p.m.*

### Wednesday, August 15th.

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Our Overseas Trade.

THE steady progress in British overseas trade which has been a feature of the Board of Trade returns during the past few months was continued during July, both imports and exports showing expansion. The figures for the seven months of the year under review also show a general improvement in trade, exports having increased by £17 654 796, while imports have declined by nearly £10 000 000. The latest value of British exports for the month was £60 885 097, or £1 412 609 higher than June, and an increase of £4 763 966 when compared with the corresponding month of last year. Imports, on the other hand, totalled £95 468 408, a decrease of £3 901 018 on the figures for the previous month, but an advance of £2 086 128 when compared with July of last year. The largest single increase in exports for the month was for vehicles, under which head are grouped locomotives, ships, motor cars and aircraft. For these an advance of £2 132 614 was shown over the corresponding month a year ago. Nothing occurred during the month to arrest the downward movement of our coal exports, which, both as regards quantity and value, were slightly lower than the June totals; in seven months there has been a decline of £5 846 564, as compared with the corresponding period of 1927. On the electrical side, details of which, as given in the Board of Trade returns, are published elsewhere in this issue, exports for July, 1928, show a decline when compared with July, 1927, the decrease amounting to £10 533. This drop, though disappointing, perhaps, is recompensed by the fact that the total electrical exports for the seven months of the year under review show an increase of £24 636 over the total for the same period of 1927. Imports of electrical goods and apparatus during July, 1928, also increased when compared with the same month a year ago, the figures being £39 305. The true position of our electrical overseas trade is shown, however, by a balance of £7 337 480 in favour of exports over imports for the seven months of this year. Taking into consideration the fact that this time of the year is invariably a somewhat inactive one so far as the electrical industry is concerned, these figures, though they might be better, are, at any rate, fairly satisfactory.

## Electrical Progress in Austria.

THE exploitation of Austrian water power on a large scale was the subject of serious consideration before the war, but it encountered opposition from the coal fields of the former monarchy, that is, the territories which at present constitute Czecho-Slovakia and Poland. After the war and the dissolution of Austria-Hungary, conditions were changed. The coal-producing provinces became foreign countries and what was formerly domestic trade became foreign trade, consequently Austria is now endeavouring to use its water-power for the generation of electricity. To this end it is estimated that the available water power can be utilised to the extent of 3 374 000 mean annual turbine horse power, of which only about 18 per cent. was developed at the end of 1927. At the end of that year there were fifteen stations under construction, having an estimated output of 548 400 000 kWh, while the maximum annual output from the 218 existing stations was 2 246 100 000 kWh. Considerable progress has also been made in distribution, the total h.t. transmission lines amounting to 10 239 km in 1927, compared with 2 712 at the end of 1918. With so much progress being made the opportunities for business in heavy and other electrical plant are many. It is true that German manufacturers are showing considerable interest in these developments, and in some instances financing hydro-electric development schemes, but nevertheless, even accepting this competition, the opportunities afford a very good outlet for British electrical exports.

## Electrical Aid for the Blind.

ONE of the most gratifying accomplishments of electrical engineering is the aid which it can give to the blind. Probably the most well-known service is that of broadcasting, but we learn from the "Literary Digest" that the whole field of literature may now be opened to the blind by the invention of an electrical device whereby printed letters are interpreted in the form of sounds. The device, called the "Visograph," is based upon the characteristic of the selenium cell. A book is held in a mechanical holder and an electrically-generated ray about $\frac{1}{1000}$ of an inch in diameter is projected upon the page. The ray can be moved along at the will of the operator. The selenium cell is the main feature of the device. When the light ray is on the white paper, an electric current flows through the apparatus, causing a buzzing to be emitted by a loud-speaker. When the ray strikes the black of the type, the current ceases. Upon the light ray depends a pantograph, similar to that used by architects and sculptors, geared so that a steel rod at its end travels four times the distance covered by the light ray. Under this rod are several aluminium strips, forming the ground on which the rod "writes." The blind reader draws the pantograph over the strips, and by alternating silence and buzz, feels out the shape of the



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letter, progressing then to the next, and so on to the end of the line.

## A New Objection.

OBJECTIONS other than those with respect to overhead lines are few and far between, but notwithstanding this fact, our attention has been drawn to one appertaining to the erection of transformer stations and their possible effect upon wireless reception. The transformers are to be erected in South County Dublin for distribution of current under the Shannon Electricity Supply Scheme, and a correspondent to the Irish daily Press points out that the presence of such transformers "will be likely to make wireless reception impossible to listeners in the vicinity of such stations." It is further pointed out that the better and more costly the wireless receiver, the more certain it is to be affected, and the greater the distance at which it will be likely to pick up the disturbing impulses. We know that in a few cases where a.c. eliminators are used in conjunction with receivers incorporating low-frequency transformers, a certain amount of "hum" can sometimes be heard as a background, but we have not yet experienced any difficulty in regard to transformers. In fact, installing a modern multi-valve set near to a transformer station for purposes of test produced no appreciable hum whatsoever. Though it is not impossible for a.c. ripple to be super-imposed on broadcast reception as a result of the presence of a transformer station in the vicinity of the receiver, it is, nevertheless, too broad a statement to accept that all transformer stations "will be likely to make wireless reception impossible." To the non-technical public such remarks may be accepted without question, and are, in consequence, likely to prejudice their views with respect to the Shannon or any other electricity scheme.

## B.I.F. Date Unchanged.

WHILE we are glad to hear that next year's British Industries Fair is to be even larger than last year, and that most of the additional accommodation is already let, we believe we reflect the opinion of many of our readers when we express regret that the authorities have not seen fit to alter the date from February to a more suitable month. A good deal was heard during February of the Fair Committee's decision to take a referendum upon the subject, but so far we have heard nothing of the result, unless we are to assume from the recent announcement that next year's Fair is to be held on the usual date, that it showed a majority favouring a continuation of the existing arrangements. Meanwhile this country, and the continent of Europe generally, is thronged with overseas visitors, few of whom would ever come here in February. The continental countries are taking advantage of these visits and, starting with this month and continuing until October, there is a string of trade fairs which will certainly attract many buyers who will not patronise the British Fair.

## Refrigeration and Pure Food.

RECENT cases of illness attributed to tainted food have aroused widespread interest, and the new pure food regulations, which prohibit the use of preservatives, have come in for a good deal of blame for some of the epidemics that have broken out in various parts of the country. Is it right, though, to blame the food laws? When this legislation was introduced it was intended that traders handling perishable foodstuffs should be responsible for their delivery to the public in a fresh condition. For this to be accomplished without the use of preservatives obviously meant that foods liable to deteriorate must be kept in refrigerators right up to the time of sale to the housewife. Now, as we have pointed out before, the average housewife regards electric refrigerators as a luxury article, and fails to see in any case how food purchased only a few minutes before it is required to be cooked need be stored in a domestic refrigerator. It is difficult to blame her for taking this view, and to get her to change it will require a long period of educative publicity. But surely someone is to blame for the large amount of tainted food that has been in evidence during the warm weather this year. In our opinion it is the retailer of perishable foods who is chiefly to be blamed. His wholesale sources of supply have in most cases regularly employed some form of refrigeration for many years, but to large numbers of retailers refrigeration is still as much a novelty as it is to the average housewife. The recent refrigerator campaign may have led to some improvement in the retail field but it is obvious that many tradesmen who should have refrigerators are still without them. This, then, is the angle from which we may attack the twin problem of selling more electric refrigerators and ensuring that the public shall not be able to buy tainted food.

## Compulsory Apprenticeship.

THOSE who share our views as to the desirability of having a proper indentured apprenticeship system applied to all boys entering the electrical contracting trade will learn with interest of recent legislation in Ontario which provides that no person may enter into any contract of apprenticeship in the electrical trade except in accordance with the provisions of the Apprenticeship Act, and that no minor shall be employed in the electrical trade for a period longer than three months, except under a contract of apprenticeship. Although we in this country would like to see the principle enforced from within the trade, and without Government assistance or interference, the actual training and management of the Canadian apprentices will be in the hands of local joint trade committees. The general organisation and management of the Act is vested in an inspector, whose duty it will be to register each boy, to see that both employer and apprentice are obeying the law, to establish a permanent system of training of apprentices, and to collaborate with educational authorities. Uniform apprentice indentures are used, and a transfer principle is applied where employers have not sufficient work to keep apprentices employed, or when it is necessary to transfer an apprentice to give him training in branches of the trade not provided for by the employer to whom he may be indentured. A period of intensive training in trade practice in the technical schools is provided during the indenture period. When the scheme is in full operation the money for paying the boys during their school training will be drawn from a fund for which all employers will be assessed under the Workmen's Compensation Act.

## "Ack-Acks" in the Air Raids.

READERS in London and other parts of Southern England will have been much impressed this week with the intense aerial activity which has characterised the R.A.F. manoeuvres. Engagements between aircraft, some defending and others attacking vulnerable points, have been visible to the public on a scale never before attempted and it is not unnatural that the spectacular nature of these encounters should hold the interest to the exclusion of other vital, but less obvious activities. First among these comes, of course, the defensive ground organisation provided by units of the London Electrical Engineers (R.E.). Without this essential service defensive 'planes would never have knowledge of impending attack in sufficient time to ward it off, nor would they have reliable information as to the position and direction of movement of enemy aircraft. The anti-aircraft gunners, too, would be without a target in the absence of the searchlight companies whose pencils of light seem so unerringly to pick out aeroplanes out of the blackest sky. Some weeks ago, in giving details of some of the ingenious electrical equipment used by the London anti-aircraft units of the Territorial Army, we mentioned that a number of vacancies still exist for suitable recruits from the electrical industry. The excellent work done this week by the London Electrical Engineers guarantees to prospective applicants a job that is of real interest and is at the same time of prime national importance.

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# THE COMPLEX NUMBER AND ITS USE IN ELECTRICAL THEORY.

## Algebraic Derivations as Probable Cause of Difficulties in Calculation—Advantages of Trigonometrical Considerations—An Attempt at Mental Conception of the Complex Number.

By G. WINDRED.

IN the majority of mathematical text books which contain reference to complex numbers the subject is approached from algebraical considerations concerning the theory of biquadratic residues. There is, however, another conception of the subject, which will be followed in the present paper, which has a trigonometrical basis and is discussed in certain text books on higher trigonometry. The latter method of approaching the subject has the distinct advantage, for purposes of the present kind, that it allows of a conception of the spatial relations portrayed by complex numbers, and hence assists in abstractions from the fundamental principles.

It is probably the algebraic derivation mentioned above which is responsible for the difficulties sometimes experienced in the manipulation of equations containing complex terms. In any event, it is evident that this elegant method of analysis has been much neglected, from the view-point of its inclusion in the realm of applied mathematics. The present paper is intended as an introduction to the application of the theory, and is of necessity in the present instance limited to electrical considerations, from which however the general applications become apparent.

The majority of text books on applied mathematics in electrical theory or general physics include some reference to complex quantities. Such references are, however, almost invariably intended simply as an introduction to the use of conjugate functions, which are of great importance in connection with problems in two dimensions, such as, for example the determination of equipotentials and stream lines in problems in hydrodynamics and electromagnetic theory.

In the more elementary works, where a more detailed account of the theory of complex quantities might reasonably be expected, there is very rarely any reference to the subject, in spite of the reputed intermediary nature of such works between the popular type of exposition and the standard mathematical text books.

As a consequence of these conditions, the whole subject of complex representation is invested in the majority of cases with an undue amount of obscurity, which robs it of very numerous applications in the branches of electrical theory with which the present paper is chiefly concerned; namely, the solution of electrical problems in two dimensions, and the establishment on *a priori* grounds of the arguments leading to these solutions.

### The Complex Quantity.

Every combination of symbols can be explained, and everything explicable is a line of definite length and direction, and every such line can be represented by $p+q\sqrt{-1}$.—DE MORGAN.

The sweeping generality of this statement is in itself sufficient to indicate the wide range of its applications. We proceed in an attempt to establish an accurate *mental conception* of the complex number, derived from the fundamental principles of the vector, or directed quantity.

In the well-known Cartesian system of co-ordinates two real variables are necessary to specify the magnitude and space location of a directed, or vector, quantity; one variable being in the $x$ axis and the other in the $y$ axis. In this system the magnitude, or argument, of the vector is given by the relation $A=(x^2+y^2)^{\frac{1}{2}}$, while its angular displacement from the $x$ axis or its amplitude, is expressed by $\theta=\tan^{-1}y/x$.

Since the $x$ and $y$ components of the vector are at right-angles in the Cartesian system, a further method of locating the vector becomes apparent: the $y$ component may be regarded as measured from the point of termination of the $x$ component in the $x$ axis and at right-angles thereto.

If, therefore, this rotation of the $y$ component through one right-angle can be algebraically specified, then the vector is completely represented by an equation of the form

$$A=x+jy \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The symbol $j$ in this expression thus serves to indicate that the $y$ component of the vector is directed at right-angles to the remaining term. It also signifies that the addition of the $x$ and $y$ components is vectorial and not algebraic.

We observe, therefore, that $j$ is an operator, or versor, which, when applied to any real variable, rotates it through one right-angle in a positive direction. Conversely, $-j$ may be taken as representing a displacement of any real variable to which it is applied through one right-angle in a negative direction.

The term "imaginary" has, somewhat unhappily, been applied to the quantity $j$, which, as we shall shortly proceed

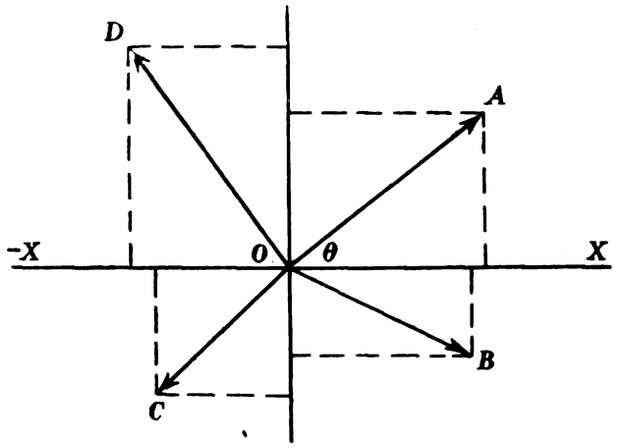


Fig. 1.

to show, is equivalent to the algebraic quantity $\sqrt{-1}$; denoted in most mathematical text books by the letter $\iota$ or $i$, connoting "impossible" or "imaginary." If the matter is considered correctly, however, it becomes apparent that this terminology is inaccurate, in view of the fact that any criterion of mathematical possibility or otherwise must be with reference to the appropriate mathematical domain.

The realm of the complex number, involving the operator $j$ may be regarded as two-dimensional with respect to ordinary algebra; hence its nature permits of operations which, with respect to the domain of ordinary algebra, are "impossible."

If the equation (1) be multiplied by $-1$ there results

$$-A=-x-jy, \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

representing a vector of the same magnitude as that expressed by equation (1) but having an exactly opposite direction. The effect of multiplying by $-1$ is therefore a rotation through two right-angles. As we have taken $j$ to indicate a rotation through one right-angle it is now evident that $-1=j^2$, or two successive applications of the operator $j$.

The co-ordinate system of Fig. 1 allows of the complete representation of any of the four possible forms of vector in the Cartesian system: thus from the figure

$$\begin{aligned} OA &= x+jy \\ OB &= x-jy \\ OC &= -x-jy \\ OD &= -x+jy \end{aligned} \quad . \quad . \quad . \quad (3)$$

from which it is seen that the application of the operator $j$ to any vector results in its displacement through one right-angle, for if we take the vector $A$ and apply $j$ to it, we obtain

$$jA=jx+j^2y=jx-y, \text{ since } j^2=-1 \quad . \quad . \quad . \quad (4)$$

similarly,

$$jB=jx-j^2y=jx+y, \text{ since } -j^2=+1 \quad . \quad . \quad (5)$$

If we reverse the sign of the operator, we have

$$-jA=-jx-j^2y=-jx+y \quad . \quad . \quad . \quad . \quad (6)$$

$$-jB=-jx+j^2y=-jx-y, \text{ etc.} \quad . \quad . \quad . \quad (7)$$

From these operations, the significance of $j$ is completely specified.

Referring to the vector $A$ in Fig. 1, we have by trigonometry, $x=A\cos\theta$, $y=A\sin\theta$, so that equation (1) may be rewritten

$$\begin{aligned} OA &= x+jy=A\cos\theta+jA\sin\theta, \\ \text{or} \quad & A(\cos\theta+j\sin\theta), \end{aligned} \quad . \quad . \quad . \quad (8)$$

which is an alternative form of the complex number. It will

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be observed that in this expression $OA$ and $A$ have equal scalar values, but $OA$ is a vector and $A$ an ordinary number.

We have, from equations (8) expressions for the complex number in both Cartesian and Polar co-ordinates. We next consider the third possible method of expressing the complex number, by means of an exponential form.

## An Example.

It is shown in text books on algebra, e.g., Chrystal's "Algebra" that, when $\varepsilon$ is the base of natural logarithms,

$$\varepsilon^{bx}=1+bx+\frac{b^2}{\underline{2}}x^2+\frac{b^3}{\underline{3}}x^3+\frac{b^4}{\underline{4}}x^4+, \quad . \quad . \quad . \quad (9)$$

and also from trigonometry,

$$\sin\theta=\theta-\frac{\theta^3}{\underline{3}}+\frac{\theta^5}{\underline{5}}- \quad . \quad . \quad . \quad ,$$

$$\cos\theta=1-\frac{\theta^2}{\underline{2}}+\frac{\theta^4}{\underline{4}}- \quad . \quad . \quad . \quad ,$$

By substituting the corresponding series in the polar form of equation (8) we obtain

$$x+jy=A\left(1-\frac{\theta^2}{\underline{2}}+\frac{\theta^4}{\underline{4}}- \quad . \quad .\right)+j\left(\theta-\frac{\theta^3}{3}+\frac{\theta^5}{\underline{5}}- \quad . \quad .\right) \quad . \quad .(10)$$

If, in the exponential series given by equation (9) we replace $bx$ by $j\theta$, there results

$$\varepsilon^{j\theta}=1+j\theta+\frac{j^2\theta^2}{\underline{2}}+\frac{j^3\theta^3}{\underline{3}}+\frac{j^4\theta^4}{\underline{4}}+ \quad . \quad . \quad ,$$

which, from our definition of $j$ may be written

$$\varepsilon^{j\theta}=1+j\theta-\frac{\theta^2}{\underline{2}}-\frac{j\theta^3}{\underline{3}}+\frac{\theta^4}{\underline{4}}+ \quad . \quad . \quad ,$$

from which, by grouping real and imaginary terms

$$\varepsilon^{j\theta}=\left(1-\frac{\theta^2}{\underline{2}}+\frac{\theta^4}{\underline{4}}-\frac{\theta^6}{\underline{6}}+ \quad . \quad .\right)+j\left(\theta-\frac{\theta^3}{\underline{3}}+\frac{\theta^5}{\underline{5}}-\frac{\theta^7}{\underline{7}}+ \quad . \quad .\right),$$

which is seen to be identical with the bracketed portion of equation (10) so that we have the important result

$$\varepsilon^{j\theta}=\cos\theta+j\sin\theta \quad . \quad . \quad . \quad . \quad . \quad (11)$$

This result is due to Euler, and together with De Moivre's theorem is considered as one of the most important results of modern mathematical analysis. The principle leads to the theorem that:

*Every number may be expressed in the form $r\varepsilon^{j\theta}$, where $r$ is the modulus and $\theta$ the argument of the number in its trigonometric form,*

from which its mathematical importance may be judged.

At this stage it is instructive to collect together the identities which have so far been established for the complex number.

If $A$ is the vector specified by $(x, y)$, or $(r, \theta)$, we have from equation (1),

$$\left.\begin{array}{ll} & \mathbf{A}=x+jy, \\ \text{from eq. (8),} & \mathbf{A}=A(\cos\theta+j\sin\theta), \\ \text{and from eq. (11)} & \mathbf{A}=A\varepsilon^{j\theta} \end{array}\right\} \quad . \quad . \quad (12)$$

For the case in which the imaginary component of the vector lies in a negative quadrant, it is easily established that the corresponding values are, respectively

$$\left.\begin{array}{l} \mathbf{A}=x-jy \\ \mathbf{A}=A(\cos\theta-j\sin\theta), \\ \mathbf{A}=A\varepsilon^{-j\theta} \end{array}\right\} \quad . \quad . \quad (13)$$

The foregoing equations (12) and 13) are thus seen to be merely representative of the different available methods of denoting the complex number, and it is evident that each of these methods is suited to a particular realm of application.

## The Algebra of Complex Quantities.

In the limited space at present available it would be impossible to give a comprehensive account of the numerous theorems which exist concerning the complex number and its properties. It will, however, be necessary to recapitulate the most important of these theorems in a manner suited to the future scope of the paper. The theorems of present importance are those relating to the processes of addition and subtraction, multiplication and division, and the law of indices.

If we take the complex number $x+jy$, as defined by equation (1) and add thereto the quantity $a+jb$, we obtain

$$(x+jy)+(a+jb)=x+a+j(y+b) \quad . \quad . \quad . \quad . \quad (14)$$

which is also a complex number, having a real component $x+a$, and an imaginary component $y+b$.

By subtracting $a+jb$ from $x+jy$ there results

$$(x+jy)-(a+jb)=x-a+j(y-b) \quad . \quad . \quad . \quad . \quad (15)$$

and in general, we have—

DEF. I. *The sum or difference of two or more complex numbers is a complex number having a real component, equal to the sum or difference of the real components, and an imaginary component equal to the sum or difference of the imaginary components of the complex numbers.*

If we multiply the complex numbers $x+jy$ and $a+jb$ we obtain

$$(x+jy)(a+jb)=ax+jya+jbx+j^2by=ax-by+j(ya+bx). \quad (16)$$

It is instructive to perform the same operation after expressing the component numbers in the form of equation (11) thus: $x+jy=r\varepsilon^{j\theta_1}$, $a+jb=s\varepsilon^{j\theta_2}$. We have then

$$(x+jy)\,(a+jb)=r\varepsilon^{j\theta_1}\cdot s\varepsilon^{j\theta_2}=rs\varepsilon^{j(\theta_1+\theta_2)} \quad . \quad . \quad (17)$$

which, from equation (11) may be written

$$rs[\cos(\theta_1+\theta_2)+j\sin(\theta_1+\theta_2)].$$

Proceeding as in ordinary algebra, we find

$$(x+jy)(a+jb)=r\,(\cos\theta_1+j\sin\theta_1)s(\cos\theta_2+j\sin\theta_2) \quad . \quad (18)$$

which is evidently the polar equivalent to the exponential form of the product as expressed in equation (17).

The case of division is subject to a similar demonstration. For instance, if we put

$$\frac{x+jy}{a+jb}=\frac{r\varepsilon^{j\theta_1}}{s\varepsilon^{j\theta_2}},$$

we know from the ordinary algebraical laws of indices, that the equation may be rewritten in the form

$$\frac{x+jy}{a+jb}=\frac{r}{s}\left[\varepsilon^{j(\theta_1-\theta_2)}\right]=\frac{r}{s}\left[\cos(\theta_1-\theta_2)+j\sin(\theta_1-\theta_2)\right] \quad (19)$$

## In the case of Algebra.

Proceeding now as in algebra, we would find that upon rationalising by means of the factor $a-jb$ there results—

$$\frac{x+jy}{a+jb}=\frac{(x+jy)\,(a-jb)}{a^2+b^2}$$

On simplifying the numerator we have

$$\frac{ax+yb+j(ya-bx)}{a^2+b^2}=\frac{ax+yb}{a^2+b^2}+j\frac{ya-bx}{a^2+b^2}.$$

From which, by separating reals and imaginaries, it is found from equation (19) that

$$\frac{r}{s}\cos(\theta_1-\theta_2)=\frac{ax+yb}{a^2+b^2},\ \frac{r}{s}\sin(\theta_1-\theta_2)=\frac{ya-bx}{a^2+b^2},$$

and it follows that since $a^2+b^2=s^2$,

$$r\cos(\theta_1-\theta_2)=\frac{ax+yb}{(a^2+b^2)^{\frac{1}{2}}},\ r\sin(\theta_1-\theta_2)=\frac{ya-bx}{(a^2+b^2)^{\frac{1}{2}}} \quad (20)$$

The foregoing equations lead to the following theorems:

DEF. II.—*The product of two complex numbers is a complex number whose modulus is the product of the moduli and whose argument is the sum of the arguments of the complex numbers.*

DEF. III.—*The quotient of two complex numbers is a complex number whose modulus is the modulus of the dividend divided by the modulus of the divisor, and whose argument is the argument of the dividend diminished by the argument of the divisor.*

In establishing a theorem of indices relating to complex numbers we may make use of Def. II and the equations leading to it. By repeated application of the rule,

$$(r_1,\theta_1)\times(r_2,\theta_2)\times\ \ldots\ \times(r_n,\theta_n)=(r_1r_2\ \ldots\ r_n,\ \theta_1+\theta_2+\ \ldots\ +\theta_n),$$

so that if the moduli $r_1$, $r_2$ etc., be each equal to $r$, and the arguments $\theta_1$, $\theta_2$ etc., each equal to $\theta$, that is, if all the complex numbers are equal,

$$(r,\theta)^n=(r^n,n\theta) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (21)$$

whence:

DEF. IV.—*The nth power of a complex number is a complex number whose modulus is the nth power of the modulus of the original number, and whose amplitude is n times the amplitude of the original number.*

*(To be continued.)*

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# NOVEL ELECTRIC SHUNTING LOCOMOTIVES

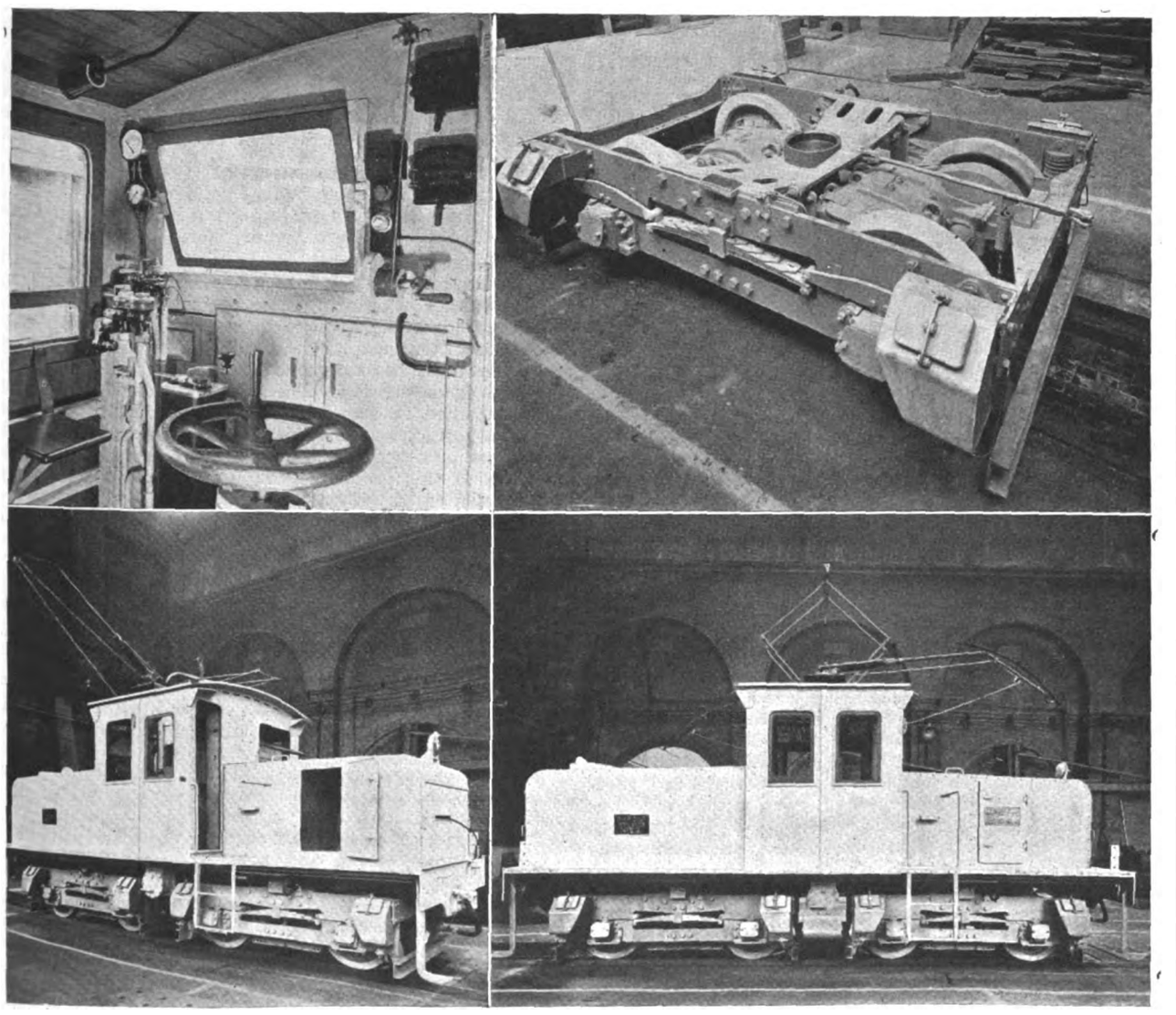
## Description of Electric Locomotives for Iron Ore Quarry in New South Wales—Special Precautions against Dust.

TWO electric shunting locomotives of unusual and interesting design to meet special requirements of quarry service have recently been built by the Metropolitan-Vickers Electrical Co., Ltd., for the Broken Hill Proprietary Co., Ltd., of New South Wales. They are to be used at a large iron ore quarry known as the Iron Knob Mine, for which a complete electrification scheme, covering the operation of locomotives, shovels, crushers, pumps, winches, and other gear, has been adopted.

The locomotives which are illustrated in the accompanying photographs are similar, each locomotive being capable of handling a shunting service of four wagons each of 30 tons capacity at 5 to 10 miles an hour on the level and up to a maximum gradient of 1 per cent. Each rake of wagons weighs about 200 tons loaded and 80 tons empty. The duty consists of taking a loaded rake from an electric shovel to the crusher about half a mile away, returning empty and reloading 1·1 times per hour. This allows 18 minutes for loading the rake, 20 minutes for travelling, and 16 minutes for dumping the ore. The track is 3 ft. 6 in. gauge, and has a maximum curvature of 100 ft. radius. The track and the service are of the roughest nature, and for this reason the locomotives are of exceptionally robust construction. They are capable of being lifted in one piece for replacing on the track in case of derailment, and in service they will be specially protected by a heavy framework of timber over the ends of the body to prevent damage by a possible blow from the swinging shovel or from the ore spilling from the shovel when loading.

The locomotives are of the swivelled double-bogie central cab type. Each bogie has two axle-mounted motors connected permanently in series for service on 600 V supply, and the two pairs of motors are arranged for series parallel control. Because of the prevalence of stone dust, motors of the totally enclosed type have been adopted, and all apparatus compartments are fitted with dust-proof doors. The control system is of a simplified electro-pneumatic type operated from a central driver's cab. The controls are duplicated in order to permit driving in either direction. A low voltage supply for operating the control gear will be taken by means of a potentiometer from the 600 V line.

Air-braking equipment manufactured by the Westinghouse Brake and Saxby Signal Co., Ltd., is provided, the compressed air at 80 lb. per sq. in. pressure being obtained from a D.H. 25 Bungalow type compressor, which also feeds the reservoirs for the electro-pneumatic control system, pneumatic sanding



*ILLUSTRATING some of the details of the new electric shunting locomotives built for use in an iron quarry in New South Wales by the Metropolitan-Vickers Electrical Co., Ltd. The two top pictures show (left) part of the driver's cabin, with the master controller and hand-brake pillar, and (right), one of the two motor bogies. The two lower illustrations show the one side bow collector extended on the left, and the pantograph raised in position on the right.*

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and air whistle. Current collection is by means of a pantograph for ordinary service, supplemented by two side bow collectors on tramway type booms for use when the overhead line is widely displaced to clear the electric shovel. One of the photographs (p. 175) shows the pantograph extended as for service with the side bows lowered, while in another the pantograph is down and one side bow swung out for service. In addition to these collectors, provision is made for power supply by trailing cable when travelling on temporary extensions outside the area of the overhead line equipment. The cable, 100 yd. in length, is carried on a motor-operated reel mounted in a chamber at the end of the locomotive.

The body of the locomotive has a total length of 23 ft., and an extreme width of 9 ft. It is divided into five compartments, viz., the cable-reel and compressor compartments at one end, the driver's cab in the middle, and the control apparatus and resistance compartments at the other end. The driver's cab is provided with drop windows to enable the driver to obtain a side view along the train, and also to manipulate the control cords of the side bow collectors without leaving the locomotive. The pantograph is raised and lowered by means of a winch provided in the cab. Each locomotive in working order weighs about 22 tons and is capable of a continuous tractive effort of 1 100 lb. at 8 miles per hour. At the hourly rating the tractive effort is 3 500 lb. at 5 miles per hour.

Power for the operation of the electrical equipment of the quarry is brought by a 33 000 V transmission line from the company's generating station at Whyalla. A sub-station is provided at the quarry, where the voltage is stepped down to 3 300 V, and a motor generator set provides the necessary 600 V d.c. supply for the locomotives. The transformers and switchgear for the transmission system and the whole of the equipment for the sub-station have also been supplied by the Metropolitan-Vickers Electrical Co.

## BOOK REVIEWS.

**Los Majistrales De Fuerza Electromotriz.** By ARTURO E. SALAZAR. (University Press: Santiago de Chile.) Pp. xiv+133.

This book may be said to be a treatise on standard cells and their application to testing. Such a work from Chile is surprising to the reviewer, since it deals so thoroughly with the design and construction of Daniell, Clark, Carhart-Clark, Weston and cadmium cells. It would appear that the Chilians are taking the subject of testing rather seriously, a fact that should be considered by our testers. That is, they are starting at the right end of the business, and not, as is the case here, at the terminals of the instruments. The work is divided into seven chapters, the first of which is really an introduction. This deals with the object of the work, and it is stated that it is the result of experiments carried out in Chile University on various types of cells.

Reference is made to the various cells and their manufacturers. The second chapter deals with the tests carried out on cadmium cells under various conditions and temperatures. In this section tables II and III show the variation in temperature and subsequent voltage. Chapter 3 is interesting from the fact that it describes and illustrates two cadmium cells which have been tested at the National Physical Laboratory, Teddington. The results of the tests are given and comparisons are made with figures obtained for the same cells from the Bureau of Standards of America. In chapter 4 the use of these cells is dealt with in conjunction with a potentiometer; this is a valuable chapter, since I know of no better treatment in an English text book except perhaps in "Electricity Meters" by Gerhardi. Two good graphs are contained in the remaining sections which show volts-temperature curves. To official testers who understand Spanish the work will be useful. If the work were translated into English it would have a great sale in England and America.

CYRIL SYLVESTER.

**Hydraulics.** By E. H. LEWITT. Third Edition. (London: Sir Isaac Pitman and Sons.) Pp. xii+372. 10s. 6d. net.

Mr. Lewitt, being a lecturer at the City and Guilds College would obviously be well fitted to write upon an engineering subject when the primary object is to assist students in meeting the requirements of examiners. That, in fact, is what the author claims as the primary object of his book. We have perused this volume with considerable interest. In the first place it is singularly well printed and illustrated. The study of hydraulics as viewed from the standpoint of an essential part of an engineer's education is, when we look back on our student days, terribly dry, especially when, after one comes to practical realities, the actual problems to solve in everyday work are comparatively few and relatively simple. To some extent the resident student of an engineering school does get some interest in the subject from the apparatus and experiments in the hydraulic laboratory, but it takes a good deal to excite the interest of one not so favourably placed, and to lead him step by step to an intelligent appreciation of what, after all, is a fairly simple subject. Mr. Lewitt has undoubtedly appreciated this, and he takes us step by step through all that really matters in hydraulics. The different articles, of which there are 137—that is, so far as the first half of the book is concerned—discuss in its various aspects the behaviour of static and flowing water, and give simple formulæ for solving problems relating thereto after explaining their derivation, after which the reader is provided with examples for practice. There is very little therein which the intelligent student should fail to grasp, and if he has conscientiously read the book he should certainly make good in a technical examination on the subject.

The latter part of the volume deals with pumps and turbines, not, as the author makes clear, from the design point of view, but rather as to the theoretical principles involved. His method of discussing the flow of water in turbines is clear and concise, but we rather wish he had made it plain that of the six types of turbine he describes, four have now ceased to have any practical value, while the propeller type, which is now so much in vogue, is not dealt with. In view of the importance of water power in these days we hope to see the omission remedied in the next edition, and we should also like to see a discussion on draft tubes.

But these are, after all, small matters, and looking back on the bewildering way in which writers used to treat this subject it is refreshing to find one who has taken such pains to provide a book of real educational value and no small readable interest.

F. JOHNSTONE TAYLOR.

**Mechanical Characteristics of Transmission Lines.** Part II. The Care of Wire-Spans Supported at Unequal Elevations. By PROF. SEIICHIRO NODA, Ryojun College of Engineering, Port Arthur, South Manchuria.

This memoir is the result of a series of investigations carried out by the Ryojun College of Engineering on the mechanical characteristics of electric power transmission lines. It deals with the fundamental equations of the wire span, and of suspension from unequal elevations. The effect of suspension insulators has been considered, as also the effects of various methods of suspension. Theoretically accurate results have been obtained by somewhat elaborate calculations; certain practical formulae are also introduced with working examples.

The memoir treats on the analytical as well as graphical solution of this problem. Elaborate tables and charts are also presented at the end of the memoir. Unfortunately all units and figures are given in the metric system, which detracts from its value where English units are in general use, and where time is not available to recalculate and convert and so forth.

WILLIAM T. TAYLOR.

**Illuminating Engineering for Students and Engineers.** 2nd Ed. Edited by F. E. CADY and H. B. DATES. (London: Chapman and Hall.) Pp. xv+515. 25s. net.

This volume, a revision of an earlier work, is intended to be a text book for students and engineers, and completely fulfils this purpose. One has only to consider the names of the contributors to realise that the text would be of a practical and reliable nature, since all are actively engaged in illuminating engineering in one or other of its many phases.

The fourteen chapters deal successively with fundamentals of light measurement and control, and many important practical aspects of applied illuminating engineering. In some instances, the chapters represent a comprehensive and yet simple review of present-day knowledge on the subjects treated; this is particularly true of the sections dealing with "Light Production" and "Light Sources."

The volume is well illustrated with original graphs and diagrams, while much valuable data is provided in tabular form. The suggestions for collateral reading at the end of each chapter are valuable to the student, but the references are chiefly to American publications.

The book represents an important contribution to the literature on lighting, and is written with authority.

W. E. BUSH.

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# LIMITED LIABILITY FOR ELECTRICAL CONTRACTORS AND TRADERS.

## Disadvantages of Sole Trading—Unlimited Liability and Ordinary Partnership—The Private Limited One-Man Business—Forming a Limited Company.

By G. DENNIS BOND, A.C.I.S.

IN many cases the business of electrical contracting and retailing is carried on as a one-man business, in some cases in the form of an ordinary partnership, in very few cases as a limited partnership, and generally, only in the case of large businesses, under the protection of limited liability.

The main disadvantage of sole-trading is the absence of protection for the sole-trader against his liability for his trading debts. If he falls on bad times, and his creditors press him for their accounts, they can take in satisfaction thereof not only the money which he considers invested for the purposes of his business, but also any money or assets which he has set aside for private purposes. His creditors may even take his furniture in satisfaction of their claims.

### Liabilities of Partners.

In the case of an ordinary partnership, this great disadvantage of unlimited liability still remains. The relation of the partners to one another is usually settled in the deed of partnership; but where none exists, the rights and liabilities of the partners *inter se* are regulated by the Partnership Act, 1890. In any case, the liabilities of the partners to outsiders are regulated by the above Act; and, if the assets of the firm are not sufficient to meet its liabilities, then the creditors may proceed against the private property of the partners.

Each member of the partnership is an agent of the firm in the firm's business, and it may well be that one partner may place the firm in queer street by binding the firm by some act of negligence. In that case, it would be no use the other partners attempting to repudiate liability on the ground that they had expressly forbidden the recalcitrant partner to do any such act, unless they could prove that the creditors were aware that they had so expressly forbidden him to act.

There is no necessity (unless provided by the Deed of Partnership) for an annual audit of the partners' accounts; neither is there any guarantee that the capital of the firm will remain stationary—the capital will automatically increase as profits are made and money is put into the firm by partners; and will automatically decrease as losses are incurred and withdrawals for private purposes made by members of the firm. Such a state of affairs does not conduce to the success of a partnership, where it is essential that the capital should remain relatively stable.

Some of these disadvantages may be partially removed by taking advantage of the Limited Partnerships Act, 1907. By this Act, a partnership firm may consist of one or more general partners. who are liable for all the debts and obligations of the firm, and of one or more limited partners, who must contribute thereto a fixed agreed sum or sums as capital or property, and who are only liable for the debts of the firm to the extent of the amount so contributed.

A limited partner is not allowed to take any part in the management of the business of the firm—he cannot dissolve the firm by giving notice, and he cannot withdraw any part of his capital; but he may, with the assent of the general partners, assign his share of the partnership to some other person. The general partners may introduce other partners without his assent.

Every limited partnership must be registered in accordance with the provisions of the Act. This is done by sending to the Registrar of Joint Stock Companies a statement, signed by all the partners, stating the following particulars:—

1. The firm name. 2. General nature of the business. 3. Principal place of business. 4. Full names of each of the partners. 5. The term, if any, for which the partnership is entered into, and the date of the beginning thereof. 6. A statement that the partnership is limited, and the description of every limited partner as such. 7. The sum contributed by each limited partner, and whether paid in cash, or how otherwise.

A registration fee of £2 is payable and an *ad valorem* stamp duty of £1 per cent. of the amount introduced by each limited partner must be paid. Thus, the fees payable would be £3 where a limited partnership were formed and the limited partner contributes £100 as his share.

The fact that any person may inspect the Register of Limited Partnerships on payment of a fee of one shilling may be considered undesirable by persons considering taking up limited partnership.

Persons desirous of forming themselves into a company enjoying limited liability must do so in the manner prescribed by the Limited Companies Acts of 1908, 1913, and 1917.

A limited company is quite distinct from its members—it is a separate entity or *persona*. Thus, if Jones and Brown contribute £100 each and promote a limited company called Jones and Brown, Ltd., they are quite distinct from the company.

The following table shows the differences between an ordinary partnership and a limited company:—

| Partnership. | Limited Company. |
|---|---|
| 1. The partnership is not distinct from the partners. | 1. The company has a separate existence. |
| 2. Members cannot make contracts with the firm. | 2. Members can make contracts with the company. |
| 3. Members are agents of the partnership in the firm's business. | 3. Members are not agents of the company and cannot bind it. The management of the company is in the hands of a body of the members known as a board of directors, who can bind the company. |
| 4. The liability of the members is unlimited. | 4. The liability of the members is limited to the amount contributed by each of them. |
| 5. Partners may make what arrangements they like among themselves. | 6. The members are prohibited by law from making certain arrangements otherwise than in a certain prescribed manner, so that the rights of minorities are protected. |

The type of limited company generally suitable to electrical contractors and dealers is, no doubt, the private limited company.

A private limited company differs from a public limited company in that the number of its members may be two or more instead of seven or more, and that the number of its members must not exceed 50 (unless the excess is composed of present or past employees of the company), and it restricts the right to transfer its shares and prohibits any invitation to the public to subscribe for any shares or debentures of the company.

The private limited company is particularly suitable to the one-man business. The contractor or trader can obtain the desirable advantage of limiting his liability for debts and obligations to the amount he puts into the business by registering as a private limited company, in which he can hold all the shares except one, which can be held by a member of his family or by a friend or other nominee.

He can thus carry on business without any noticeable restrictions as if he were a sole-trader, and he has the satisfaction of knowing that he only stands to lose the amount he contributes to the company if the business falls upon evil days. The creditors cannot take his private assets as in the case of a sole-trading or a partnership.

In addition, incorporation as a limited company carries the advantage of continuance of the business after the death of the parties primarily interested in it, better facilities for borrowing, and power to introduce more capital by the issue of shares to new members.

The following is a brief outline of the steps necessary for the formation of a limited company:—

Draw up the Memorandum of Association, which regulates the connection of the company to outsiders. This must contain (*a*) the name of the company, with "limited" as the last word of its name; (*b*) that part of the United Kingdom where its registered office is to be situate; (*c*) the objects of the company; (*d*) that the liability of the members is limited; (*e*) the amount of the share capital.

### Articles of Association.

The internal regulations of the company are governed by a set of rules, known as the Articles of Association. A model set of Articles, called Table A, is provided by the Companies (Consolidation) Act, 1908, for use by a company which has not

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drawn up a set of its own. and Table A applies also where the Articles drawn up by the company do not expressly exclude or modify the regulations in Table A.

Both the Memorandum and Articles of Association must be stamped with a 10s. deed stamp, and filed with the Registrar of Joint Stock Companies. The following fees must also be paid :—

1. A capital duty of 20s. per cent. imposed by the Finance Act, 1920 (i.e., £1 duty for every £100 of capital).

2. A fee of £2 where the nominal capital does not exceed £2 000, and £1 for every additional £1 000 or part of £1 000, up to £5 000.

The following table shows the fees payable to the Registrar to convert a business into a limited company, where all the capital is issued :—

| Capital of | Deeds. | Registration Fees. | Capital Duty. | Total. |
|---|---|---|---|---|
| £100 | £1 | £2 | £1 | £4 |
| £500 | £1 | £2 | £5 | £8 |
| £1 000 | £1 | £2 | £10 | £13 |
| £3 000 | £1 | £3 | £30 | £34 |

In addition, the cost of drawing up the Memorandum of Association and other preliminary expenses has to be met.

# AS OTHERS SEE US.

## Remarkable American Report on British Power Companies.

A remarkable attempt to delineate the sinister activities of British power companies is contained in an innocent-looking publication by Prof. Orren C. Hormell, which is sponsored by the National Municipal League, New York. To anyone understanding the relative positions of private and municipal enterprise in the electricity supply industry in Great Britain and in the U.S.A. the report, which is entitled "Electricity in Great Britain—A Study in Administration," makes interesting, and at times amusing, reading.

After emphasising the importance of the publicly owned and operated electricity undertakings, and the handicaps with which they are faced, the report goes on to stress the "highly advantageous position" which the power companies have held in the British industry.

The reasons given for this are :—

"First, because their powers were perpetual in tenure, not being subject to the purchase clause of the Act of 1888. Second, they are protected against loss from unprofitable extensions by a binding contract relative to a minimum return on the actual investment incurred in the extension. For example, authorised undertakers before receiving a supply in bulk were required to agree to continue the supply for a period of at least seven years and pay annually for the supply an amount equalling not less than 20 per cent. on the outlay incurred by the company in making provision for the supply.

"Third : Through stock ownership and interlocking directorates, many of the large power companies have been able to control within certain large industrial areas not only the supply of power in bulk, but also the distributing side of the industry as well.

"For example, the Newcastle-upon-Tyne Electric Supply Co., Ltd., one of the largest and most successful British power companies, through ownership of the stock of a large number of distributing companies, controls and actually operates the distribution as well as the generation of electricity throughout an area of over 1 400 square miles, embracing practically the whole of the industrial area of the north-east coast."

### Interlocking Directorates.

Warming up to his subject, the author points out that "the concentration of control, however, is not confined to districts ; it is becoming national (in some instances international) in extent. This centralising tendency in the private electricity field is being advanced not only by the ownership of stock, but also (and especially) by the creation of interlocking directorates.

"Two examples will suffice to illustrate the point : Sir Hugo Hirst, Bart., sometimes referred to as the 'Samuel Insull of British electricity,' is the managing director of the General Electric Co., Ltd. In addition, he holds the following positions in other companies :—

"Chairman of the Frinton-on-Sea and District Electric Light and Power Co., Ltd. ; Electricity Co. of Macclesfield ; Steel Conduit Co., Ltd. ; General Electric de France, Ltd. ; General Electric Co. of India, Ltd. ; General Electric Co. of China, Ltd. ; Anglo-Argentine General Electric Co., Ltd. ; Leamington Glass Works ; vice-chairman of Pirelli-General Cable Works, Ltd. ; director of Aron Electricity Meter, Ltd. ; British General Electric Co. (South Africa), Ltd. ; Madeira Electric Lighting Co. (1909), Ltd. ; Travancore Minerals Co., Ltd. ; Société de Produites Chemiques des Terres Rares.

"The second example is that of Mr. George Balfour, M.P., who is an officer and director in even more of the British electricity companies than is Sir Hugo Hirst. His official positions in the industry are as follows : Director of Argentine Light and Power Co., Ltd. ; Argentine Tramways and Power Co., Ltd. ; Arbroath Electric Light and Power Co., Ltd. ; Balfour, Beatty and Co., Ltd. (chairman) ; Dumbarton Burgh and Country Tramways Co., Ltd. (chairman) ; Dundee, Broughty Ferry and District Tramways Co., Ltd. (chairman) ; Dunfermline and District Tramway Co. (managing) ; Edinburgh and London Trust, Ltd. ; Falkirk and District Tramways Co. ; Hydro-Electric Development Co., Ltd. ; Scottish Power Co., Ltd. ; Scottish Central Electric Power Co. ; Fife Tramways, Light and Power Co. (managing) ; Fife Electric Power Co. ; Lancashire Electric Light and Power Co., Ltd. ; Lancashire Electric Power Co. ; Llandudno and Colwyn Bay Electric Railway, Ltd. ; Metropolitan Electric Supply Co., Ltd. ; Mansfield and District Tramways, Ltd. ; Mansfield and District Light Railways Co. ; Midland Electric Light and Power Co., Ltd. ; Nottinghamshire and Derbyshire Tramways Co. ; Midland Counties Electric Supply Co., Ltd. (chairman) ; United Electric Tramways of Montevideo, Ltd. ; Wemyss and District Tramways Co. (chairman) ; Galashiels and District Electric Supply Co., Ltd. ; Brentford Electric Supply Co., Ltd. ; Cordoba (Argentine) Electric Tramways Construction Co., Ltd. ; Uxbridge and District Electric Supply Co., Ltd. ; London United Tramways, Ltd. ; Power Securities Corporation, Ltd. (chairman) ; Grampian Electricity Supply Co. (chairman) ; Chesham Electric Light and Power Co., Ltd.

### The International Aspect.

"The international aspect of the situation is strikingly illustrated by the position of the electrical manufacturing firm, the British Thomson-Houston Co., Ltd., the controlling shares of which are held by the International General Electric Co. of New York. The British Thomson-Houston Co., Ltd., is one of the three largest holders of the ordinary shares (common stock) of the Power Security Corporation, the chairman of which is Mr. George Balfour, M.P.

"It is apparent," the author adds, "that centralisation of financial control is taking place in British private electrical industry, even though the British have not yet adopted the American type of holding companies."

# LOOKING BACKWARD.

## Interesting Extracts from Early Volumes of "The Electrician."

IN the issue of THE ELECTRICIAN dated August 17th, 1878, it was reported that :—

The British Association was holding its annual meeting in Dublin.

Claims were put forward for balata as a substitute for gutta-percha.

The longest telegraph circuit working duplex was from Salt Lake to Virginia, a distance of 678 miles. The longest quadruplex line was from Pittsburg to St. Louis, 687 miles.

An extraordinary general meeting of the Eastern Telegraph Co. approved the acquisition of the shares and undertaking of the Black Sea Telegraph Co., and the completion of the Eastern Co.'s system of telegraphs in the Mediterranean.

* * *

Twenty-five years ago, according to THE ELECTRICIAN of August 21st, 1903 :—

Electro-medical treatment of malignant diseases was discussed at a B.M.A. meeting.

Draft regulations were issued by the Home Office treating the manufacture of accumulators as a dangerous trade.

The National Physical Laboratory announced that Mr. F. E. Smith's research on the resistance of mercury and the construction of a standard mercury resistance was practically complete.

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# NEWS IN BRIEF.

## Egyptian Electrical Imports—Blackpool's Illuminations—Situations Vacant—Hull's Telephone Campaign—The Sydney Royal Eastern Show—Portuguese Import Duties—Electric Cookers for Sandringham.

THE Quartermaster-General of the U.S. Army has just purchased 1 900 electric cookers.

Telephone services between German towns and all parts of Spain were commenced last Friday.

An assistant electrical engineer is required by the Perak River Hydro-Electric Power Co., Ltd.

The Madras Government require an electrical engineer, in connection with the Canvery Metur reservoir project.

A telephone service between Great Britain and Milan, via Switzerland, was begun last week. Extensions beyond Milan are contemplated.

Oldham Electricity Committee have decided to purchase premises in Union Street to be opened as showrooms for fittings and appliances.

During the first three months of the current year, electrical goods to the value of £E168 577 were imported into Egypt. Wires and cables amounted to £E 98549.

The Saskatchewan Power Commission recommend the purchase by the Provincial Government of hydro-electric plants at Regina, Moose Jaw, Saskatoon, Prince Albert and North Battleford.

The average cost of electricity to the domestc consumer in Canada is stated by the Ontario Hydro-Electric Power Commission to be less than 1d. per kWh, compared with 3½d. in the United States.

The Telegraph Construction and Maintenance Co.'s cable ship *Dominia* will begin, before the end of the present month, the laying of the Western Union Telegraph Co.'s new cable between the Azores and Bay Roberts, Newfoundland.

Tests are being made on the Grimsby trawler *Saint Endellion*, which is on a voyage to Iceland, with a wireless "soundir g" apparatus. The sound of a gong is transmitted through the water, and the sound echoed back from the sea bed is picked up by receivers which indicate the depth of the water.

The Public Health Department of the town of Lausanne, Switzerland, propose to organise an Exhibition of X-ray apparatus, electric medical apparatus, etc, to be held from September 10th to 13th. Further particulars can be obtained from the Department of Overseas Trade. (Reference B.X. 4 600).

The capital invested in hydro-electric enterprises in New Zealand has increased from £1 500 000 in 1918 to nearly £19 000 000. The total output is 138 925 kW against 43 980 kW in 1918, and the number of people to whom current is available has risen from 467 000 to 1 239 935 out of a population of 1 480 000.

Hull Telephones Committee are to organise a six months' newspaper advertising campaign for bringing to the public notice the advantages of the telephone in the home. There is already an annual profit on the Hull telephones—the only municipal telephone service in Great Britain—but it is believed that judicious advertisement will increa.e the profits.

The Westinghouse Electric and Manufacturing Co. have produced a device for the automatic switching on of electric light at an aerodrome on the approach of aircraft. The hum of the engine is picked up by a microphone, current is transmitted to a resonant circuit tuned to the frequency of the hum of the engine, and the lighting circuit is closed when the aircraft descends below 1 500 feet.

The next Royal Eastern Show at Sydney, new South Wales, will afford a good opportunity for exhibiting machinery and appliances for agricultural and domestic purposes. Applications for space are to be sent to the Secretary, Royal Agricultural Society of N.S.W., 33, Macquarie Place, Sydney. Some further particulars can be obtained at the Department of Overseas Trade. Electric refrigerators and labour-saving appliances were exhibited at the show last Easter.

A decree has been published revoking the exemption from import duty which has hitherto applied to the following cla es of goods when imported into Portugal by official, semi-official and private organisations: Material for Coimbra municipal electric tramways; wireless apparatus for Portuguese vessels; material for public institutions for scientific research or propaganda; material for municipalities for the distribution of electricity; material for hydro-electric installations; electrical material for the Casa de Mazara; material for the Posts and Telegraphs Administration.

An assistant divisional telegraph engineer is required for the Indian Posts and Telegraphs Department.

Fulham Electricity Committee have voted £2 400 for fitting and furnishing the new showrooms and offices.

Moving pictures were transmitted over two miles by radio at Pittsburgh, Pa., on Thursday of last week.

Warrington Electricity Committee have decided to object to the N.W. England scheme of the Central Electricity Board.

A demonstration of "stereoscopic television" was given to certain representatives of the Press on Friday of last week. See page 189.

Electric cookers are the latest addition to the modern improvements made at Sandringham House, the King's Norfolk residence.

Gravesend Corporation are arranging a ceremony to mark the twenty-fifth year of the establishment of the municipal electricity undertaking.

Glasgow Electricity Committee recommend the acceptance of tenders amounting to £843 16s., for the erection of substations in Meiklewood Road, and Shannon Street.

On May 31st, the telephones working in this country numbered 1 651 240, of which 585 704 were in London, and 1 065 536 in the provinces. The total increased by 12 673 during May.

Reading Tramways Committee are to purchase a feed pump, two circulating pumps, an electrically-driven turbine pump, automatic circuit breakers, and four electrical controllers for tramcar rol ing stock, at a cost of about £900.

Stepney (London) Borough Council have decided that members of the Electricity Committee who were defendants in an action recently brought against them by a firm for alleged conspiracy in respect of the cutting off of the electricity supply during the General Strike shall have their expenses reimbursed by the Council.

The Transport and Commur ications Committee of the International Chamber of Commerce, Paris, have passed resolutions which may materially benefit telegraphic Press and business communications. The resolutions will be presented to the Congress of the International Telegraph Union in Brussels in September.

Plymouth, which has already had a Civic Week and a Regatta Week, is enjoying a Navy Week. It is proposed to hold a Devonport (and probably also a Stonehouse) Carnival, with a Shopping Week in the autumn. It is suggested that the latter should be held from October 29th to November 3rd, and preliminary arrangements have been made.

Imports into New Zealand during the first quarter of this year included electrical machinery, appliances and equipment valued at £542 166, of which the United Kingdom's share was £300 617, that of the U.S.A., £115 861, Canada, £33 881, and Australia, £10 072. These figures include an addition of 10 per cent. to the values in the exporting countries.

The Blackpool annual scheme of illuminations will commence on September 8th. The big promenade display begins two weeks later, September 22nd. In both cases the illuminations will continue up to and including the night of October 22nd. Morecambe's promenade illuminations will commence about the third week in August, and will continue for a month.

About 1 200 delegates attended the recent Congress of Radiology at Stockholm, including 80 British scientists, and at the exhibition held in connection with the Congress many British manufacturers showed their products. Amongst the most important items in the agenda of the Congress were the British recommendations regarding X-ray protection and accurate estimation of doses of radium for therapeutic purposes.

In 1915 Marylebone (London) B.C. approved a scheme of apprenticeship in connection with the electricity undertaking, and in 1916 a special course of study at the Marylebone Central Institute was approved. Reports from the headmasters on the work of the apprentices were not entirely satisfactory. The operating side of the electricity department is now almost entirely restricted to men skilled in specialised trades, which prevents apprentices competing for the majority of the posts which become available. The Electricity Committee recommend that the four existing vacancies for apprentices be not filled.

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# PERSONAL.

MR. C. A. Vandervell gave the prizes for the annual fete on behalf of the Pangbourne (Berks) Nursing Association.

Sir John Denison-Pender has gone abroad until August 24th.

Mr. E. A. Gatehouse, of the "Electrical Review," who recently underwent an operation, is making satisfactory progress.

Gillingham (Kent) Town Council have increased the salary of Mr. S. Hartland, mains assistant, from £260 to £286 per annum.

Mr. David Reid, largely interested in Kelvin Bottomley and Baird, Ltd., left personal estate in Great Britain of the value of £45 851.

Mr. I. Elkins, of Abertillery electricity showrooms staff, has secured the first-class certificate of the Association of Mining Electrical Engineers.

Recipients of Diplomas in Electrical Engineering at University College, London, include Messrs. F. R. Livock, N. K. Patel, and A. Ragunather.

After 35 years' service, Mr. W. B. Smith, charge engineer with the Bermondsey Electricity Department, is to be superannuated at £111 15s. per year.

Oldham Electricity Committee recommend an increase in the salary of Mr. F. L. Ogden, borough electrical engineer, from £900 to £1 100 per annum.

The marriage of Mr. Harold Rentell, son of the late Mr. Sidney Rentell to Miss Joy Tremain, was solemnised at the old Parish Church, Barnes, on July 28th.

Manchester Corporation have appointed Mr. H. W. Bristow, at present assistant boiler house engineer at Stuart Street station, as boiler house engineer at the Barton power station.

On the occasion of his marriage to Miss G. M. Smith, Mr. George Hamblin, of the staff of the Wrexham electricity department, has been presented by his colleagues with a clock.

Mr. H. C. Eyles, of the staff of the Sheerness and District Electric Power Co., Ltd., who was married recently to Miss Dorothy Nichol, has been presented by his colleagues with a canteen of cutlery.

Estate of the gross value of £309 488, with net personalty £307 928, was left by the late Mr. Charles Albert Knight, consulting engineer, lately a director of Babcock and Wilcox, Ltd., who died in June, aged 75 years.

The marriage was solemnised at Christ Church, Highfield, Southampton, on August 7th, of Miss Ivy Mabel Harmer, daughter of Mr. S. G. Harmer, manager of the Western Union Cable Co., of Southampton, and Mr. H. Hartley Thomas.

Stockport Town Council have, on the promotion of Mr. Oldroyd as deputy electrical engineer, appointed Mr. W. R. Allcock, power station superintendent; Mr. E. A. Gleaves, assistant power station superintendent; Mr. V. Foster, charge engineer; and Mr. J. Ball, assistant charge engineer.

Mr. J. G. Pea ce, director of the British Cast Iron Research Association, has been unanimously awarded by the judges the first prize of 100 guineas for a series of practicable proposals relating to "Goodwill in Industry." The competition was organised by the Glasgow and West of Scotland Association of Foremen, Engineers and Draughtsmen.

The Council of the City and Guilds of London Institute have conferred the distinction of Fellow (F.C.G.I.) upon Messrs. A. B. Buckley, A. C. Cookson, C. V. Drysdale, M. Solomon, and G. W. Tripp. The Fellowship is conferred by the Council upon those who, having obtained the Associateship of the Institute and spent at least five years in actual practice, produce evidence of having done some original and valuable research work, or of having otherwise contributed to the advancement of the industry in which they are engaged.

Terms and conditions recommended by the Glasgow Electricity Committee in connection with the appointment of Mr. Herbert Bell, as general manager of the Electricity Department, permit of Mr. Bell, on attaining the age of 65 years retiring from the service, and thereafter receiving during his lifetime an allowance to be paid out of the funds of the Electricity Department, of a sum equal to one-half of his average annual salary during the seven years ending on the date of retirement. It is also recommended that he pay over to the Corporation the sum of £255 17s. 9d., being the amount contributed by him to the Superannuation Fund established by Hull Corporation under the Local Government and Other Officers Superannuation Act, 1922, and that he contribute 5 per cent. of his salary towards his retiring allowance.

There has been a series of staff changes in the Liverpool Electricity Department in consequence of the promotion of Mr. F. J. Robinson to the position of city electrical engineer. In the generating department, Mr. J. Hamilton, station superintendent, becomes superintendent engineer of generation at a salary of £900; Mr. H. A. W. Williams, turbine house superintendent, becomes station superintendent; Mr. K. M. Fergusson, maintenance engineer, becomes assistant boiler house superintendent; Mr. H. W. Jones, superintendent engineer in charge No. 3 Lister Drive station, becomes generation superintendent; Mr. G. A. Thompson, assistant engineer No. 3 station, becomes superintendent engineer. Distribution staff changes are: Mr. E. L. Morland, distribution engineer, is appointed superintendent engineer of distribution at a salary of £900 per annum; Mr. J. H. Murray, h.t. mains engineer, becomes distribution engineer; Mr. C. L. Eagle, l.t. mains superintendent, becomes assistant distribution engineer; Mr. J. G. Jones, superintendent jointer, becomes mains superintendent; Mr. J. Stirrup, superintendent meter department, becomes consumers engineer at a salary of £600 per annum; Mr. W. Mayhew becomes assistant high tension engineer; Mr. S. Lowey, installation engineer, becomes assistant consumers engineer; Mr. H. J. Lamden, battery superintendent, will in future be known as assistant electrical engineer, and Mr. C. H. Hall, assistant sub-station engineer, as battery superintendent. Mr. L. Breach, senior engineering assistant, has been promoted chief electrical assistant at a salary of £750 per annum; Mr. H. Midgley, chief assistant mechanical engineer, becomes chief technical assistant at £750 per annum, and Mr. M. H. Wardle, principal assistant in the Lighting Department, becomes chief assistant at £550 per annum.

## Obituary.

MR. C. T. CAYLEY, aged 74 years. He was a director of the English Electric Co., Ltd., and formerly chairman of Dick, Kerr and Co., Ltd.

MR. ARTHUR WILLMOTT, on August 10th, from heart failure, after a short illness. He was a member of the Engineers' Club, and particularly well-known in electrical circles in the Midlands. For many years he was works manager of the Electric Ordnance and Accessories Co., and later filled a similar position with Messrs. Lyons and Wrench, and the Igranic Electric Co., Ltd.

MR. W. A. CHAMEN, until recently engineer and general manager of the South Wales Electrical Power Distribution Co., at Cardiff, on August 13th, aged 65 years. Mr. Chamen was one of the real pioneers of the British electrical industry, having joined Cromptons in 1881 and carried out for them many important installations in various parts of the world. His first big job was the arc lighting installation at King's Cross Station of the Great Northern Railway. He put down a number of mill installations in Italy and returned to London to take charge of the lighting of the Law Courts, the first large installation of incandescent lighting in the United Kingdom. As chief outdoor engineer for Crompton and Co., he was responsible for public and private lighting in many important towns. In 1898 he was appointed chief electrical engineer to Glasgow Corporation, a position which he held until 1905, when he joined Messrs. Bramwell and Harris to assist them in the development of various power schemes with which they were connected. During his seven years in Glasgow he designed and supervised the construction of the Port Dundas and St. Andrew's Cross generating stations. In December, 1905, Mr. Chamen became general manager of the South Wales Electrical Power Distribution Co., and in July, 1907, of the Treforest Electrical Consumers' Co., Ltd. He retired from the South Wales Co. last year, when, it will be remembered, Mr. J. W. Beauchamp was appointed in his place. Mr. Chamen, who was a full member of the Institutions of Electrical and Mechanical Engineers, also carried on a private consulting engineering practice in Cardiff, and in this capacity he advised, among others, the Swansea Harbour Trust, and the Rhymney Iron Co. He was chairman of the Glasgow local section of the I.E.E. in 1903, and first chairman of the Western Centre. The funeral at Weston-super-Mare Cemetery on Thursday was preceded by a memorial service at St. Dyfrig's Church, Cardiff.

Mr. W. A. Chamen, whose death was announced on Monday.

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# IN PARLIAMENT.

## Acts of Parliament which have Received Royal Assent.

THE Royal Assent to the following new Acts of Parliament was read on August 3rd : Post Office and Telegraph (Money) Act ; Chesterfield Corporation (Trolley Vehicles) Order Confirmation Act ; Bradford Corporation (Trolley Vehicles) Order Confirmation Act ; Gloucester Corporation Act ; Greenock and Port Glasgow Tramways Co. Act ; Shropshire, Worcestershire and Staffordshire Electric Power Act ; Stretford and District Electricity Board Act ; Wessex Electricity Act ; Nottinghamshire and Derbyshire Traction Act ; London, Midland and Scottish, Great Western, London and North Eastern and Southern Railways (Road Transport) Acts ; Wolverhampton Corporation Act ; Rotherham Corporation Act ; Weald Electricity Supply Co., Ltd., Act ; Cleveland and Durham County Electric Power Act ; North Metropolitan Electric Power Supply (Consolidation) Act.

## The Rating of Electricity Undertakings.

On the Report stage of the Rating and Valuation (Apportionment) Bill to the House of Lords, Lord Askwith, before the House closed, moved an amendment with the object of giving rate relief to public electricity undertakings in respect of supplies to workshops and factories, and on condition that the benefit was passed on to consumers. The First Commissioner of Works said the proposal presented great difficulties and would involve a heavy additional charge on the taxpayer. The amendment was defeated by 35 votes to 16.

## Supply Orders.

The House of Lords approved Electricity Special Orders in respect to (1) Chesham (Extension) ; (2) Brackley, Buckingham and Winslow ; (3) Llanelly (Extension) ; (4) Northampton (Extension). The House of Commons approved Electtrity Special Orders in respect to (1) New Mills urban district, (2) Brightlingsea urban district, (3) the Order authorising compulsory acquisition of lands for a generating station at Little Barford, Beds, was approved, with the addition of a clause for the protection of Col. C. E. A. Allington, from whom lands are to be acquired ; (4) the borough of Brackley ; Middleton, Cheney and Brackley rural districts, and parts of Daventry and Towcester rural districts, the borough of Buckingham, and Buckingham and Winslow rural districts ; (5) Crick rural district and parts of Brixworth and Oxendon rural districts ; (6) the borough of Kidwelly and parts of Carmarthen, Llandilo Fawr and Llanelly rural districts ; (7) Amersham rural district and parts of Berkhampsted, Hemel Hempstead and Watford rural districts.

## Replies to Questions.

The Income Tax Acts do not provide specifically for the exemption of scientific institutions and societies from income tax on the income derived from their investments. The question whether such an institution or society is entitled to exemption depends upon whether or not it comes within the provisions of Section 37 of the Income Tax Act, 1918, as being a body established for charitable purposes only.

A proposal by the Scottish Board of Health to have wireless telephone apparatus provided for communication between Foula and the mainland of Zetland for medical purposes is not being proceeded with at present owing to the expense involved.

The Postmaster-General has installed experimental short-range wireless telephone apparatus between islands in the Channel Island group for the purpose of testing its efficiency for Post Office purposes.

Particulars of the new method of assessing rural telephone call office guarantees have been communicated to the National Federation of Women's Institutes and to all the railway companies, and a leaflet is to be distributed explaining the legal powers of rural district councils, parish councils and parish meetings to enter into guarantees.

The Minister of Transport states that under the London Traffic Act, 1924, it falls to the London and Home Counties Traffic Advisory Committee to advise him upon all matters within the scope of that Act, and the appointment of the Royal Commission on Transport cannot derogate in any way from their responsibilities. He must accordingly continue to rely upon the Statutory Committee to advise him upon the special traffic problems of the London area, including the problem of co-ordinating the various forms of passenger services in that area.

# OVERSEAS TRADE.

## Electrical Exports for Seven Months £7 337 480 in Excess of Imports.

EXPORTS of electrical machinery apparatus and materials supplied from the United Kingdom during July, 1928, amounted to £1 410 980, against £1 421 513 for the same month last year, representing a decline of £10 533. For the seven months of the year under review the total value of British electrical exports amounted to £10 788 489, as against £10 763 853 for the same period of 1927, representing an increase of £24 636. Electrical imports for July, 1928, amounted to £485 605, representing an increase of £39 305 over the figures for the same month last year. The total electrical imports for the seven months for this year amounted to £3 451 009, as against £3 099 415 for the same period of 1927, an increase of £441 694. Items in the export figures for the month which show increases include motors and generators, other than railway and tramway motors, increase £28 741 ; insulated electrical wires and cables other than rubber insulated, not being telegraph or telephone wires and cables, increase £20 874 ; electrical instruments, other than telegraphic and telephonic, but including commercial ammeters, voltmeters, etc., house service meters and scientific meters, increase £986.

Complete figures for July 1928, and for the seven months, contrasted with the corresponding month and period of last year, are given below.

| | Month of July | | Seven Months. | |
|---|---|---|---|---|
| | 1927. | 1928. | 1927. | 1928. |
| | £ | £ | £ | £ |
| IMPORTS. | | | | |
| Electrical Machinery | 134 738 | 150 251 | 955 668 | 1 026 742 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 9 249 | 18 831 | 71 530 | 94 578 |
| Insulation other than rubber (not being Telegraph or Telephone Wires or Cables) | 41 831 | 51 971 | 337 337 | 330 026 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 4 919 | 1 988 | 48 810 | 48 772 |
| Submarine Telegraph and Telephone Cables) | — | — | — | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 25 421 | 44 816 | 235 777 | 336 206 |
| Carbons, Electric | 11 884 | 7 105 | 55 591 | 77 135 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 43 744 | 33 482 | 196 571 | 279 463 |
| Arc Lamps and Electric Searchlights | 1 926 | 147 | 4 387 | 4 302 |
| Parts thereof (except Carbon Rods) | 2 036 | 2 660 | 15 489 | 14 381 |
| Batteries and Accumulators (including parts) | 51 136 | 40 333 | 307 391 | 293 763 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 18 230 | 25 572 | 161 159 | 164 198 |
| Switchboards, other than Telegraph and Telephone | 29 | 3 | 1 069 | 780 |
| Electrical Goods and Apparatus, all other Sorts | 101,157 | 108 446 | 708 636 | 780 663 |
| Total of Electrical Goods and Apparatus | 446 300 | 485 605 | 3 099 415 | 3 451 009 |
| EXPORTS. | £ | £ | £ | £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 27 613 | 25 523 | 349 229 | 325 582 |
| Other Motors and Generators | 171 818 | 200 559 | 1 321 993 | 1 456 084 |
| All other Sorts | 343 981 | 320 535 | 2 259 531 | 2 221 742 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 116 154 | 114 347 | 842 262 | 821 269 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 98 827 | 119 701 | 908 914 | 892939 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 74 886 | 58 840 | 487 457 | 561 993 |
| Submarine Telegraph and Telephone Cables | 33 187 | 8 211 | 398 628 | 117 732 |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 190 822 | 164 965 | 1 455 079 | 1 711 896 |
| Carbons, Electric | 996 | 267 | 12 742 | 9 069 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 42 488 | 42 457 | 359 254 | 298 101 |
| Arc Lamps and Electric Searchlights | 1 086 | 1 128 | 9 764 | 8 686 |
| Parts thereof (except Carbon Rods) | 6 | 245 | 2 555 | 5 472 |
| Batteries and Accumulators (including parts) | 119 768 | 98 331 | 717 235 | 629 469 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 30 857 | 31 843 | 209 833 | 233 416 |
| Switchboards, other than Telegraph and Telephone | 3 976 | 5 834 | 39 237 | 45 716 |
| Electrical Goods and Apparatus, all other Sorts | 168 048 | 218 194 | 1 390 110 | 1 449 323 |
| Total of Electrical Goods and Apparatus | 1 421 513 | 1 410 980 | 10 763 853 | 10 788 489 |

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# AN INTERESTING VISIT.

## Apparatus and Equipment in Construction at Stafford.

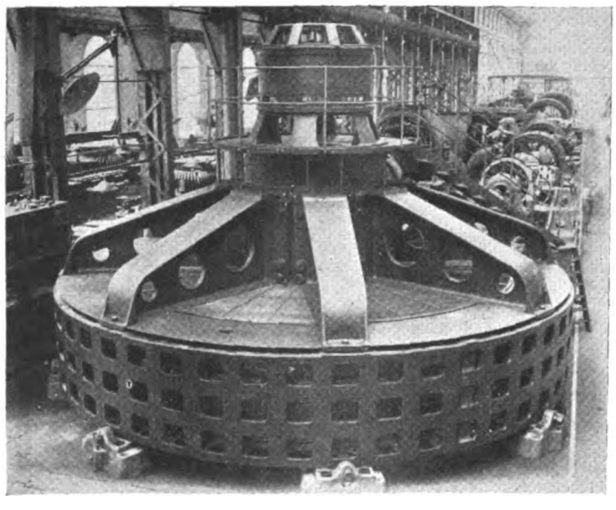
IN connection with the recent visit of engineers from supply undertakings throughout the country, and members of the electrical press to the Stafford Works of the English Electric Co., Ltd., for the purpose of seeing a demonstration of the Wilkinson change-circuit system, and of inspecting the work in progress in the heavy electrical machine, transformer and switchgear departments of the company, we give below a brief description of the more important machines which were in course of manufacture or testing.

In the heavy machinery department was to be seen a 31 250 kVA turbo-alternator which is for installation in the Dalmarnock power station. It is intended to replace an existing 25-cycle machine which is now being dismantled. The alternator is a three-phase machine, having the maximum continuous rating mentioned above, and will generate at 6 500 V, 0·8 power factor, with temperature rises within the limits of British Standard Specification No. 225, 1925. It has an emergency rating of 34 400 kVA, without dangerous heating. The speed is 1 500 revs. per min. Other machines included a 15 625 kVA turbo-alternator for Wallasey Corporation and a 16 667 kVA alternator for Preston Corporation, this being the fourth to be installed in the Ribble power station. It is designed to run at 3 000 revs. per min., with a normal terminal pressure of 6 600 V and 0·9 power factor. Another interesting work comprised three 18 750 kVA turbo-alternators for St. George's Bay power station at Athens. These machines are similar to the Preston Corporation machines, but of slightly larger dimensions. They will generate three-phase current at 6 600 V, 50-cycles, and 0·8 power factor. They form part of a comprehensive contract for the entire reconstruction of the electricity supply and traction system of Athens and its suburbs. Three water turbine alternators for Perak River Hydro-Electric Co. were also on view. These machines, which are intended for the Chenderoh power station, are claimed to be the largest of their type built in this country. They are designed for coupling to vertical shaft reaction turbines developing 15 000 H.P., at 93·7 revs. per min., and will each have a normal rating of 11 250 kVA at 0·8 power factor with an overload capacity of 12 350 kVA, at 0·875 power factor and will generate three-phase, 50-cycle current at 6 600 V. The rotors are designed for an over-speed of 187 revs. per min., and the rim carrying the poles is built up of steel laminations keyed to a central steel spider. The rotor is supported in a Michell type thrust bearing, mounted on a massive eight-arm upper bracket, while the lower bracket is designed to support the rotor during erection, and carries separate braking and jacking cylinders.

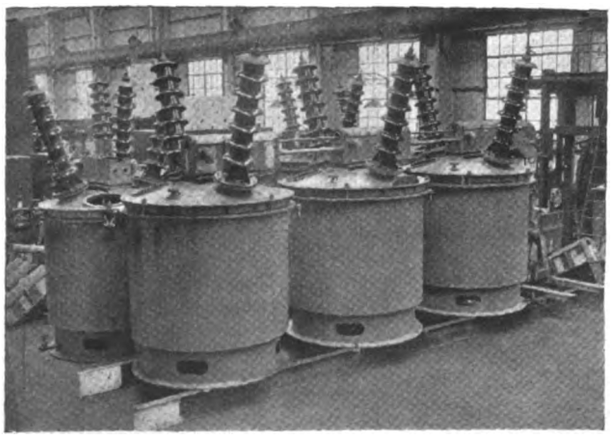
Of vertical shaft alternators special mention may be made of a 10 000 kVA unit which has recently been set to work in the Alouette power station, British Columbia, and of the four sets in the power stations of the Lanarkshire Hydro-Electric Power Co.

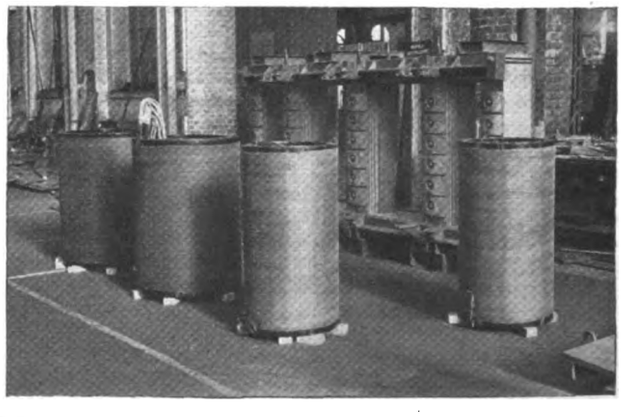
Some very interesting water turbine d.c. generators were seen in various stages of manufacture. They form part of an order for the North British Aluminium Co., Ltd., for the new hydro-electric power station at Lochaber. The complete order comprises five impulse turbines, each of 9 600 H.P., each driving two 3 400 kW horizontal d.c. generators. The necessity for the massive construction of the generators, which was observed, will be readily appreciated when it is stated that each machine has an output of 10 000 A at 300 V, and has to run at practically full-load throughout the year. Further, they have had to be designed to withstand an over-speed of 90 per cent., and this fact, combined with the large current to be taken from the commutators, has required a very heavy structural design for this part of the rotating portion.

On the occasion of the visit a number of high-frequency alternators were under construction and on the test bed. In the Winding Bay were seen stators and rotors nearing completion for two 150 kW, 2,200 cycle sets and one 650 kW, 1 000-cycle set. The construction of the rotors of these machines calls for special mention, since the high peripheral speed has required the use of special bronze keys for retaining the pole coils in place and manganese bronze end bells for the overhang of the windings. Axial ventilation is employed



*SEEN at the Stafford Works of the English Electric Co., Ltd. A hydro-electric unit for the Perak River scheme, on the left, and, right, a special induction regulator for Richmond, the purpose of which is explained in the text. Below: A group of 500 000 and 750 000 kVA oil-circuit breakers on the left, with the components for a 5-limbed 9 000 kVA transformer on the right.*





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and the completed rotor, although inherently of the salient pole type, bears general resemblance to a small turbo-alternator rotor. Mica insulation is used for both the stator and the rotor coils. In the case of the 650 kW set, the stator frame of the driving motor and of the alternator are of the sheet steel built-up type, as now being employed so extensively in the United States.

In the transformer department was seen a 9 000 kVA self-cooled transformer for Manchester Corporation. The parts seen were of special interest in that we were informed that it is the first 5-limb three-phase core-type transformer to be manufactured in this country. The core (shown in photograph) embodies the key-bolt type of construction. It will be remembered that amongst the special advantages claimed for this type of construction is that it eliminates the use of tie-bolts between the top and bottom yokes, and thus does away with the difficulties which arise in insulating these sufficiently to ensure freedom from breakdown where they pass close to the high-tension windings.

### Transformers for Scottish Scheme.

Coils and other parts for the construction of eight three phase transformer units of 10 000 and 15 000 kVA capacity, for the Central Scotland Electricity Scheme were seen in course of manufacture. In spite of the size of these units they were designed so that they could be transported from the works to site in their own tanks in oil. The transformers are arranged for operation at 132 000 V, with the high voltage windings star connected and the neutral solidly grounded. The low-voltage winding will be connected in delta, and to provide a neutral a separate earthing reactor is being provided which will also serve 440 V mains for running auxiliary plant. Each transformer will be provided with on-load tap changing gear to give plus and minus 10 per cent. voltage variation.

Another interesting item was a special induction regulator for Richmond, which claims to represent the solution of a problem which has never before been attempted, namely, that of counteracting extremely rapid variations in voltage by apparatus of this description. The regulator is to be used on a system which takes a bulk supply from a traction net-work, and the problem was to develop a regulator that would operate quickly enough to smooth out the rapid fluctuations in the net-work voltage, so as to give a practically constant voltage on the bulk supply. The regulator has been designed so that it will give the full amount of regulation of plus and minus 10 per cent., that is to say 20 per cent. in all in 1¼ seconds. The regulator in question is for use on a 300 kVA feeder operating at 440 V on a 331·3 cycles-per-sec. system.

In the erecting shop and the various detail assembly shops a variety of switchgear was seen in all stages of progress, including 110 000 V oil circuit-breakers. These were of two types, similar in external appearance. In one type there are two breaks per phase giving a rupturing capacity of 500 000 kVA, and in the other four breaks per phase with a rupturing capacity of 750 000 kVA. The breakers are installed in switching stations of the outdoor type and are mounted on a concrete floor in groups of three, connected by an operating rod for electrical operation by solenoid or motor. Access to each tank is obtained through a manhole in the top cover.

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## RAILROAD ELECTRIFICATION.

### A £500 000 Midland Scheme.

ONE of the biggest post-war electrification undertakings outside London is to be begun at once, between London Road, Manchester, and Altrincham, sanction having been given to the scheme by the railway companies concerned, and the engineers have the work in hand. Specifications are being prepared and the actual work of electrifying the line will begin in the autumn. Various estimates of the probable expenditure are made, but it seems likely that the cost will be nearly half-a-million sterling. The subject of electrification has been under consideration for some time, but the general slump in railway traffic throughout the country has caused many schemes to be held up. The change from steam to electricity over nine miles, although complete in itself, is part of a larger scheme. The ultimate idea is to extend the arm into a loop by electrifying the line through Longsight, Mouldeth Road, East Didsbury, Cheadle and Gatley, and link up with the Cheshire lines running between Cheadle and Northenden, Bagueley and Altrincham, which last place would then be the extremity of the loop.

## BUSINESS ITEMS.

THE Trojan Lamp Co. have opened a wholesale and retail depot at 30, Old Town Street, Plymouth.

Mr. Wilfred Henstock, wireless dealer, of Mansfield, has taken larger premises in Church Street.

J. Lyons and Co., Ltd. have over 2 500 "Frigidaire" electric refrigerators distributed throughout the country.

It is reported that the Civic Commissioners of Sydney, N.S.W., have accepted a tender of £149 331 from the General Electric Co., Ltd., for 33 000 V cable.

The Park Royal Engineering Co., Ltd., announce that Mr. W. Kirtley is no longer their representative for Newcastle-on-Tyne and the N.E. coast.

Showrooms for the display and sale of Frigidaire automatic electric refrigerators have been opened at 99, Old Town Street, Plymouth, by W. G. Heath and Co.

A. C. Cossor, Ltd., announce that their Birmingham Depot has been removed to 8, Temple Street. A new depot has been established in Leeds at 4, Park Place.

George Green and Co., announce that they have removed to the Gee-Gee Works, Chapel Road, West Norwood, London, S.E.17. Telephone number: Streatham 8272.

Mr. Colin H. Gardner, radio manufacturer, of 27, High Street, Stourbridge, has been appointed technical consultant to the Eagle Engineering Co. Mr. Gardner will continue to carry on his own business.

A British subject in Batavia wishes to represent British manufacturers of electric lighting sets and electric torches. Particulars from the Department of Overseas Trade, quoting Reference No. 103.

With reference to our illustration of the new showroom of C. Donovan and Co. on page 162 last week, we are asked to point out that the firm in question is Donovan and Co., of Cornwall Street, Birmingham.

An important contract for Riley stokers for the Pedro Mendoza station at Buenos Aires, has been secured by Riley Stoker Co., Ltd., of 9, Bridge Street, London, S.W.1, acting as sub-contractors to Babcock and Wilcox, Ltd.

Leonard Toomer and Co., wholesale electrical and radio suppliers, of 54, Lower Thames Street, London, E.C3, request catalogues of electric lamps, fires, fittings, etc., together with particulars concerning radio accessories, components, etc.

J. H. Pease (Southend), Ltd., dealers in electric lamps, fittings and accessories, announce that their business at 23, Queen's Road, Southend-on-Sea, is shortly being closed down, and in consequence their stock is being realised by a special sale.

The address of the Direct West India Cable Co., Ltd., the Halifax and Bermudas Cable Co., Ltd., the Cuba Submarine Telegraph Co., Ltd., and the West India and Panama Telegraph Co., Ltd., has been changed to Electra House, Moorgate, London, E.C.2.

Messrs. H. O. Swoboda, Inc., consulting engineers, of Pittsburgh, Pa., have been retained by the Altoona School District, Altoona, Penn., for providing an emergency lighting system for the senior and junior high schools. It is stated that the system will not only be in compliance with the latest regulations of the Department of Labour and Industry of the Commonwealth of Pennsylvania, but it will also contain a number of features which will make it fool-proof.

Sulzer Bros. have recently received an order for an eight-cylinder, two-cycle, Diesel engine of 5 000 B.H.P., for the Bucharest Electricity Works. This power station is already equipped with eleven Diesel engines of other makes, ranging in sizes from 240 to 2 000 B.H.P. Another order of interest is that for the power station in Jaipur, India, for which a 620 B.H.P. Sulzer engine has been ordered. In both cases the engines will be direct coupled to alternators, the larger engine running at 150 revs. per min., and the smaller at 187 revs. per min.

An outstanding feature of the Bournemouth Hospital Fete, to be held in Meyrick Park, on September 5th, will be the lighting effects. Behind the arena where the fete is being staged there is a wooden slope, and when the question of spectacular illumination was being considered, it was decided to illuminate this by means of floodlighting. Some idea of the effects to be produced may be conveyed by the fact that no less than 60 B.T.H. floodlight projectors, each equipped with a high wattage gasfilled lamp and fitted with colour screens, are to be employed. The Bournemouth and Poole Electricity Supply Co., Ltd., are responsible for carrying out the scheme, in the planning of which they collaborated with the British Thomson-Houston Co.

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# SELLING LINES.

AMONG the designing departments of the British Central Electrical Co., Ltd., of 6–8 Rosebery Avenue, London, E.C., may be mentioned that department which is devoted to the suitable conversion of *objets d'art*. Rare ornaments, lacquered pedestals and so on, submitted by customers for adaptation as lighting fittings and standards form interesting subjects for the designer, and in this respect a recent visit to the showrooms of British Central Electrical Co., revealed some novel ideas. When a client has his own designs, these are carried out and

**Examples of the work of the British Central Electrical Co., Ltd.**

kept distinct to him, but the treatment and colouring are usually left to the discretion of the designers whose experience enables them to evolve a suitable lampshade even for the most unusual bases. The showrooms have the appearance of a miniature museum; rare rose quartz carvings, Chinese idols and solemn-faced Buddhas rest side by side awaiting conversion. Ultimately they leave the studios bearing a shade in keeping with their period characterisation. Other shades by the same firm are expressed in skin (real vellum), silk and parchment, as well as in what is claimed to be a new material, "ambrey." The designs range from "period" shades inspired by classic influences to the most ultra-modern conceptions.

The special coils for the Mullard "Master Three" are now being made by the London Electric Wire Co. and Smith, Ltd. The coils are wound with Litz wire.

## POWER PLANT FOR BRITISH COLUMBIA.

### New Power Station for Vancouver.

THE British Columbia Power Corporation has awarded to C. C. Moore & Co., of Vancouver and San Francisco, a contract for the construction of a steam-power plant for the production of electricity, to be erected at Burrard Inlet, half a mile west of the Second Narrows Bridge in Vancouver Harbour, at a cost of $2 500 000. Surveys and test bearings are now practically completed and engineers will start work immediately on detailed plans of the structure. It is expected that the plant, which will be known as the Hastings Steam Plant, will be completed by September 1st, 1930. The contract provides for the construction of the first 20 000 kW turbo-generating unit of a station which will ultimately contain four similar units. Plans for the plant include the construction of docks, coal-handling equipment, bunkers and other facilities for receiving fuel from vessels. There will also be spur tracks at the rear of the plant for receiving shipments. The British Columbia Power Corporation, which recently acquired the Canadian interests of the British Columbia Electric Railway Co., will, when the new plant is completed, have a total of six generating plants on the mainland of British Columbia, including the Bridge River hydro-electric power developments on which work is now in progress. The main generating supply of the city of Vancouver and the surrounding districts are the Lake Buntzen, Stave Falls and Alouette "hydro" plants, the last-named of which is an automatic station operating without resident attendants, recently brought into operation in order to develop 12 000 H.P. from water diverted into Stave Lake through a tunnel bored beneath a mountain range separating Alouette and Stave Lakes. The station is controlled from the Stave Falls power house ten miles away. With its Jordan River and Coldstream hydro-electric plants on Vancouver Island, and the existing reserve steam plants at Vancouver and Victoria, the British Columbia Power Corporation has at present over 200 000 H.P. of developed capacity.

# ELECTRICITY IN IRELAND.

### Increased Consumption throughout Northern Territory.

IN the annual report of the Electricity Commissioners for Northern Ireland for the year ended March 31st, 1928, it is stated that of the statutory undertakings, Belfast sold nearly 44¾ million kWh during the year, compared with about 2¾ million sold by Londonderry Corporation, and nearly half a million by the Larne Electric Light and Power Co. The smallest of the statutory undertakings is the Markethill Electric Light and Power Co., which sold only 10 417 kWh. Public appreciation of the uses and amenities of electricity is slowly but steadily gaining ground throughout the whole of Northern Ireland. During the year the Commissioners gave their consent to the erection of new generating stations at Armagh, Broughshane, Donaghadee, Moneymore, Portstewart, Rostrevor, and Tandragee, and authorised extensions of existing generating stations at Ahoghill, Fintona Kilkeel, and Newcastle. In the case of Portstewart there was already a generating station, but the rapid development of this seaside resort necessitates the erection of a new station with increased capacity. As far as practicable, the Commissioners insist on all new undertakings being so designed and equipped as to fit in readily with any comprehensive scheme that may hereafter be introduced. When the Lisburn scheme was mooted the Commissioners, having in mind the possibilities of a scheme of development encircling Lough Neagh, as visualised by the Development Commission, succeeded in making an arrangement with the Lisburn Electric Supply Co., whereby a line capable of transmitting at a pressure of 33 000 V is to be erected, instead of a 6 600 V line, as originally proposed.

## TRACTION MOTORS SPECIFICATION.

### Recommendations of the International Electrotechnical Commission Adopted.

THE revision of the old British standard specification No. 72 for electrical machinery, was completed some months ago by the issue of the B.S. specification for rotary convertors (B.S. Specification No. 172-1927) and the British standard rules for methods of declaring efficiency (B.S. Specification No. 269-1927) there now being a series of seven specifications, which, taken together, replace the old Specification No. 72. Some of these newer specifications have already reached the revision stage, the latest to be revised being that for the electrical performance of d.c. series-wound traction motors, B.S. Specification No. 173-1928.

In this specification the latest recommendations of the International Electrotechnical Commission have been adopted in so far as they are applicable to service conditions in this country. The tests to be applied to traction motors are dealt with in greater detail than in the old specification, particularly as regards commutation tests. An important change in the new specification relates to the method of determining the temperature-rise, the resistance method being specified for use wherever possible. In the old specification the thermometer method was the only method recognised. Copies of this new specification (No. 173-1928) may be obtained from the Publications Department, B.E.S.A., 28, Victoria Street, London, S.W.1; price 2s. 2d., post free.

### TELEPHONES IN SWEDEN.

Information regarding telephones in Sweden, extracted from the Statistical Report of the Swedish Telegraph Department for 1927, just published, shows that in 1927 the number of telephone stations was 4 735, of which 28 were private. Two automatic telephone exchanges are being built in Stockholm and one in Gothenburg. Telephone conversations numbered 694·6 millions in 1927 as against 662·1 millions in 1926; of these 317 000 were to foreign countries against 308 000 in the preceding year; 298 000 from foreign countries against 276 000 and 60 000 through Sweden against 56 000 in 1926. Of 615 000 telephone conversations with foreign countries Denmark accounted for 260 500, Norway for 197 500, Germany for 126 000 and Great Britain for 3 200 (first year of traffic). Telephone traffic was opened up during the year with Great Britain, France, Belgium, and the Netherlands. The number of telephones, including extensions, in use in 1927 was 453 513 (or 74·5 per thousand inhabitants) as against 438 059 in 1926. The income derived from telephone traffic in 1927 was 75 003 000 kr. as against 72 335 000 kr. in 1926.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

KENDAL CORPORATION.—Supply, delivery and laying of approximately one mile of 6 600 V cable with pilot and three miles of low-tension cable. Specifications, etc., from Mr. J. E. Storr, Commercial Union Buildings, 14, Park Row, Leeds. Deposit, £2 2s.

SWINDON CORPORATION, August 18th.—Supply and erection of: (1) one storage battery; and (2) three turbine driven boiler feed pumps. Specifications, etc., from Messrs. Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, London, S.W.1; deposit £2 2s. for each section.

ANTRIM LIGHT AND POWER CO., LTD., August 20th.—For supply and erection of one 35 kW generator and one 9 kW generator. Specifications from the secretary, the Antrim Light and Power Co., Ltd., Antrim.

CLITHEROE CORPORATION, August 20th.—Overhead wiring in the Cattle Market. Plans and specifications can be seen at the office of the Borough Engineer.

GLASGOW CORPORATION, August 20th.—Electric lighting installation of Crossloan Road, Govan, and Keppochhill Road, housing schemes. Specifications, etc., from the Manager, 75, Waterloo Street, Glasgow.

BERKHAMSTED GUARDIANS, August 21st.—Electric light installation at the institution. Particulars from the clerk, Mr. A. Brooke Turner.

GRIMSBY CORPORATION, August 22nd. Supply of one 500 kW motor converter and low tension switchgear. Specifications, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby.

GROVE PARK HOSPITAL, August 22nd.—For installation of wireless equipment. Specifications, etc., from the office of the Board, Victoria Embankment, London, E.C.4. Deposit, £1.

HUDDERSFIELD TOWN COUNCIL, August 22nd.—Installing electric light in 22 houses at Brackenhall Road, Sheepbridge. Particulars from the Borough Architect, 26, Ramsden Street.

MANCHESTER CORPORATION, August 22nd.—Twelve months' supply of electric cooking ranges. Specification (No. 224) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, August 22nd.—(1) Rewiring fire alarm systems at Caterham Mental Hospital; and (2) electric lighting installation in shore and pier buildings at Long Reach Hospital, Dartford; deposit £1 in respect of each work.

BIRMINGHAM ASYLUMS COMMITTEE, August 25th.—Electric lighting and power installation at Winson Green Mental Hospital, Lodge Road, Birmingham. Specification, etc., from City Engineer, Council House, Birmingham; deposit £5.

HARROGATE CORPORATION, August 25th.—Supply of two 2 500 kVA transformers and supply and erection of 11 000 V switchgear and 30-ton travelling crane. Specification from Borough Electrical Engineer.

HACKNEY (LONDON) BOARD OF GUARDIANS, August 29th. For the installation of an automatic telephone and fire alarm system at the branch institution and separate school at Brentwood, Essex. Specifications, etc., from Mr. E. W. Harbour, 2, Sidney Road, Homerton, London, E.9.

BRISTOL GUARDIANS, August 30th.—Supply of electrical fittings for six months. Particulars from the clerk, Mr. Thomas S. Lamb, St. Peter's Hospital, Bristol.

BAGULEY SANATORIUM (TIMPERLEY), August 31st.—To supply, deliver, erect and connect up to main board in engine room, and switchboards, three twin V.I.R. taped lead covered, steel tape armoured and jute served, 600 megohms, grade cable. Specification, etc., from the Sanatorium, by appointment.

MANCHESTER CORPORATION, August 31st.—Supply and placing in position at various sub-stations, of eight 250 kVA, eight 500 kVA, and two 125 kVA static transformers. Specification (No. 225), etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ROCHDALE CORPORATION, August 31st.—For supply of 500 electric wash boilers to be taken over a period of 12 months. Specifications, etc., from the Engineer and Manager, Electricity Works, Dane Street, Rochdale.

SALFORD BOARD OF GUARDIANS, August 31st.—Lighting and power supply to garage and east end rooms of the Eccles New Road Institution. Specification, etc., from Mr. E. H. Inchley, Poor Law Offices, Eccles New Road, Salford.

STANDING JOINT COMMITTEE FOR DEVON, September 1st.—Supply of police accoutrements for three years, including electric lamps. Tender forms, etc., from the Chief Constable of Devon, Exeter.

LLANTARNAM URBAN DISTRICT COUNCIL, September 3rd.—(1) High and low-tension switchgear; (2) transformers; and (3) overhead and underground mains. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

*ON their way. A youthful "lorry" driver and his load, working in the cause of electrical expansion.*

LLANDUDNO URBAN DISTRICT COUNCIL, September 4th.—Supply, delivery, supervision of laying and complete jointing of e.h.t. and l.t. cables, cubicles, transformers and unit type feeder pillars. Specifications, etc., from the Electrical Engineer, Electricity Works, Llandudno.

RHONDDA URBAN DISTRICT COUNCIL, September 4th.—Supply and delivery of one 150 kVA three-phase, static transformer, 3 500/414 V, 25 cycles; one 150 kVA three phase static transformer, 11 000/414 V, 25 cycles. Specifications and form of tender from Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

## Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

VICTORIAN ELECTRICITY COMMISSION, August 20th.—Supply and delivery of 66 000 V transformers and spares. (Reference B.X. 4 541.)

MADRAS GOVERNMENT, August 21st.—(A) Penstocks and valves; (B) turbines; (C) alternators; (D) transformers; (E) switchgear, protective gear, etc., in connection with Glen Morgan hydro-electric scheme. Specifications, schedules, etc., from Messrs. Balfour, Beatty and Co., Ltd., 66, Queen Street, London, E.C.4. Fee 5s. (not returnable) for each schedule.

IRISH FREE STATE ELECTRICITY BOARD, August 22nd.—Supply and erection of approximately 32 kiosk and 13 pole-type transformer stations, with switchgear and transformers (10 000/380-200 V) in various towns. Conditions of contract, specification, etc., from Mr. P. J. Dempsey, secretary; deposit £5.

STATE ELECTRICITY WORKS, MONTEVIDEO, August 22nd.—Supply of metal filament lamps. (Reference B.X. 4 560.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, August 29th.—Two 20 000 kW 25 cycle turbo-alternators, with condensing plant, etc., for Ultimo power house. (Reference B.X. 4 402.)

JOHANNESBURG MUNICIPALITY, August 30th.—Street lighting switches. (Reference B.X. 4 584.)

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JOHANNESBURG MUNICIPALITY, August 30th.—Supply of tramcar tyres and street lighting time switches.

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of six 10 kVA induction voltage regulators for 400/200 V supply (contract No. 4). (Reference B.X. 4 617.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 700 tons of steel tramway rails, 2 000 pairs of fish plates, 5 000 steel tiebars and 12 manganese steel leg crossings (contract No. 13). (Reference A.X. 6 632.*)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 1 000 kVA and 250 kVA transformers. (Contract No. 8). (Reference B.X. 4 618.)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

CAPE TOWN CITY COUNCIL, August 31st.—For supply and delivery of 29 300 yards of multi-core, paper insulated, lead covered cables. (Reference B.X. 4 633.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cord for indoor installations. (Reference B.X. 4 590.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. Reference A.X. 6 538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21). Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

CAPE TOWN MUNICIPALITY, September 4th.—Supply of 1 000 kW converter set (specification No. 427/1928). (Reference B.X. 4 604).

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 6th.—Motor-driven milling, pipe screwing, grinding and planing machines, etc. (Reference A.X. 6 592.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th.—Supply of 338 000 metres of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA) MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

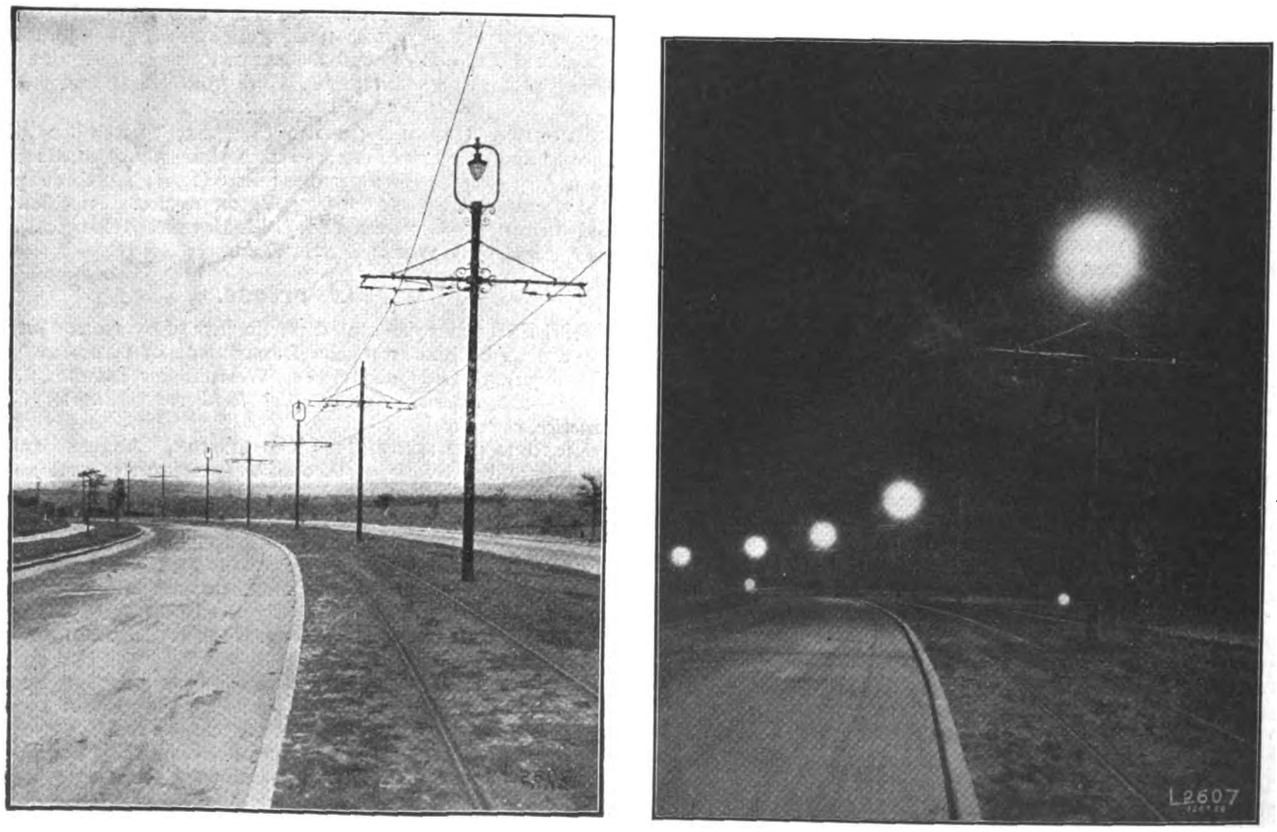
ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 17th.—Supply and delivery of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, together with junction and terminal boxes. (Reference B.X. 4 608.)

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 19th.—Supply and delivery of 250 V lead covered conductors. (Reference B.X. 4 607.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 20th.—Supply and delivery of one electrically-driven heavy duty double face-plate wheel lathe for Germiston wagon repair shops. (Reference A.X. 6 660.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)




*THE accompanying illustrations show day and night views of B.T.-H. "Leeds" lantern installations at the Exhibition of Street Lighting Equipment recently held in Sheffield, in connection with the Association of Public Lighting Engineers' Annual Conference. The photographs show 300 W size lanterns attached to the tramway standards on the Prince of Wales Road. The mounting height was 25 ft., the average spacing 120 ft., the spacing-height ratio thus being 4·8. A maximum illumination of 0·3 foot-candles and a minimum illumination of 0·043 foot-candles were obtained, giving a diversity of 7–1.*

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TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—For the supply and delivery of 250 ornamental electric lamp standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 2nd.—Supply and delivery of switchboard cords. (Reference R.X. 4 621.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44.) (Reference B.X. 4 637.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-stations. (Reference B.X. 4 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, erection, etc., of mechanical step grates and accessories, for Yallourn power station. Specification (No. 28/48), etc., from the Agent-General, Victoria House, Strand, London, W.C.; charge £1 1s. for three copies, returnable under certain conditions.

## Tenders Accepted.

OLDHAM CORPORATION.—Union Cable Co., Ltd., supply of cable.

NORTHAMPTON CORPORATION.—Heenan and Froude, refuse destructor, £11 399.

MAIDENHEAD TOWN COUNCIL.—W. Lucy and Co., Ltd., three additional kiosks, £470.

CUMNOCK TOWN COUNCIL.—The General Electric Co., Ltd., lamps, fittings, etc., £202 9s.

BOURNEMOUTH CORPORATION.—Aish and Co., electric light fittings for new pavilion, £3 000.

TAUNTON CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., paper insulated cables.

CRANBROOK GUARDIANS.—Powell and Co., installation of electric fan in laundry, £5 1s. 6d.

ADMIRALTY.—Alloy Welding Processes, Ltd., supply of A.W.P. electrodes for 12 months.

HEMEL HEMPSTEAD CORPORATION.—C. E. Wootton, electric wiring at waterworks, £52 10s. 3d.

STONE (STAFFS) URBAN COUNCIL.—John Collier and Co., Ltd., construction of overhead lines.

ARAPUNI (N.Z.) HYDRO-ELECTRIC SCHEME.—Metropolitan-Vickers Electrical Co., Ltd., switchgear and steelwork.

GILLINGHAM CORPORATION.—Multi-way Earthing Co., wiring of two shops in High Street, Gillingham (recommended).

METROPOLITAN WATER BOARD.—General Electric Co., Ltd., and Stella Lamp Co., Ltd., supply of electric lamps.

ROTHERHAM RURAL DISTRICT COUNCIL.—Lilleker Bros., Ltd., wiring 19 houses for electric light at Catcliffe, £49 10s.

HULL EDUCATION COMMITTEE.—Alex. Shaw and Son, electric light installation at the Grammar School, £141 10s.

DARLINGTON CORPORATION.—Messrs. E. and H. Clover, electric light installation, at Corporation Road Infants School.

SHANKLIN URBAN DISTRICT COUNCIL.—Economic Guaranteed Electric Lamp Co., metal filament lamps (amber and red).

HOLBORN (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., requirements of Osram electric lamps for 12 months.

SPALDING URBAN DISTRICT COUNCIL.—John Collier and Son, Ltd., cable from transformer to sugar beet factory, £56.

WESTMINSTER CITY COUNCIL.—Hammond Bros. and Champness, Ltd., provision of electric lift at Buckingham Palace Road Baths, £835 (recommended).

CHESTERFIELD CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., supply of copper wire, £104 11s.; Macintosh Cable Co., Ltd., supply of e.h.t. cable, £3 516.

SALFORD CORPORATION.—W. T. Glover and Co., Ltd., supply of e.h.t. cable, £777 8s.; N. V. Nederlandsche Kabelfabriek, 1 290 yards of l.t. cable, £1 096 10s.

WEST HAM MUNICIPAL COLLEGE.—Crompton Parkinson, Ltd., rotary converter, £98; West Ham Electricity Dept., replacement of power mains, £144 (both recommended).

CROYDON CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., motor generator set, £575 10s.; Kingsdown Electrical Co., electric light installation, Davidson School, £258.

## Cable Tender.

ERITH URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., cables, etc., for supplies to the mills of Cannon and Gaze and Thames Milling Co., £3 834 5s. 9d.

SPENBOROUGH URBAN DISTRICT COUNCIL.—F. W. Birkett and Sons, Ltd., electric light installations at Hightown Council and C.E. Schools and Littletown Council School, Cleckheaton.

MANCHESTER CORPORATION.—Meta Manufacturing Co., Ltd., electric light installation at Tuer Street depot; J. Needham and Sons, Ltd., supply of cast iron bases and finials.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD.—Ferguson, Pailin, Ltd., erection of 14 transformer kiosks and switchgear in the county of Dublin; Asca Electric, Ltd., erection of transformers.

CLACTON-ON-SEA URBAN DISTRICT COUNCIL.—Crompton Parkinson, Ltd., e.h.t. and l.t. switchgear for St. Osyth Road sub-station, £640; Fuller Electrical Manufacturing Co., transformers, £180.

NEWCASTLE-UPON-TYNE CORPORATION.—Austin and Co., provision of an electric lift at Home for Incurables, £620 14s.; Devereux, Moodie and Co., electric light installation at Home for Incurables, £420.

MANCHESTER CORPORATION.—Callender's Cable and Construction Co., Ltd., overground switch pillars; Babcock and Wilcox, Ltd., electrically-operated coal wagon tipper, for Barton power station.

BIRKENHEAD CORPORATION.—Callender's Cable and Construction Co., Ltd., supply and laying of mains equipment, in connection with bulk supply to Hoylake and West Kirby U.D.C., 23s. 1d. per yard.

STOURBRIDGE BOARD OF GUARDIANS.—Messrs. Thomas Priest, installing electric light at Wordsley Institution and Sandfield House at £936 14s. There were 15 other tenders, four being for over £2 000.

DOUGLAS (I.O.M.) BOROUGH COUNCIL.—Richardsons, Westgarth and Co., Ltd., one 1 000 kW steam turbo-alternator, condensing plant, cooling tower, and accessories, and two 15 000 lb. boilers with pipe work, etc., £28 000.

LONDON COUNTY COUNCIL.—Baxter and Caunter, Ltd., Edison Swan Electric Co., Ltd., Eyre Smelting Co., Ltd., Julius Sax and Co., Ltd., Siemens Electric Lamps and Supplies, Ltd., and J. H. Tucker and Co., Ltd., supply of electric fittings.

CHESTERFIELD CORPORATION.—British Insulated Cables Ltd., supply and erection of overhead equipment for New Whittington trackless trolley vehicle route, £4 288; Brush Electrical Engineering Co., Ltd., supply of 150 kVA transformer, £125.

NEWRY URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., oil engine, £4 542; Metropolitan-Vickers Electrical Co., Ltd., switchboard, £614; Herbert Morris, Ltd., travelling crane, £151; Irish Electrical Construction Co., mains and services, £7 754.

GREAT WESTERN RAILWAY.—Coventry Victor Motor Co., supply of 16 air-cooled engines, in connection with conversion of electric trucks to petrol-electric drive at the Swindon works, and supply of one 2-ton electric transporter crane at the Brentford Docks.

BARNSTAPLE CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., cables, £17 403 8s. 10d.; Harland Engineering Co., switchgear, £2 089 19s. 6d.; Mirrlees, Bickerton and Day, Ltd., Diesel engine and generators, £3 076; Tudor Accumulator Co., Ltd., battery, £269 10s. 3d.

WALTON-ON-THAMES URBAN COUNCIL.—Greenwich Cable Works, cables, £2 123 18s. Landis and Gyr, Ltd., a.c. meters to replace d.c. meters. Hopkinson Induction Motors, Ltd., motors, £604 8s., less £63 for old motors. Martins, Ltd., converting wireless sets for use on a.c., £45 10s.

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# WORK IN PROSPECT.

ABINGDON.—Housing scheme (30), for the Rural Council. Particulars from the Surveyor.

BECONTREE (ESSEX).—Housing scheme (5 000), for London County Council.

BOLTON.—Houses (50), Geneva Road East, for Mr. H. Parvin.—Houses (20), Latimer Road, for Mr. J. Clayton.

BOSTON.—Housing scheme (28), for the Town Council. Particulars from the Borough Surveyor.

BRERETON.—School (216 places), for Staffs Education Committee. Particulars from the Education Architect, Stafford.

CONNAH'S QUAY.—Extensions, Custom House Lane school, for Flintshire Education Committee. Particulars from the county architect, Mr. R. G. Whitley, Mold.

COTON.—School to cost £2 767, for Staffs Education Committee. Particulars from contractors, H. Spencer and Son, Cannock.

## Three New Schools.

Co. DURHAM.—Schools, Usworth Colliery (£17 640), Brandon Colliery (£22 499), and Billingham (£12 094), for the Education Committee, to be erected by direct labour. Particulars from the education architect, Durham.

DARLINGTON.—School (440 places), for the Borough Education Committee. Particulars from the clerk, Mr. H. Hopkins.

DARLINGTON.—Rivet works and reconstruction of mill, Whessoe Lane. Particulars from the architects, Bradshaw, Gass and Hope,

ELLESMERE PORT AND WHITBY.—School (850 places), for Cheshire Education Committee. Particulars from the clerk, Mr. R. Potts, Chester.

FLEETWOOD.—Housing scheme, Warren Farm Estate, for the Urban Council. Particulars from the Surveyor.

GREAT OUSEBURN.—Housing scheme (10), Poppleton Nether, for the Rural Council. Particulars from the surveyor, Mr. H. C. Paine, Green Hammerton, York.

HAMILTON.—Business premises for the Co-operative Society. Particulars from the architect, Mr. G. Paterson, Cadzow Street.

HECKMONDWIKE.—Secondary school extensions, to cost £14 115, for West Riding Education Committee. Particulars from the Education Architect, Wakefield.

HUDDERSFIELD.—Additional 100 houses and public baths for the Town Council. Particulars from the Borough Architect.

IRBY (BIRKENHEAD).—Village hall. Particulars from the Secretary, Mr. H. Reynolds.

KENDAL.—Extensions to Westmorland Hospital, to cost £14 000. Particulars from the architects, J. F. Curwen and Son, Highgate.

KING'S DYKE.—Church and Schools for the United Methodist Trustees. Particulars from the architects, W. Fovargue and Son, The Causeway, March.

LANARK.—Police station, to cost £10 000, for Lanarkshire County Council. Particulars from the County Surveyor.

LYE AND WOLLESCOTE.—Housing scheme (46), for the Urban Council. Particulars from the architect, Mr. H. E. Folkes.

LYMM.—Housing scheme (20), for the Urban Council. Particulars from Surveyor.

MAESYCWMMER.—Secondary school, for Glamorgan Education Committee. Particulars from Director of Education, Cardiff.

RAMSEY (ISLE OF MAN).—Houses for the Town Commissioners. Particulars from the contractors, C. D. Crowe and Son.

READING.—Additional 120 houses, for the Town Council. Particulars from Borough Surveyor.

ST. ALBANS.—Houses (18), London Colney, for the Rural Council. Particulars from Surveyor.

SIDMOUTH.—Extensions to Victoria Hospital, to cost £10 000. Particulars from the Secretary.

STOCKTON-ON-TEES.—Additional 158 houses, for the Town Council. Particulars from Borough Surveyor.

TROON.—Houses (14), for Mr. Alexander Wilson.

WARMINSTER.—Cottage hospital, to cost £10 000. Particulars from the Secretary.

WESTON-SUPER-MARE.—Masonic Hall extensions, for the Masonic Hall Co., Ltd. Particulars from the architect, Mr. P. B. Rigg, 69, High Street.

WILLITON.—Housing scheme (56), for the Rural Council. Particulars from the Surveyor.

# TRADE PUBLICATIONS.

THE latest price list of the Normand Electrical Co., Ltd., has been received.

The current price list of a.c. motors by Induction Motors (London), Ltd., has been sent to us.

Book 2, section 1A, giving details of telephone equipment, has been issued from Gent and Co., Ltd.

Folder No. 310 concerning Henley tape has been issued by the W. T. Henley Telegraph Works Co., Ltd.

A copy of their current price list has been received from Siemens Electric Lamps and Supplies, Ltd.

A.F.A. Accumulators, Ltd., have published catalogue P.3, descriptive of "Pertrix" long-life dry batteries.

A folder describing "Elect" electrical immersion heaters has been received from the Electric Heating Co.

Prescot terminal boxes and sealing ends are described by British Insulated Cables Ltd., in publication P.238.

Two new publications by Philips Lamps, Ltd., are lists Nos. 106 and 107, dealing with their automatic trickle charger.

The Wandsworth Electrical Manufacturing Co., Ltd., have sent us a copy of their new catalogue of electrical accessories.

Book 6A, published by Gent and Co., Ltd., describes liquid-level indicating, recording and alarm signals, electrical and mechanical.

Siemens Electric Lamps and Supplies, Ltd., have sent us their latest catalogue (No. 198), descriptive of Holophane stiletto reflectors.

Ironclad fuse and switchgear is dealt with in catalogue No. 2.122, by Siemens Electric Lamps and Supplies, Ltd. This catalogue supersedes No. 2.121.

We have received from Switchgear and Cowans, Ltd., catalogue section No. 1/3, dealing with remote controlled electrically-operated circuit-breakers.

A new publication by Gent and Co., Ltd., is book 1, section 2a, dealing with iron-case bells, indicators, relays, pushes and morse keys for power mains and battery circuits for mines, railways, etc.

The Finnell system of electric scrubbing, waxing and polishing is described in a new publication by Finnell System, Ltd. A special folder in colours and dealing with the same subject has also been published.

A new publication dealing with their universal duplex unit has been published by the Automatic Telephone Manufacturing Co., Ltd., and suggestions for the application of the instrument, with special appeal to telegraph engineers and superintendents, are given.

## Meters for Radio Work.

A new edition of their booklet describing portable meters, and entitled "Radio Control," has been published by the Weston Electrical Instrument Co., Ltd. A new folder dealing with models 489 and 528, both of which are suitable for radio purposes, has also been published.

Ferguson, Pailin, Ltd., have published catalogue section No. 62, S.1, describing indoor isolating switches, type "W"; No. 64, S.1, outdoor isolating switches, type "HO"; No. 65, S.3, outdoor isolating switches, type "CO"; No. 96, S.1, electrically-operated semaphores, type "L"; No. 107, S.1, alternating current potential indicator; No. 127, S.1, ammeter switches, type "F"; No. 200, S.3, metal enclosed draw-out truck switchgear types "AB" and "BB"; and No. 200, V.3, metal enclosed draw-out truck switchgear, type "BB."

We have received from the English Electric Co., Ltd., publication No. 920, dealing with compound-filled armour-clad switchgear. Publication No. 924, dealing with the Central England Electricity Scheme, and relating particularly to "English Electric" dual-frequency motors has also been received. This latter has been specially issued for the use of power users in the Central England area. Another new publication is No. 989, describing turbo-alternators of 5 000 kW and over. This latter booklet includes a number of interesting illustrations of various machines.

The British Thomson-Houston Co., Ltd., have published list No. 3312A, describing truck type switchgear type T. form B.; No. 3350, ironclad draw-out switchgear; No. 4157, ironclad oil-immersed circuit breakers; No. 4310, ironclad switch-fuses; No. 4591B (section key), instrument transformers; No. 4591, sections 1, 2 and 3, air-cooled voltage transformers; No. 4591, sections 11, 12 and 13 air-cooled current transformers; No. 4591, sections 14 and 15, oil-immersed current transformers; No. 5330, a.c. motor control panels; No. 5801, a.c. brake magnets; and No. 6783, d.c. controllers for tramcars.

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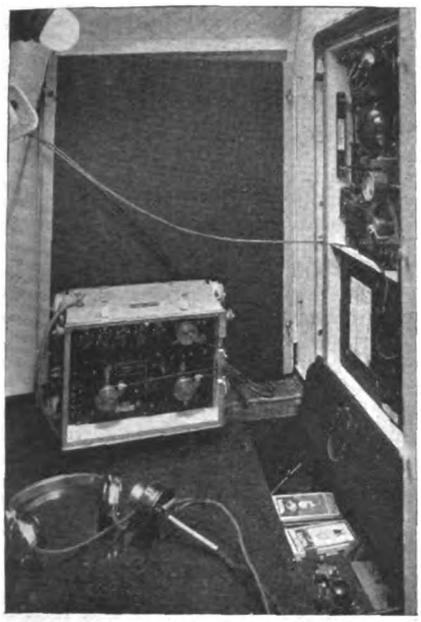
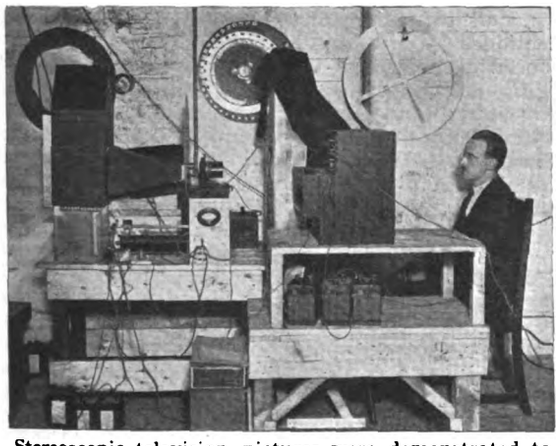
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

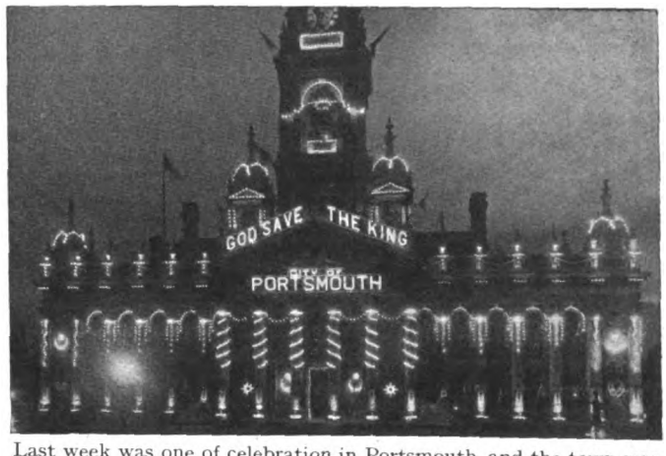


The Marconi installation on the flying boat "Calcutta." The 500 W transmitter is on the right, and the five valve receiver on the table in the centre. See page 191.

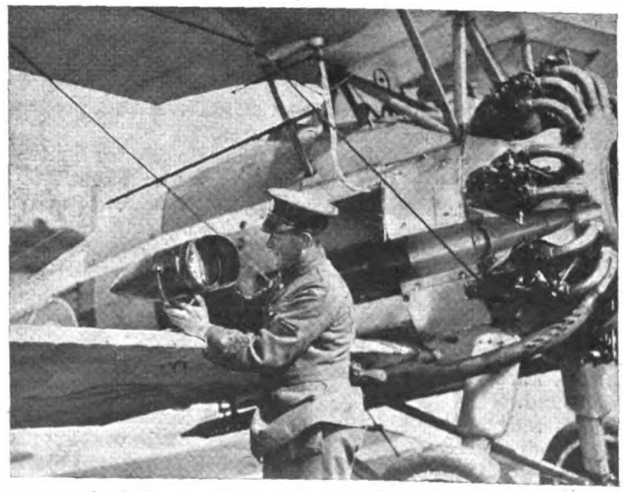
A diver descending in the Severn, at the Quay, Gloucester, in connection with the dredging operations which are being carried out in preparation for the laying of cables across the river bed, connecting the Lydney power station with Gloucester Electricity Works.



Stereoscopic television pictures were demonstrated to certain members of the daily Press by Mr. J. L. Baird, on Friday of last week. It is claimed that this effect is obtained by sending two pictures, which, when viewed at the receiving end, are blended into one.




Last week was one of celebration in Portsmouth, and the town was illuminated with floodlights, "fairy" lamps, and all the other types of electrical splendour. The Guildhall, a photograph of which is given above, was particularly attractive, and held interest for the residents both in and out of the town.



As was to be expected, electricity is playing a big part in the present air defences of London. Apart from the fact that the 26th Anti-Aircraft Battalion R.E. (London Electrical Engineers) T.A. is "doing its bit," the electrical devices, which form part of the "detecting" and "spotting" systems in the line of defence, are many and varied. The left-hand picture shows one of the high-powered searchlights on a ground station, while on the right hand is seen the type of searchlight carried by the defending aircraft.

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# ELECTRICITY SUPPLY.

## New Cables at York—Extensions at Douglas (I.O.M.) Proposed—Electric Street Lighting for Hetton-le-Hole—Suggested Overhead Lines at Luton—Service Cables at Guildford—Hastings and New Meters.

SETTLE R.D.C. are considering the purchase of the Ingelton electric light installation.

Clitheroe proposes to apply for sanction to borrow £1 000 for electric street lighting.

Malvern U.D.C. have applied for loans of £1 000 for transformers, and £500 for meters.

Colchester T.C. have received sanction to a loan of £7 686 for mains and sub-station plant and equipment.

Carlisle Electricity Committee have expressed their approval of the North-West England electricity scheme.

Morecambe Electricity Committee have arranged terms for supply to V. Wilkinson, Ltd., Royds Mills.

York Electricity Committee have authorised the laying of a cable to Deighton Grove, at an estimated cost of £2 200.

Hebden Bridge Urban Council have applied to the Commissioners for an Order to supply electricity outside the town area.

Douglas (Isle of Man) Electricity Committee have been notified that the Tynwald Court will sanction loans for extensions.

Ottery St. Mary Urban Council have given consent to the West of England Electricity Supply Co. supplying electricity to the town.

The Electricity Commissioners have written to Uttoxeter R.D.C. stating that they have decided to grant an order to the Urban Council.

Hetton-le-Hole Urban Council have received sanction to a loan of £5 376 for the conversion of the public lighting system from gas to electricity.

Oxford Corporation have decided by 29 votes to 17 to exercise their right to purchase the undertaking of the Oxford Electric Co., Ltd., in the town.

Luton T.C. have applied for a loan of £13 304 for overhead lines and switchgear for the proposed supply of electricity to Eaton Bray, Edlesborough, Totternhoe, and other villages.

Birkenhead T.C. have approved a recommendation to supply electricity in bulk to Hoylake and West Kirby U.D.C. Borrowing powers for £8 100 for mains and equipment are being obtained.

Hull Electricity Committee have appointed a sub-committee to deal with a proposal of the Tramways Committee to purchase from the department all electrical energy necessary for the tramways undertaking.

In connection with the supply to the Hampden Park district, Eastbourne Electricity Committee have voted £770 for buildings; £495 for transformers; £795 for equipment, and £1 437 for h.t. and l.t. cable.

Gravesend Corporation are to extend mains at a cost of £1 700 to enable supplies to be provided at the sanatorium and the Strood Hospital. The Electricity Committee seek sanction for a loan of £20 000 for mains and £10 000 for house services.

The Electricity Commissioners have informed Plympton R.D.C. that they hope to be in a position to revoke, at an early date, the Order under which Plymouth Corporation supply electricity in the Plympton rural district. The R.D.C. propose to undertake the supply in their own area.

Reigate T.C. have offered a supply of electricity for lighting and power to the works of the Fullers Earth Union, Ltd., subject to a minimum guarantee of £300 per annum for five years, the charges to be 6d. per kWh for lighting and 1½d. for power. The extension of mains will cost £1 021.

The electric lighting of the esplanade at Whitehead, Antrim, was formally inaugurated recently by Coun. R. Nolan, chairman of the Lighting Committee. The installation, which was carried out by the Northern Electricity Supply Co., comprises 28 50 c.p. lamps on 14 steel standards, and the cable is laid underground.

Middlesex County Council have arranged to take electricity in bulk from the North Metropolitan Electric Power Supply Co., for supplying the colony and mental hospital at Porters Park. The charges will be £5 10s. per kW of maximum demand per annum, plus 0·4d. per kWh, with a sliding scale based on cost of coal.

As Bangor Corporation's last loans of £3 000 for prospective expenditure on electricity mains and consumers services, and £1 000 for prospective expenditure on meters, will be exhausted within the next three months, it is intended to seek sanction to borrow a further £3 000 for prospective expenditure on mains; and £400 for prospective expenditure on meters.

Hastings Electricity Committee seek sanction for a loan of £10 000 for meters. Overhead lines to supply the added area, including the Guardians' institution, are to be erected at a cost of £840.—The Corporation have also applied for a loan of £1 500 for compensation for Messrs. Jenner and Simpson, who have been supplying electricity to about 80 consumers in Battle, which area has been taken over by the Corporation under their extension Order.

The newly erected sub-station of the Hawarden Council at Ewloe operating the 11 000 V switchgear, has just been put into service. This section is part of the second portion of the scheme for the electrification of the Hawarden rural area, which includes Sealand, Broughton and Bretton, and Penyffordd. There are well over 1 300 consumers connected to the supply, and it is anticipated that in the near future Penyffordd, Penymynydd, Broughton and Bretton, together with Sealand, will also be linked up.

Guildford Electricity Committee have decided to bear half the cost of laying in the necessary service cables from the mains to consumers' premises. In cases where the supply is required for heating purposes and the existing cable is not large enough to carry the requirements, new mains will be laid free of charge.—Terms have been arranged with Messrs. Dennis Brothers, Ltd., for a bulk supply of electricity.—Supply in bulk to the Cranleigh Gas and Electricity Co. has been sanctioned by the Commissioners.

The borough engineer of Colchester has submitted to the Lighting Committee particulars of oil lamps in the borough, and the estimated cost of substituting electric lighting. The particulars have been sent to the borough electrical engineer for consideration.—The Electricity Committee are considering the application from the Frinton-on-Sea and District Electric Light and Power Co., Ltd., as to bulk supply.—Sanction to borrow £7 686, for mains and sub-station plant and equipment for the Lexden extensions, has been obtained.

The Yorkshire Power Company have placed a contract with the Foundation Co., Ltd., London, for the establishment of a power transmission line from Salterhebble to Hebden Bridge and with Callenders Cable and Construction Company for a transmission line from Shipley to Silsden. These two lines will form part of the transmission system which the Yorkshire Power Company have established, and will complete a ring main interconnecting the Aire and Calder Valleys by a line through the Worth Valley and Keighley district.

At last week's meeting of Dundee Corporation Works Committee, the Convener, Mr. J. Phin, reported that he and the city engineer had inspected the electric transmission line towers in Edinburgh similar to those which it was proposed to erect, under the Central Electricity Board's scheme, in Kingsway, Dundee. The sag of the lines between the towers brought them to within 25 feet of the ground, and the wires were 12 feet apart. The towers in Kingsway would have to be closer together or more than 80 feet in height. It was decided to invite all the members of the Council to inspect the Edinburgh towers, before entering into final negotiations with the Central Electricity Board.

Mr. A. C. Cramb, borough electrical engineer, has submitted to Croydon Electricity Committee recommendations as to reductions in charges for electricity amounting to £17 000 per annum, or £14 000 for the current financial year if the reductions are put into force as from the June meter readings, and the estimated net surplus for the year, after taking into account such reductions, is £11 500. Mr. Cramb states that the essential tariff for general supply is a multi-part tariff, and he proposes that, eventually, the flat rate shall only apply to short hour consumers. It is proposed to draw the attention of each flat rate consumer to the advantages of the all-in system. The use of current for water heating should be encouraged, and the department consider that a satisfactory means of ensuring that the water heater is not taking current during periods of heavy demand would be the use of a change-over switch cutting off the water heater when the cooker is in use.

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# ELECTRIC TRACTION.

## Electrification of the G.I.P. Railway from Bombay to Poona.

IT is hoped that the electric train service on the Great Indian Peninsula Railway main line from Bombay to Poona will be opened on March 31st next. The electrified line to Igatpuri will be opened a year later, when the whole scheme should be completed.

The profit on the Leicester Corporation tramways for the past year was £19 986.

Warrington Tramways Committee report a profit of £6 993 on the past year's working.

Accrington Tramways made a gross profit last year of £13 269 and a net profit of £1 472 against £1 058.

For the year ended March 31st, 1928, Leeds Corporation Tramways show a surplus of £66 647 9s. 4d.

The two-deck steam trains on the line between Paris and Versailles have been replaced by electric trains.

Metropolitan Electric Tramways, Ltd., have decided to equip some 54 more tramcars with transverse seats.

Colchester Tramways Department shows a loss of £811 for the past year, compared with a loss of £1 984 for the previous year.

Passengers carried on the Manchester tramways during the year ended March 31st numbered 328 013 199, against 310 559 874 in the previous year. Revenue was £1 856 592 against £1 763 280.

London County Council Highways Committee recommend the carrying out of the scheme for the enlargement of the tramway subway beneath Aldwych and Kingsway, at a cost of £326 500, in order to permit of the use of double-deck cars.

Bradford Corporation Improvements Committee have agreed to pay to the tramways department £22 796 (being the cost of acquisition and alteration of new tramway offices in Bolton Road) as compensation in respect of the taking of the tramway offices in Hall Ings required for the rebuilding scheme for the central area.

Torquay Tramways Co., in order to cope with the heavy summer traffic between Torquay and Paignton, have placed in service two new additional cars with upholstered transverse seats. The vehicles were constructed and equipped by the Brush Electrical Engineering Co., and the British Thomson-Houston Co.

The scheme for the electrification of the railway between London Road station, Manchester, and Altrincham has been sanctioned by the Great Central and North-Western Joint Co. and the London, Midland and Scottish Railway Co., and work will start on the system quite soon. It is understood that later other suburban stations will be brought in.

# METAL AND CHEMICAL PRICES.

TUESDAY, August 14th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 5 0 | — | 5s. 0d. |
| Electro Wirebars | ,, | £69 5 0 | — | — |
| H.C. Wires, basis | per lb. | 9 1/8d. | — | — |
| Sheet | ,, | 10 1/4d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0 1/8d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2d. | — | — |
| Sheet ,, | ,, | 9 3/8d. | — | — |
| Wire ,, | ,, | 9 3/8d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | |
| *Lead Pig*— | | | | |
| English | per ton | £22 15 0 | 5s. 0d. | — |
| Foreign or Colonial | ,, | £21 7 6 | 5s. 0d. | — |
| *Tin*— | | | | |
| Ingot | per ton | £213 15 0 | 7s. 6d. | — |
| Wire, basis | per lb. | 2s. 9 1/4d. | — | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 7 6 | — | 5s. 0d. |
| *Mercury* | per bottle | £22 15 0 | £1 15 0 | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2 1/2d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3 1/4d.
*Rubber*—Para fine, 11 1/4d.; plantation 1st latex, 9 1/8d.

∴ The metal prices are supplied by British Insulated Cables Ltd. and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

# WIRELESS NOTES.

## Captain Courtney's Rescue—The "Calcutta's" Powerful Equipment.

NO details are yet available as to the use made by Captain Courtney of his wireless apparatus during his flight from the Azores, but the following telegram has been received by the Marconi Co. in London: "Rescue entirely due to Marconi Wireless—Courtney." The aircraft wireless transmitting and receiving set which he carried was similar to the apparatus with which all the Imperial Airways passenger carrying machines are equipped. It has a normal range of about 200 miles when in flight and includes arrangements for emergency transmission in the event of a forced descent. After landing on the water Captain Courtney and his companions would have raised an emergency aerial on the wings of the flying boat and have transmitted their messages by means of the emergency battery. The range obtainable by this means would be between 70 and 100 miles, and the power available would have been sufficient to enable them to send out messages at intervals during 24 hours provided no damage was done to the apparatus.

### Another Example.

The "Calcutta" flying boat which is moored in the Thames just off the Terrace of the Houses of Parliament is also equipped with a Marconi wireless transmitter. This apparatus, of 500 W power, known as the Marconi Type AD 8, has been specially developed for use in the large flying boats and airships which will fly on the projected Empire air routes. The installation on the "Calcutta" is capable of communication with air ports at distances of from 300 to 400 miles by telegraphy or telephony and can thus travel between air port or other wireless stations 600 to 800 miles apart without losing contact. The set is so designed that should aircraft carrying this type of apparatus have to alight they will still be able to communicate by wireless with the nearest wireless station, while in the event of a flying boat being in need of help on the water, the pilot would be able to send out a distress call to ships. The range of wavelengths provided for the transmitter is variable between 600 metres and 1 500 metres. The standard wavelength for ship working is 600 metres and that for aircraft 900 metres. The receiver may be tuned in to any wavelength between 600 and 4 000 metres. The installation of wireless apparatus in aircraft, even of the largest types, presents special problems on account of the necessity for the utmost economy of weight and space, and these have been taken into account in the design of the AD 8 equipment. The transmitter and receiver, which are mounted in separate cases and slung in rubber shock absorbers, may be fitted in any convenient position on the machine and operated from the pilot's or navigator's cockpit by means of Bowden cables. The wind-driven generator that supplies the power for the various circuits also supplies the current for the lighting of the aircraft. Two valves are used in the transmitter, which may be used for continuous wave and tonic train telegraphy and also for telephony, while a special circuit enables the speaker to overhear his own voice and so check the quality of his transmission. The 5-valve receiver has been specially designed for sharp tuning to avoid interference during reception. See page 189.

### LEAD MARKET REPORT.

James Forster and Co. state that the lead market has been quiet, but the undertone has remained firm throughout. The tone in New York is steady with the price unchanged at 6.20 cents.

Closing prices on August 9th were £21 5s. for August and September, and £21 6s. 3d. for October and November, or 3s. 9d. up to 1s. 3d. down on the week according to month of arrival.

Writing in a contemporary recently, Captain E. de Normanville, the motoring correspondent, said: "Talking of side lamp bulbs, I am bound to mention a remarkable experience of reliability—just terminated. Two days ago I had the first bulb failure amongst the head and side lamps of my 20-70 H.P. Daimler. Looking at the speedometer, I found a reading of 27 384 miles. This struck me as wonderful testimony to the name of 'Osram.' I have changed the tail lamp bulb twice, but such a distance without failure amongst the head and side lamps seems extraordinarily good. I have never previously approached such reliability."

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# COMPANY NEWS.

## Electrical Shares Generally Quiet, with Few Price Changes—Wireless and Cable Holdings Show Slight Drop—Manufacturing Interests Variable—Traction Descriptions Unsteady, with Electricity Supply Shares Dull.

THE electrical share market remains quiet in all departments, and again there are but few price changes to record. Eastern Telegraph ordinary stock has weakened 5 points and Marconi's Wireless shares have lost last week's improvement. International Marines are a shade better. In the manufacturing group Siemens ordinary shares are 7½d. up, but Ever Ready shares at 26s. 9d. are 1s. lower. District Railway stock is 2 points to the good at 77, and Underground shares have improved 1s. to 26s. 6d., but Central Londons are 2 down. Shropshire Power "B" have risen over 2s. to 33s. 9d.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927 Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/6 | 27/- | 60/- | 10/- |
| 4½ | ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/- | 38/- | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/6 | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord .. .. | 47/6 | 47/6 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 25/- | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13.9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 33/9 | 31/6 | 23/- | 20/9 |
| (*j*) | W'minster Elec. Sup. Ord. (£1) .. | 27/6 | 27/6 | 52/- | 18/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 35 - | 35/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk... | 126 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 71 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb... .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102¾ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 70½ | 70½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. | 80 | 80 | 98¾ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 85 | 85 | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 65½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 67½ | 67½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 66 | 66 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 72 | 72 | 92¾ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 77 | 75 | 66½ | 12¾ |
| 4½ | ,, ,, 4% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 25/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord .. | 85/- | 85/- | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109¾ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/1½ | 28/1½ | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/- | 20/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/9 | 27/9 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 38/6 | 38/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 112/6 | 112/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 32/6 | 32/6 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/1½ | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 59½ | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 77½ | 77¾ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 245½ | 250 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 65½ | 65½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24½ | 25 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38 | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 56¾ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 65/- | 66/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 51/- | 50/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24/3 | 25 | 23 | 11/3/6 |

(*a*) 1s. 7½d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d. ‡Including 1s. bonus.

OXFORD ELECTRIC CO., LTD.—Int. div. 7 p.c. p.a., less tax, on ord. shs., payable September 1st.

EDMUNDSONS ELECTRICITY CORPORATION will, on November 15, redeem the whole of the outstanding 4½ p.c. 1st mortgage deb. stock at the rate of £105 for every £100 of stock. Accrued interest will be paid at the date of redemption.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Net increase for half-year, $68 659 239. New telephones installed during half-year, 375 000. It is proposed to spend about $400 000 000 annually for the next five years upon extensn. and improvemt. of the system, which already provides 150 telephones per 1 000 of populatn.

ELECTRICIDAD DE LA PROVINCIA DE BUENOS AIRES.—After deductg. from workg. pfts., gen. exs., directors' fees, taxes in Europe, deb. int., sinkg. fund for redemptn. bonds, int., comsns. and dif. in exchange, and after addg. pft. on bonds purchased, net pfts. amt. to £165 631. Proposed place to reserve, £8 281, directors, £15 735, reserve (Art. 111) £71 767, div. 8 p.c. on pre-pref. shs. and 8 p.c. on pref. £82 622 paid in connection with issue of 350 000 new pref. shs. issued in 1927, written off, debitg. to res. in accordance Art. 111.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—With ref. to notice of redemption of 6½ p.c. convertible 10-year 1st deb. stock, given on June 19, holders desirous of exercising their conversion rights are reminded by the board that notices of conversion of their stock into ord. shrs. on October 1st next must reach reg. office of the co., together with the relevant stock certificate or certificates, on or before September 9. The rate of conversion is one fully paid ord. sh. of £1 for every £3 (nominal value) of stk. Deb. stk. holders who do not desire to exercise their conversion rights must surrender their stk. certificate or certificates to the co. prior to October 1, 1928, at which date the stk. comprised in such certificate or certificates will be redmd. in cash at a prem. of 5 p.c., and all int. accrued on such stk. to the rdemptn. date will be paid to the stk. holder.

MEXICO TRAMWAYS CO.—Rpt. for 1927 states that there was considerable improvemt. in earngs. received from operatn. of tramways in Mexico City and surrounding districts, due largely to changes introduced towards end of March, 1927, and to increase of rolling stock by addition of 20 new cars. A further 30 new cars have also bn. ordered and delivered. As a result of the arrangemt. entered into by Mexican Light and Power Co. for settlement of arrears of int. on outstanding bonds co. received during year further £500 000 par value of Mexican Light and Power 2nd mtge. bds., with cash payment of $365 000 in settlemt. of arrears of int. on £1 000 000 of such bds. held by co. Also arrears of int. to 31 Dec., 1926. on Mexican Light and Power Co.'s 6 p.c. income bds., were liquidated by delivery of 10 years' unsecured non-int. bearg. notes for full amt. of such unpaid int. During the year company received full year's int. on all its holdgs. of both these classes of bds. Consolidated rev. and expenditure acct. shows that amt. remaing. after paymt. of fixed charges payable in cash was applied towards mtg. necessary cap. expenditures for improving and developing company's works and installations.

MIDDLE WEST UTILITIES CO. — Divs. of $2 p. sh. on $100 par prior lien and $1 p. sh. on $6 prior lien stk. will be payable on Sept. 15. Directors announce authorisatn. and sale to Halsey Stuart and Co. of $30 000 000 5½ p.c. serial gold notes dated Aug. 1, 1928, maturing $10 000 000 annually in one, two and three years. Gross earngs. of Middle West Utilities Co. subsidiaries for 1927 were $96 659 078. Of this amt., after all prior charges, there was accruing to the securities owned by co. $9 274 256. Earngs. from other sources. $3 537 188, makg. total of $12 811 444 available for int. of $1 650 000 on serial gold notes. As from Jan. 1, 1928, Middle West Utilities Co. acquired control of National Electric Power Co. and National Public Service Corporation. The six months' earngs of these cos. contribute substantially to increased gross earngs. of subsidiaries for year ended June 30, 1928, gross earngs. for that period being $123 495 977. Proceeds from the sale of serial gold notes will be used principally towards reimbursing the co.'s treasury for fds. used in developmt. of subsidiary cos. and for general corporate purposes. Company's intention is to put out common stock from year to

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year, as it is thought better to do more financing through common stock.

## Company Meetings.

AUTOMATIC EQUIPMENTS, LTD.—At the statutory meeting last week the chairman said, following negotiations with the London tramway and omnibus companies controlled by the Underground Group, they had received from them their first order for a number of Aspinall ticket machines. It had been the policy of the company to concentrate in its development on the London services by studying their needs and securing the active co-operation of the Underground companies, no better experience of the most practical character could be obtained. They anticipated that in the near future successful mass trials would be completed, not only by the Underground companies, but by other companies, that would result in important contracts being placed with the company for their ticket machines. Good progress had already been made, and the first deliveries would be coming through in the near future. They had also entered into arrangements with Ericsson Telephones, Ltd., to lay down the full equipment of tools to produce machines in quantity. The high standing of the Ericsson Co. was a guarantee that the machines would be produced in standardised form, with material and workmanship of the highest quality.

BENN BROTHERS, LTD.—The thirty-second annual general meeting of Benn Brothers, Ltd., publishers of THE ELECTRICIAN, was held at Bouverie House, on Friday of last week. Moving the adoption of the report, Sir Ernest Benn said he did not pretend, and none of his colleagues pretended, to be satisfied with the figures given. They were never likely to be satisfied. The gross profit for the year was nearly £1 000 better than a year ago. The net profit was £2 400 better. That again he hoped to see improved upon in the future. "I referred a year ago to the strength of the balance sheet," said Sir Ernest, "and you may wish me just to repeat that note this year. It is a stronger balance sheet than ever. If you will total the assets side of it you will find a total of £354 000. Ignore altogether your goodwill of £79 000; pay off your creditors, including the bank £60 000, and you have left in liquid assets, or assets that are at least worth the figures put upon them, a total of £215 000, or exactly the amount of the capital of your company." Continuing, Sir Ernest said there was nothing spectacular about the year under review. No new buildings had been erected, and no new papers started. All the figures showed a normal steady movement in the right direction, but there had been no boom or slump. That did not mean, however, that solid, important and permanent work had not been done in all departments. It could be said of every one of the 25 smaller businesses of which his company is composed that they were each rather stronger to-day than a year ago. It was not always possible to judge an economic situation from a surface view. Thus Ernest Benn, Ltd., while offering to its chief proprietors a prospect of profits and dividends, was also rendering another very vital and less obvious service. That company was a very big buyer of advertising space. It had increased its turnover in books from £80 000 two or three years ago to nearly a quarter of a million sterling, and this increase could be very largely attributed to judicious advertising. Thus a situation has arisen in which Bouverie House, through its trade papers, was selling large quantities of advertising space, and, through its book sales department, was buying the same commodity. He had never hesitated in the past to recommend advertising expenditure to others, but his confidence in the article that he sold was now immensely strengthened by the wonderful practical experience acquired. Sir Ernest also said, "Perhaps even more important is the bearing of this experience upon the net sale controversy which has now afflicted the advertising market for nearly twenty years. Although big national advertisers, we have a clear conscience in the matter. We have never asked for any particulars of the circulations of the papers in which we advertise. The stunt or stomach basis to which advertising has been reduced by the net sale enthusiasts is of no interest to us. In selling advertising space and in buying advertising space, we are interested in brains and not in stomachs, and there are far fewer brains than stomachs about. Our appeal, whether as buyers or sellers, is to influence atmosphere, character, quality and commercial importance, and these things are miles removed from the million sale puffed up with coupons and benefits."

Since the date of the balance sheet another promising subsidiary had been launched. Encouraged by the experience with the Trade Promotion Trust and the enthusiastic welcome which retail furnishers and others had given to the service offered through that company, the Book Marketing Board had been founded. The object was, by the introduction of instalment buying, to widen the book market and to render assistance to the booksellers.

The report and accounts were adopted, and the dividends as recommended were declared.

## New Companies.

GREAT ASBY ELECTRIC LIGHT AND WATER CO., LTD.—Cap. £2 000. Reg. office: Green Banks, Great Asby, Appleby.

ASSOCIATED CONSTRUCTION AND POWER CO., LTD.—Cap., £10 000. Electrical engineers, etc. Reg. office: Broadway Buildings, Westminster, S.W.1.

MIDLAND FACTORS, LTD.—Cap., £500. Wireless accessories manufacturers, electrical and general engineers, etc. Reg. office: 248, Corporation Street, Birmingham.

HODGSON AND BECKETT, LTD.—Cap., £2 500. Electrical manufacturers' agents, electricians, contractors, etc. [Reg. office: Maxwell House, 6, St. Paul's Square, Liverpool.

HORACE GRENSTED, LTD.—Cap., £2 000. To acquire business of wireless engineer and dealer in wireless instruments and accessories carried on by H. Grensted at 31, Station Road, Sittingbourne.

NANTWICH ELECTRIC, LTD.—Cap., £500. To acquire business of electrical engineer and contractor carried on by B. Nadin at 3, Hospital Street, Nantwich, Cheshire, as "Nantwich Electrical Co."

CLASSIC RADIO AND GRAMOPHONE CO., LTD.—Cap., £2,000. Manufacturers of and dealers in wireless apparatus, etc. Solicitors: Soames, Edwards and Jones, Lennox House, Norfolk Street, Strand, London, W.C.2.

DRURY RADIO CO., LTD.—Cap. £2 000. Manufacturers of and dealers in instruments, accessories, literature, etc., connected with radio telegraphy, telephony or television. Office: Drury Buildings, 23, Water Street, Liverpool.

NEW STANDARD WIRELESS VALVE CO., LTD.—Cap. £500. Manufacturers of and dealers in (wholesale and retail) wireless thermionic valves, radio apparatus, electric lamp bulbs, etc. Solicitor: H. G. Barclay, Exchange Chambers, Macclesfield, Cheshire.

NEW TRACTION CO., LTD.—Cap., £5 000. To acquire any inventions, patent and other rights for or in respect of any light railway, tramway or other means of communication, etc. Solicitors, Walker, Martineau and Co., 36, Theobalds Road, London, W.C.1.

J. H. GRANT, LTD.—Cap., £5 000. To acquire the business of a constructional engineer, plumber and electrician, now carried on by J. H. Grant, at Princes Street Ironworks and St. Mary's Road, Oxford. Solicitors: D. Rawlinson, 6, King Edward Street, Oxford.

WORLDECHO RECORDS, LTD.—Cap., £125 000. To acquire trade mark "Worldecho" and carry on business of manufacturers of and dealers in gramophones, phonographs, wireless and electrical equipment and appliances, etc. Reg. office: 40, Hatton Garden, London, E.C.1. (Public company.)

A. BODKIN AND CO., LTD.—Cap., £3 000. To acquire business carried on by A. Bodkin at 3, Connaught Road, Eastbourne and elsewhere, and to carry on business of manufacturers and repairers of storage batteries, accumulator charging apparatus, etc. Reg, office: 20A, Cornfield Road, Eastbourne.

ARGENTINE INDUSTRIAL CO., LTD.—Cap., £200 000. To acquire undertaking of South American Light and Power Co., Ltd. (in liq.), to acquire and hold securities of railway, electric power and lighting, and other public or private companies, etc. Reg. office: River Plate House, Finsbury Circus, London, E.C. (Public company.)

OATWAY SAFETY HEATING CO., LTD.—Cap., £12 500. To acquire any interests in any patents, brevets d'inventions, concessions and the like relating to any invention for the production, treatment, storage, application, distribution and use of electricity, etc. Reg. office: Marban Place, Bravington Road, Paddington, London, W.9.

DENMARK TRACK RACING CO., LTD.—Cap., £57 500. To acquire the property and rights of Greyhound Racing Aktieselskab (incorporated in Denmark), to construct tracks for racing greyhounds by means of electric hares or any other system, and to organise and carry on races, etc., in Scandinavia. Solicitors: A. and G. W. Fox, 53, Princess Street, Manchester.

P.S.R. LAMP CO., LTD.—Cap., £20 000. To acquire from H. Parkin the benefit of the Patent No. 285 703, dated May 31st, 1927, for Great Britain, Northern Ireland and Isle of Man, and (when obtained) the benefit of patents in the U.S.A., France, Italy, Canada, Belgium, Czecho-Slovakia, Germany, Australia, Switzerland, and any other countries or places in respect of a certain invention relating to anti-dazzle devices for head lamps for automobiles, etc. Solicitor: E. Fitz-Gerald Hart, 18, Park Lane, Leeds.

BRITISH TALKING PICTURES, LTD.—Cap., £500 000. To acquire (*a*) undertaking of De Forest Phonofilms, Ltd., (*b*) from British Consolidated Investments Corporation, Ltd., certain foreign patents and rights in connection with such inventions, and (*c*) from British Talking Films, Ltd., undertaking of that company and particularly its name; to carry on business of manufacturers and repairers of and dealers in cinematographs, talking and sound producing machines, wireless instruments, etc. Reg. office: 3, London Wall Buildings, London, E.C.2. (Public company.)

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# MUNICIPAL FINANCE.

## Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1927-8 of the 57 undertakings included in the following table was £10 416 118. The gross profit on the year's working of the 57 undertakings was £5 125 483, and the aggregate sales of electricity amounted to 1 764 914 860 kWh, while 24 undertakings out of the total number have contributed an aggregate of £147 962 to the relief of rates out of the year's profits or from reserve.

| Authority. | Total Revenue. £ | Gross Profit. £ | Net Profit. or deficit. £ | (*a*) Working Costs. per kWh sold. | Total Cost per kWh (inc. capital charges). | Electricity sold (kWh). | Increase (+) or Decrease (−) in kWh sold. | Maximum Simultaneous Load kW. | (*h*) Load Factor. | Radiators and Cookers Connected (total) in kW except where otherwise stated. | Other Domestic Appliances connected (total) kW. | Contributed in Aid of Rates. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aldershot T.C. | 23 498 | 8 313 | + 2 894 | 3·540d. | 4·820d. | 1 030 000 | + 180 621 | 840 | 14·00 | — | — | — |
| Bacup T.C. | 23 628 | 3 184 | − 88 | 1·140d. | 1·311d. | 4 300 541 | + 744 299 | 2038 | 24·08 | (*b*) 632 | See footnote (*b*) | — |
| Barnes U.D.C. | 63 715 | 35 727 | + 19 617 | 0·910d. | 1·340d. | 7 155 000 | + 87 327 | 3 850 | 21·21 | (*b*) 6 600 | See footnote (*b*) | — |
| Barnsley T.C. | 74 241 | 35 019 | + 12 088 | 0·900d. | 1·570d. | 9 189 699 | + 1 767 137 | 3 800 | 31·20 | See footnote (*e*) | See footnote (*e*) | — |
| Barrow-in-Furness T.C. | 106 713 | 44 942 | + 14 035 | 0·891d. | 1·337d. | 16 635 404 | + 1 229 605 | 5 800 | 42·09 | (*c*) (*d*) 3 060 | (*c*) (*d*) 760 | — |
| Bath C.C. | 86 091 | 44 992 | + 8 205 | 1·120d. | 2·130d. | 8 759 087 | + 2 459 898 | 5 440 | 22·75 | (*c*) 2 698 | (*c*) 2 500 | — |
| Belfast C.C. | 380 749 | 232 764 | + 79 420 | 0·631d. | 1·286d. | 56 212 857 | +11 457 029 | 30 200 | 21·20 | (*b*) 6 118 | See footnote (*b*) | — |
| Bingley U.D.C. | 26 911 | 8 091 | + 1 470 | 1·720d. | 2·639d. | 2 314 079 | + 152 287 | 1 362 | 22·00 | — | — | 500 |
| Birmingham C.C. | 1 577 553 | 767 614 | +212 815 | 0·692d. | 1·166d. | 280 985 406 | +46 761 974 | 136 000 | 23·50 | 20 771 | 2 754 | 31 000 |
| Blackburn T.C. | 203 700 | 123 421 | − 3 262 | 0·787d. | 2·029d. | 24 471 514 | + 2 580 965 | 14 725 | 23·49 | See footnote (*e*) | See footnote (*e*) | — |
| Blackpool T.C. | 212 210 | 90 358 | + 39 216 | 1·050d. | 1·490d. | 27 674 500 | + 5 271 500 | 12 800 | 24·00 | 16 000 | 2 000 | 7 890 |
| Bolton T.C. | 359 094 | 180 458 | (*f*) +65 459 | 0·482d. | 0·910d. | 64 466 454 | + 7 254 294 | 29 000 | 29·11 | 6 781 | 3 401 | — |
| Burnley T.C. | 102 319 | 43 765 | + 24 990 | 1·155d. | 1·540d. | 12 164 935 | + 1 572 100 | 5 340 | 26·00 | See footnote (*g*) | (*g*) 6 600 | — |
| Burton-on-Trent T.C. | 97 173 | 48 470 | + 6 152 | 0·674d. | (*h*) 1·263*d*. | 17 334 309 | + 1 605 238 | 6 100 | 32·35 | (*b*) 9 426 | See footnote (*b*) | 2 400 |
| Bury (Lancs.) T.C. | 112 902 | 42 831 | + 5 995 | 0·605d. | 1·015d. | 25 270 672 | + 2 059 084 | 10 840 | 26·70 | See footnote (*e*) | See footnote (*e*) | — |
| Calne T.C. | 946 | 448 | See footnote (*i*) | See footnote (*i*) | 4·410d. | 23 607 | + 8 081 | — | — | — | — | — |
| Canterbury C.C. | 32 318 | 16 662 | + 8 825 | 1·540d. | 2·350d. | 2 339 269 | + 405 929 | 1 758 | 17·00 | (*b*) 1 540 | See footnote (*b*) | — |
| Carlisle C.C. | 84 331 | 34 892 | + 37 | 0·993d. | 1·693d. | 11 947 855 | + 1 539 148 | 6 900 | 19·80 | 3 417 | 428 | — |
| Cheadle and Gatley U.D.C. | 21 655 | 11 536 | + 2 970 | 1·100d. | 2·020d. | 2 230 457 | + 633 358 | 1 010 | 25·80 | (*b*) 1 669 | See footnote (*b*) | — |
| Chesterfield T.C. | 66 121 | 36 109 | + 11 771 | 0·670d. | 1·220d. | 10 700 751 | + 2 501 075 | 5 347 | 28·20 | (*b*) 5 297 | See footnote (*b*) | 5 000 |
| Coventry C.C. | 309 080 | 146 139 | + 51 900 | 0·580d. | 0·880d. | 70 215 652 | +10 416 812 | 31 272 | 25·63 | (*b*) 8 728 | See footnote (*b*) | — |
| Croydon T.C. | 277 073 | 128 638 | + 48 989 | 0.757d. | 1·716d. | 31 914 634 | + 4 936 283 | 16 200 | 22·42 | (*b*)20 677 | See footnote (*b*) | 9 000 |
| Dover T.C. | 51 755 | 27 995 | + 8 960 | 1·920d. | 3·466d. | 2 969 320 | + 110 295 | 1 612 | 21·00 | 426 | — | — |
| Dumfries T.C. | 22 629 | 13 392 | + 2 086 | 1·750d. | 3·883d. | 1 204 469 | + 168 401 | 1 075 | 19·40 | (*b*) 114 | See footnote (*b*) | — |
| (*k*) Dundee T.C. | 320 857 | 95 324 | + 26 916 | 0·710d. | 1·090d. | 42 422 416 | + 7 289 635 | 22 464 | 26·20 | (*e*) See footnote (*e*) | See footnote (*e*) | See footnote (*l*) |
| Eastbourne T.C. | 106 075 | 47 571 | + 14 737 | 1.100*d*. | (*m*) 1·760d. | 10 768 838 | + 1 931 399 | 6 962 | 20·15 | 18 302 | (*m*) 120 | — |
| East Ham T.C. | 107 333 | 41 040 | (*o*) +16 806 | 1·602d. | 2 264d. | 9 584 310 | + 1 582 311 | 4 815 | 22·72 | — | — | 1 586 |
| Faversham T.C. | 12 774 | 5 833 | + 1 351 | 1·450d. | 2·440d. | 682 508 | + 89 735 | 1400 | 25·40 | 50 | 30 | — |
| Hammersmith (London) B.C. | 225 220 | 100 755 | + 24 076 | 0·958d. | 1·570d. | 29 481 354 | + 2 207 554 | 13 100 | 32·00 | (*b*) 2 045 | See footnote (*h*) | 6 000 |
| Harwich T.C. | 11 991 | 5 995 | + 2 033 | 2·190d. | 3·930d. | 607 776 | + 146 998 | 376 | 20·43 | — | — | — |
| Heywood T.C. | 25 348 | 7 500 | + 2 988 | 1·160d. | 1·400d. | 3 690 421 | + 313 327 | 1 970 | 21·30 | See footnote (*e*) | See footnote (*e*) | 1 168 |
| Hoylake W. Kirby U.D.C. | 28 380 | 9 215 | + 706 | 2·810d. | 3·818d. | 1 560 935 | + 307 951 | 1 225 | 18·80 | — | — | — |
| Hull C.C. | 380 695 | 185 097 | (*p*) +862 249 | 0·680d. | 1·010d. | 70 289 545 | + 8 705 771 | 27 700 | 28·93 | 8 670 | 1 394 | 6 479 |
| Ipswich T.C. | 132 808 | 61 991 | + 19 766 | 1·177d. | 1·877d. | 14 439 261 | + 2 531 903 | 8 600 | 25·01 | — | — | 3 000 |
| Kendal T.C. | 10 321 | 5 189 | + 1 537 | 2·545d. | 4·102d. | 483 974 | + 53 178 | 424 | 13·00 | — | 97 | 375 |
| Leeds C.C. | 681 265 | 439 109 | (*q*) + 131 786 | 0·480d. | (*r*) 1·080d. | 120 385 212 | +13 909 568 | 54 500 | 25·21 | (*s*)46 027 | — | 35 095 |
| Leek U.D.C. | 25 759 | 12 756 | + 3 297 | 1·344d. | 2·284d. | 2 190 584 | + 348 647 | 1 250 | 20·60 | — | — | 650 |
| Manchester C.C. | 1 604 167 | 739 750 | +110 942 | 0·584d. | 1·011d. | 353 492 142 | +29 944 401 | 144 110 | 26·00 | (*b*) 79 502 | See footnote (*b*) | — |
| Middleton T.C. | 40 427 | 9 159 | + 1 641 | 0·758d. | 0·962d. | 8 792 077 | − 75 341 | 4 547 | 22·00 | (*u*) 163 | — | 1 000 |
| Nelson T.C. | 62 367 | 26 024 | + 4 170 | 0·920d. | 1·470d. | 9 365 596 | + 933 005 | 4 360 | 24·45 | See footnote (*e*) | See footnote (*e*) | 1 281 |
| Nuneaton T.C. | 46 675 | 16 958 | (*x*) +3 700 | 0·665d. | 1·924d. | 5 849 554 | + 1 375 269 | 3 159 | 21·08 | (*c*) 2 700 | (*c*) 250 | — |
| Peterborough T.C. | 111 647 | 44 529 | − 2 045 | 0·774d. | 1·326d. | 19 903 916 | + 4 005 573 | 6 800 | 33·50 | (*c*) 6 000 | — | — |
| Poplar (London) B.C. | 233 276 | 88 312 | + 1 900 | 0·943d. | 1·510d. | 30 372 747 | + 1 103 264 | 17 370 | 26·42 | See footnote (*e*) | See footnote (*e*) | — |
| Portsmouth T.C. | 232 206 | 87 018 | + 13 042 | 1·120d. | 1·690d. | 25 285 858 | + 2 878 650 | 13 200 | 23·56 | 8 679 | (*y*) 4 875 | 2 000 |
| Rawtenstall T.C. | 61 388 | 28 211 | + 3 802 | 0·590d. | 0·990d. | 13 403 676 | + 2 057 019 | 6 500 | 23·50 | (*b*) 1 840 | See footnote (*b*) | — |
| Rochdale T.C. | 266 913 | 56 789 | + 6 189 | 0.758d. | 0·941d. | 66 473 682 | +13 062 948 | 27 326 | 27·60 | See footnote (*g*) | (*g*) 15 747 | — |
| Rotherham T.C. | 239 140 | 126 109 | + 17 705 | 0·423d. | 0·832d. | 63 561 013 | +17 635 763 | 28 000 | 26·00 | (*c*) 2 074 | See footnote (*e*) | — |
| Salford C.C. | 312 810 | 160 899 | + 65 138 | 0·205d. | 0·979d. | 60 696 636 | + 7 360 400 | 24 500 | 28·20 | (*b*) 17 789 | See footnote (*b*) | 15 000 |
| Scunthorpe & Frodingham D.C. | 16 956 | 8 327 | + 4 986 | 1·850d. | 2·650d. | 1 117 666 | + 232 665 | 700 | 20·78 | (*b*) 225 | See footnote (*b*) | — |
| Shrewsbury T.C. | 24 516 | 10 335 | + 5 473 | 1·750d. | 2·380d. | 1 844 628 | + 203 031 | 1 189 | 17·68 | — | — | 600 |
| Southampton T.C. | 221 642 | 104 952 | + 23 722 | 1·057d. | 1·793d. | 26 487 488 | + 3 318 542 | 15 420 | 19·55 | 17 380 | — | 8 500 |
| Southport T.C. | 105 627 | 55 755 | + 23 051 | 1·100d. | 1·820d. | 10 874 806 | + 2 105 904 | 5 980 | 20·71 | 923 | 233 | 4 000 |
| Stafford T.C. | 48 980 | 27 227 | + 5 176 | 0·668d. | 1·378d. | 7 809 171 | + 1 141 050 | 4 232 | 24·31 | (*d*) 651 | (*d*) 169 | 3 000 |
| Stockton-on-Tees T.C. | 50 425 | 22 959 | + 7 208 | 1·387d. | 1·832d. | 5 663 478 | + 951 206 | 2 808 | 22·96 | (*z*) 773 | See footnote (*e*) | 1 938 |
| Sunderland T.C. | 190 711 | 96 105 | + 40 175 | 0·670d. | 1·170d. | 31 630 314 | + 8 428 075 | 13 480 | 26·78 | — | — | 1 500 |
| Torquay T.C. | (*c*) 97 289 | (*c*) 46 966 | (*c*) + 19 567 | (*c*) 0·967d. | (*c*) 1·521d. | 12 291 192 | + 2 350 924 | 6 470 | 25·70 | See footnote (*e*) | See footnote (*e*) | — |
| Tunbridge Wells T.C. | 65 725 | 35 882 | + 14 868 | 0·910d. | 1·550d. | 7 841 585 | + 1 891 403 | 4 600 | 23·90 | See footnote (*e*) | See footnote (*e*) | — |

(*a*) Usually includes management, repairs and maintenance, rates and taxes and special charges. (*b*) Including other domestic electrical appliances. (*c*) Approximate. (*d*) On hire, excluding consumers' own apparatus. (*e*) Not available. (*f*) Special expenditure out of net profit includes £28 000 transferred to depreciation fund and £18 322 contributed to capital. (*g*) Includes all domestic electrical appliances. (*h*) Include works of a capital nature. (*i*) £218 paid off costs of Special Order. (*k*) Year ended May 15th. (*l*) Rates paid on valuation of undertaking are very high. No further contribution to rate relief is asked for. (*m*) Water heaters. (*n*) £2 431 for new meters and £3 228 for income tax not included. (*o*) After meeting capital expenditure of £11 274 out of revenue. (*p*) Includes expenditure of special and capital nature, £32 293. (*q*) After payment of contribution to capital, £63 157. (*r*) After contributing 0·120d. to capital expenditure. (*s*) Heating 12 409 kW; residual bulk, 33 618 kW; further details not available. (*t*) Before appropriation of £52 076 for capital assets. (*u*) Cookers only; radiators not known. (*x*) After deducting £1 158 for special charges of a capital nature. (*y*) Motors. (*z*) Cookers only.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CLELAND, John, 15, Bargates, Christchurch, wireless engineer. £15 11s. 4d. July 4th.

FLINT (W. O. and E.), LTD., The Arcade, Walsall, Birmingham, electricians. £10 19s. 3d. July 5th.

JOHNSON, Philip, 72, Handside Lane, Welwyn Garden City, wireless salesman. £19 4s. 4d. June 30th.

PHILLIPS, Victor C., 172, Dersingham Avenue, Manor Park, wireless dealer. £28 3s. 11d. June 22nd.

WARNES, Mr., 61, Daisy Bank Road, Victoria Park, Manchester, radio dealer. £11 6s. May 22nd.

WARWICK RADIO CO., 22, St. Lawrence Avenue, Warwick, radio apparatus dealers. £15 13s. 7d. July 4th.

## Deeds of Arrangement.

BYRN, Alfred Henry, 14, Queen's Arcade, Cardiff, and Penarth, electrician and wireless dealer. Dated, August 3rd, filed August 10th. Trustee, C. S. Sashmore, 2, Church Street, Cardiff, I.A. Liabilities unsecured, £740; assets, less secured claims, £458.

MACLEAN, Hector, 79A, High Street, and 43, Suffolk Street, Stockton-on-Tees, wireless dealer. Dated August 2nd, filed August 9th. Inspector, H. T. Sherwood, 115, High Street, Stockton-on-Tees, accountant. Liabilities unsecured, £400; assets, less secured claims, £417.

THWAITES, Herbert, trading as ASTRAL ELECTRICAL CO., 41, Market Street, Marple, radio and electrical engineer. Dated August 2nd, filed August 8th. Trustee, A. T. Eaves, 47, Mosley Street, Manchester, C.A. Liabilities unsecured, £189; assets, less secured claims, £98.

## Receiverships.

ECONOMISERS ENGINEERS, LTD. R. C. Price, certified accountant, of 10, Gore Street, Piccadilly, Manchester, was appointed receiver on July 22nd, 1928, under powers contained in debenture dated July 29th, 1926.

MACOS BATTERY MANUFACTURING CO., LTD.—R. H. Dutchman, of 122-3, Moorgate Station Chambers, E.C.2, ceased to act as receiver on July 30th, 1928.

UNEEDA SUPPLIES CO., LTD.—W. F. Baker, of 93, Mortimer Street, W.1, was appointed receiver and manager on August 1st, 1928, under powers contained in 1st charges, dated May 2nd and 30th, and June 18th, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.*]

BETAX MANUFACTURING CO., LTD., 486, Oxford Street, London, W.1, and Gray's Inn Road, London, W.C.2, dealers in electro medical appliances. At the statutory meeting of the creditors in this voluntary winding-up, the liquidator reported that the ranking liabilities were £3 473, all due to unsecured creditors, and that the assets were estimated to realise £4 135, from which had to be deducted £32 for preferential claims, and £2,000 due on debentures. The net assets, therefore, were £2 103, or a deficiency, so far as the creditors were concerned, of £1 370. The company was registered in December, 1924, with a nominal capital of £5 000 to take over an existing business. With the exception of £100, all the issued shares were allotted to the vendor or his nominees in payment of the assets acquired by the company. During the first 12 months, the turnover of the company was £8 063, with a gross profit of £4 679 and a net loss of £1 600. In 1926, the turnover fell to £7 450, but the net loss was reduced to £190. Last year the turnover still further declined to £6 163, and there was a gross profit of £3 120, but a net loss of rather more than £1 000 was incurred. The debentures were issued in 1924 for cash, and a receiver had been appointed. A resolution was passed confirming the voluntary liquidation of the company with a committee of three of the principal creditors.

## London Gazette, etc.

### Company Winding Up.

SPA HYDROTHERAPEUTIC AND ELECTRO MASSAGE ESTABLISHMENT, LTD., Park House, 48, St. Johns Road, Tunbridge Wells. Winding up order, August 3rd.

### Company Winding-up Voluntarily.

HUNGERFORD AND DISTRICT ELECTRICITY SUPPLY CO., LTD. By special resolution July 16th, confirmed July 31st. Meeting of creditors at 7, Duke Street, Adelphi, W.C.2, on August 15th, at 11 a.m. Alfred G. Cox, liquidator.

### Notices of Dividends.

CUNNINGTON, Joseph Grace Smith (separate estate), Pine Ridge, Foxley Lane, Purley, Surrey, trading with Harry Pigot Allison as Laing Wharton and Cunnington, electrical engineers and contractors, 7, Great Newport Street, London. Supplemental dividend of 10s. 7d. per £, payable any day (except Saturday), between the hours of 11 and 2, Bankruptcy Buildings, Carey Street, London, W.C.2.

WELLS, Arthur Jack, 16, Malvern Road, Luton, electrical engineer, lately carrying on business in partnership with William Bashford, at 52, Princess Street, Luton, as electrical engineers, under the style of Wells and Co. First and final dividend, 5s. 5d. per £, payable August 17th, Official Receiver's office, The Parade, Northampton.

### Order Made on Application for Discharge.

PAINTER, James Herbert (trading as VENABLES AND CO.), 99, The Broadway, Cricklewood, N.W., electrician. Discharge suspended for three years, until July 10th, 1931.

## Bankruptcy Proceedings.

GREGORY, Albert Butterworth, 29, St. Albans Road, Seven Kings, Essex, wireless expert. The receiving order herein was made recently on a creditor's petition. Debtor attributes his failure to the loss incurred in a limited company which was voluntarily wound up. The statement of affairs submitted discloses ranking liabilities of £429 against assets of £5, a deficiency of £424. In December, 1925, debtor borrowed £390 from his parents and purchased for £200 an electrical business at 43, Grafton Street, Tottenham Court Road, W., and formed a company to take it over, with a nominal and issued capital of £400, the shares being allotted as to £180 to himself, and £180 and £40 respectively to two other persons, who, together with himself, were the directors and only shareholders. The debentures for £400 were also issued to him. The company was not successful and on April 1st, 1926, he appointed a receiver and the company later was voluntarily wound up, with liabilities of about £40. The fixtures, fittings were sold by the Receiver for a trifling amount, but the stock was unsaleable, and he took it over and carried on the business on his own account until December, 1927, when he gave it up and removed the stock-in-trade, then worth about £1 10s., to his residence. He was unemployed until March 1st, 1928, when he found temporary employment as a clerk and in November, 1927, judgment was obtained against him and the present proceedings instituted.

JAWETT, Nathan, electric lamp dealer, 58, Bedford Street, E.1. The above debtor was brought to the Court on July 25th on the petition of the British Thomson-Houston Co., Ltd., creditors for, £70 and the statutory first meeting of the creditors was held on August 8th. It appeared from the proceedings that the debtor was a Polish Jew and came to this country in 1913. He was interned from August, 1914 to August, 1917, and was then released on parole. He was interested in lamps of various kinds and in 1925 started trading from his present address, 88, Bedford Street, as a dealer in electric lamps with a capital of £20. He kept the business going till 1927 just making a bare living. Amongst others he traded in gasfilled lamps of a type the patent of which was held by the petitioning creditors, and the lamps he was selling were of foreign manufacture. He was not aware that the lamps were an infringement of the petitioning creditors' patent till June, 1927, when the petitioning creditors obtained an injunction against him. They then proceeded against him for costs and he offered them £50 in settlement conditionally on their taking no further proceedings against him for damages. This they declined to accept and filed the petition against him. He attributed his present position to his liability and costs. He estimated his liabilities at £160 and his assets to produce £74. There was no offer and the matter was left with the Official Receiver.

RIDLEY, John Donald, trading as the EASTERN COUNTIES ELECTRICAL CONSTRUCTIONAL CO., 41, Butter Market, Ipswich, electrical engineer. The public examination of this debtor was held recently. Debtor estimated his liabilities at £860, with a deficiency of £812. It appeared debtor had had various situations as an electrical engineer, having been apprenticed to the trade. In September, 1926, debtor applied for registration under the Business Names Act, then having a free capital of £87, which was nearly all spent in equipping the office and getting materials. He did small jobbing work and repairs at the commencement but finding too much work he advertised for a partner, who provided only £10 by instalments. Debtor gave him an equal share in the business because he hoped that he would introduce fresh customers. The first contract they undertook was for lighting 62 Council houses, the contract was £360 odd. Debtor supervised the job and shortly after they got another contract for £1 193, and his partner was left in charge of that one. They lost money on the second contract and paid for their materials as they received money for the job. Debtor said they employed ten to fifteen men and in March last he was sold up and he expected the goods to have made £40, but they only realised £13. Debtor agreed that from October to March he lost a sum of £1 147, and he could not account for it. The debtor was ordered to file deficiency and trading accounts.

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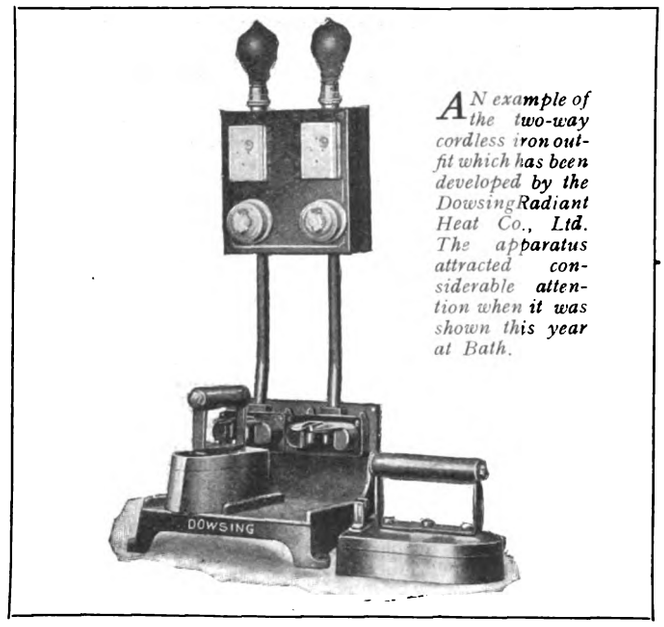
# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### July 23rd.

21 333 Electroacoustic Ges. Sub-aqueous sound apparatus. (2/8/28, Germany.)
21 288 J. A. Fullilove and W. Haddon. Casting large accumulator plates.
21 265 Garrard Engineering and Manufacturing Co., Ltd. Electric driving units.
21 273 International General Electric Co., Inc. Ignition current generators. (21/7/27, Germany.)
21 275 International General Electric Co., Inc. Electric rectifiers. (23/7/27, Germany.)




*An example of the two-way cordless iron outfit which has been developed by the Dowsing Radiant Heat Co., Ltd. The apparatus attracted considerable attention when it was shown this year at Bath.*

21 344 R. L. J. Laurent de la Ville de Roulx. Telephonic apparatus. (22/7/27, Germany.)
21 268 F. Merk. Automatic telephone exchanges. (5/12/27.)
21 304 F. Merk. Connecting lines in telephone systems.
21 305 F. Merk. Switch arrangements for telephone lines.
21 332 F. Merk. Switching apparatus for automatic telephone systems.
21 346 K. Schnell. Contact plugs. (6/10/27, Germany.)
21 265 H. V. Slade. Electrical driving units.
21 240 S. Spreadbury. System of wireless communication.
21 314 A. J. Stephens (M. H. Longbridge). Electrical recording and reproducing of sound.
21 308 O. Tants. Wireless message transmission.
21 368 Telefonaktiebolaget L. M. Ericsson. Registering counters. (3/8/27, Sweden.)
21 216 J. W. Warr. Primary batteries.

### July 24th.

21 502 Akt.-Ges. Brown, Boveri et Cie. Means for controlling electric transporting machines, etc. (16/8/27, Germany.)
21 392 H. H. Benbow. Electric signalling devices.
21 446 British Insulated Cables, Ltd., and J. G. Lauder. Extension of metal.
21 441 British Thomson-Houston Co., Ltd. Transmission of pictures. (25/7/27, U.S.)
21 452 Electroacoustic Ges. Sub-aqueous sound apparatus. (8/12/27, Germany.)
21 438 Falk, Stadelmann & Co., Ltd. Filaments for incandescent lamps. (13/9/27, Germany.)
21 448, 21 453 Falk, Stadelmann & Co., Ltd. Filaments for incandescent lamps. (23/11/27, Germany.)
21 378 C. H. Gould. Radio receivers, etc.
21 376 G. M. Hick. Galvanic battery.
21 400 W. H. Hitchcock. Electric lamp shade.
21 414 W. H. Hitchcock. Shade adaptor for electric lamps.
21 445 S. H. Holmes and J. D. Hindley-Smith. Time controlled and operated switch.
21 460 O. Y. Imray (I.G. Farbenindustrie Akt.-Ges.). Manufacture of accumulator plates.
21 451 C. Lorenz Akt.-Ges. Microphones, etc. (21/1/28, Germany.)
21 505 B. McCormick and H. Weichsel. Alternating current motors.
21 411, 21 412, 21 413 L. H. Pearson. Electric transmission of sound from gramophone records. (7/4/27).
21 435 P. Schmidmeier. Electric lamp holder, etc.
21 164 Siemens-Schuckertwerke Akt.-Ges. Transformers with oil filled terminals. (1/8/27, Germany.)

### July 25th.

21 597 Associated Telephone and Telegraph Co. Remote control systems. (3/9/27, U.S.)
21 553 J. H. E. Baker, C. M. Colebrook, Standard Telephones and Cables, Ltd. and E. P. G. Wright. Automatic telephones, etc.
21 557 N. R. Campbell and General Electric Co., Ltd. Manufacture of photo-electric cells.
21 615 J. N. Chaviara and J. F. Gill. Induction machines.
21 593 Electrical Improvements, Ltd., and L. C. Grant. Electric protective systems.
21 545 F. C. Grund and Three Star Accumulators, Ltd. Galvanic cells.
21 578 A. C. Johnson. Control apparatus for combined electric lighting and heating installations, etc.
21 603 E. M. Johnson, and Metropolitan-Vickers Electrical Co., Ltd. Electric ship propulsion systems.
21 632 Geb. Junghans Akt.-Ges. Heating device for electro-pneumatic installations. (22/12/27, Germany.)
21 605 M. Kramer. Electrically heated massage appliances.
21 516 K. Küppers. Apparatus for limitation of excess currents. (25/7/27, Germany.)
21 591 A. and G. Preen. Telephone systems, etc.
21 623 O. Schneider. Positive electrode for accumulators. (14/6/28, Germany.)
21 585 A. E. White (J. J. Nangle). Electrode.
21 618 P. W. Willans. Electro-mechanical systems.

### July 26th.

21 732 Automatic Telephone Manufacturing Co., Ltd., L. M. Simpson and R. Taylor. Telephone systems.
21 662 C. J. Beckett. Electric bulb for headlamps, etc.
21 637 D. V. Briggs. Wireless tuning systems.
21 713 Chloride Electrical Storage Co., Ltd., and B. Heap. Accumulators.
21 675 Electrical Improvements, Ltd., and L. C. Grant. Electric protective arrangements.
21 680 General Electric Co., Ltd. Apparatus for feeding wires. (27/7/27, Germany.)
21 706 Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. Electric boiling plates, etc.
21 707 Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. Earthing device for sheathings of conductors.
21 667 A. E. Isted. Disinfecting device for telephone instruments, etc.
21 710 Metropolitan-Vickers Electrical Co., Ltd. Supporting device for conductors. (30/7/27, U.S.)
21 665 W. Prior, Priorsells, Ltd. Light sensitive amplifiers.
21 709 L. Renault. Electrode holders.
21 670 A. V. Tomlinson (Mackenzie and Holland (Australia) Pty., Ltd. Electrical point and lock detectors for railways.
21 644 T. G. Williams. Telephone attachment for recording names, etc.

### July 27th.

21 867 Associated Telephone and Telegraph Co. Telephone systems. (7/1/27, U.S.)
21 748, 21 749, 21 750 H. L. Bentley and G. H. Ide. Switches.
21 805 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Precipitating metals on incandescent body.
21 823 Forges et Ateliers de Constructions Electrioques de Jeumnt. Mechanism for producing step-by-step movements to switches of electric control systems. (19/11/27, France.)
21 829 K. S. Geipel and W. Geipel, Ltd. Switches.
21 803 H. Hardy and Radi-Arc Electrical Co. (1927), Ltd. Turntable brake and battery switch for electric gramophones.
21 804 H. Hardy and Radi-Arc Electrical Co. (1927), Ltd. Variable resistances.
21 746 J. W. Howard and Lancashire Dynamo and Motor Co., Ltd. Synchronous induction motor.
21 816 Metropolitan-Vickers Electrical Co., Ltd. Electric protective apparatus. (27/7/27, U.S.)
21 828 Quarzlampen Ges. Irradiation of substances. (4/8/27, Germany.)
21 802 Radi-Arc Electrical Co. (1927), Ltd. Scratch filter for gramophone record amplifiers.
21 874 V. E. Richards. Apparatus for forming depolarising element of primary cells.
21 879 F. E. A. B. Sewell. Wireless receiving circuits, etc.
21 863 Siemens und Halske Akt.-Ges. Direction indicator for train. (28/7/27, Germany.)
21 870 Telefunken Ges. für Drahtlose Telegraphie. Aerials. (28/7/27, Germany.)
21 866 Telephon Apparat-Fabrik E. Zweitusch & Co. Ges. Impregnation material for electric condensers. (29/10/27, Germany.)
21 872 A. F. J. Wright. Supporting arms for electrical pick-ups.

### July 28th.

21 975 Akt.-Ges. Brown, Boverie et Cie. Means for suppression of back-fire in mercury vapour rectifiers. (8/8/27, Germany.)
21 917 M. von Ardenne. Electric rectifiers, etc. (6/8/27, Germany.)
21 934 R. Blackburn, L. C. Pocock, and Standard Telephones and Cables, Ltd. Telephone transmitters.
21 941 B. C. Brain, British Thomson-Houston Co., Ltd., and L. J. Davies. Thermionic discharge tubes.
21 943, 21 944 British Thomson-Houston Co., Ltd., and H. L. Satchell. Machines for winding on tape, etc.
21 945 British Thomson-Houston Co., Ltd. and H. L. Satchell. Taping, etc., machines.
21 927 J. E. Calverley, W. Donnelly and English Electric Co., Ltd. Dynamo electric machines.
21 898 G. S. Clark and G. T. McGlashan. Switchboards.
21 896 W. Holt, Octron, Ltd., and G. H. Stedman. Manufacture of oxide coated cathodes for vacuum electric discharges.
21 946 International General Electric Co., Inc. Rectifier tubes. (28/7/27, Germany.)
21 947 International General Electric Co., Inc.. Alternating current meters. (28/7/27.)
21 974 E. F. Miller. Thermionic valves.
21 936, 21 937 Soc. Chimique de la Seine and V. Szidon. Electrolytically depositing chromium.
21 922 Telefunken Ges. für Drahtlose Telegraphie. Wireless aerials. (28/7/27, Germany.)
91 976 Vreeland Corporation. Electric signalling systems. (1/8/27, U.S.)

### July 30th.

22 052 Aronwerke Elektrizitats Ges. and W. Stern. Electrical distant indicating plant, etc.
22 023 Associated Telephone and Telegraph Co. Telephone systems. (18/10/26, U.S.)
22 055 E. Compare. Electric heater for hair waving.
21 993 J. A. Crabtree. Electric plug and socket couplings.
21 994 J. A. Crabtree. Switches.
21 996 E. Frenot and M. Gronier. Multiple electrical resistances for heating. (30/7/27, France.)
21 988 W. E. Groves. Electric socket connections.
22 029 International General Electric Co., Inc. Electric lamp holders. (30/7/27, Germany.)
22 098 H. Leben and A. Reyrolle and Co., Ltd. Electric protective systems.
21 992 H. F. McLoughlin. Metallic boxes for electric switches, etc.
22 022 N. V. Philips Gloeilampenfabrieken. X-ray installation. (5/8/27, Holland.)
22 003 T. Smith. Production of electrical energy.
22 074 A. E. White (Indian Motorcycle Co.). Electrical generating systems for internal combustion engines.
22 111 F. A. Wright. Pneumatic remote control switch.

### July 31st.

22 137 W. G. Allen and Sons (Tipton), Ltd. Cable clips.
22 163 Associated Telephone and Telegraph Co. Telephone systems. (21/10/27, U.S.)
22 174 J. Baxter. Electrically illuminated manœuvre indicators for vehicles.
22 224 C. O. Browne, Gramophone Co., Ltd. and W. F. Tedham. Glow discharge tubes for photographic recording of sound.
22 157 J. W. Cairns. Control systems for electrical sound reproduction.
22 217 N. Cooke, H. Leben and A. Reyrolle and Co., Ltd. Electric protective systems.
22 194 S. English and Holophane, Ltd. Illuminating appliances.
22 199 R. Frister Akt.-Ges. Electric roasting apparatus. (2/5/28, Germany.)

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# THE ELECTRICIAN

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# Current Topics.

## The "Series Capacitor."

In the history of the electrical industry, the laboratory plaything of to-day is ever destined to be the commercial machine of to-morrow. Time has seen the progress through these stages of the electric generator and motor, the arc and the incandescent lamp, the transformer and radio. Now, according to the "General Electric Review" (U.S.A.), the tuned circuit, familiar to radio enthusiasts, and only yesterday thought to be a thing to be avoided in a commercial transmission line, is to-day being utilised to broaden the field of power transmission engineering. It appears that the "series capacitor," as it is called, is an equipment which will compensate for the inductive reactance of the line and transformers in the transmission circuit in which it is connected, and in this manner the overall voltage characteristics can be made to approximate those which would exist if resistance only were present. Figuratively, the series capacitor eliminates the element of distance in power transmission, and gives the same voltage conditions at the receiving end of the line as if the generators were directly connected to the receiver busbars, except, of course, for the effect of line resistance. The magnitude of the line current is not changed. Thus, by utilising a series capacitor it is claimed that approximately the characteristics of direct current transmission can be obtained, and the advantages of the alternating current system retained. For short lines, the series capacitor can be located at any point in the line with the same overall results. For long lines, where charging current is a factor at light loads, the capacitor can be divided into two sections, with one unit installed at the receiving end of the line and the other at the generating end, so that the charging current of the line through the capacitor at the generating end gives a drop in voltage equivalent to the rise in voltage over the inductance of the line. In cases where there are branch circuits tapped from the line, the total capacitance may be split up into sections placed just beyond each tapping-off point to hold the potential at these points at a predetermined value. Furthermore, it is claimed that the stability of a long transmission line can be materially increased by the installation of a series capacitor, because its compensation of the inductive reactance enables a greater load to be carried over the line before the load limit is reached.

## Application to Low Voltage Lines.

The application of series capacitor equipment to overhead lines of low voltage appears to be equally attractive. At present little improvement in voltage regulation is obtained by increasing the size of conductors beyond a certain limit, because the controlling factor is the inductive reactance of the line. With the addition of a series capacitor, however, the copper may be increased in size until the economic limit of copper is reached. This equipment, which has the extraordinary low loss of approximately 0·2 of 1 per cent. of the kVA rating, would seem to have made possible the use of cheap line construction in supplying large rural areas with electrical energy.

## Analysing Selling Costs.

Elsewhere in this issue we give details of a system which, it is suggested, will enable electrical contractors conducting a retail trade to analyse their shop or showroom selling costs. The plan outlined has the merits of simplicity and cheapness in that its adoption does not require the engagement of any additional staff, and even if some of our retail readers conclude after investigation that the institution of such a system would not benefit their business, all will gain a new viewpoint on selling problems. It is obvious that reduction of selling costs results in increased profits, and any means which seem to offer assistance in this direction are at least worthy of investigation. Accepting the obvious sounding but rarely appreciated assumption that the salesman is paid to sell, and that the effective part of his time is that during which he is serving customers, some of us may be rather surprised to find on investigation how small a part of the shop salesman's time is actually occupied in selling.

## The Fuel Conference.

From the details already available we have no hesitation in predicting that the Fuel Conference, to be held at the Imperial Institute, London, from September 24th to October 6th, will further enhance our reputation among the scientific nations of the world. The organisation of the first World Power Conference during the Wembley Exhibition was a tremendous enterprise, and the Fuel Conference which is being arranged under the same auspices is, in its more specialised way, of comparable magnitude. Papers for this conference are being presented by fuel organisations in all the leading countries of the world, and the extent of national and international participation in the conference places it in the unique position of being the largest and most representative conference on fuel problems ever held. Some idea of its scope may be gathered from mention of the fact that, in three sections alone, out of a

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total of 22, there are no fewer than 43 papers of direct interest to the electrical industry. The field covered by the individual sections seems very adequate, though we note in the section devoted to the transmission of power, that electrical power transmission is only dealt with in one paper—and then only in comparison with coal, oil and gas—and that the remaining three papers all deal with gas transmission and distribution problems.

## Sterilising Swimming Baths.

No small amount of public alarm has been occasioned during the past few days by revelations of the grave menace to health caused by omission to sterilise water used in many of the swimming baths that have been so well patronised this summer. There are, of course, several known ways of ensuring to bathers a permanent supply of clean water, but they are generally either expensive or impart an unpleasant taste to the water. It is therefore of interest to note that, following a series of tests carried out by the Detroit Athletic Club, it has been established that the water of swimming baths can be kept completely sterile by exposure to the rays of ultra-violet lamps. It was found that the rays not only killed all the harmful germs but that they did not add colour, taste or irritating qualities to the water. At the time of writing we have no reliable data as to the duration of ultra-violet irradiation necessary to provide complete immunity from the disease risks which undoubtedly exist, but on the information at present available this new application of ultra-violet light would seem to merit careful consideration.

## Road versus Rail.

While road arrangements for depriving the railways of passenger traffic are receiving constant attention in the lay Press, observation shows that the railways are being subjected to even greater competition for the carriage of goods. On more than one occasion of late we have referred to the growing tendency of electrical manufacturing firms to send their heavy goods by road, thus avoiding the necessity for special packing and frequent re-handling. A reader who has a house facing one of the main roads between London and the Midlands calculates that thousands of tons of merchandise pass his premises daily. During the daylight hours, and right through the night, there is an almost endless procession of heavy motor transport, and from the relatively small loads of a few months back the weights carried in this manner have increased progressively until there is hardly any piece of transportable machinery which does not find a place in these "road trains," which were envisaged, curiously enough, by Col. Crompton many years ago. Electrical goods and machinery form an ever increasing proportion of the road-borne traffic of this country, and it seems obvious that unless the railways are able to reduce rates and modify some of their irksome restrictions on the carriage of electrical goods their revenue from this important industry will rapidly approach vanishing point.

## Home Lighting Costs.

"Insist upon 3 per cent. of the cost of your home as allowance for lighting fixtures." So runs the slogan of a campaign which has been organised in the U.S.A. to educate the public to a proper realisation of the place of electric light fittings in the home. The idea is one which we can commend to individual electrical traders here. In the average English home lighting fittings are not considered as part of the cost of the house. They are generally chosen as an afterthought, and when there is usually but little money left over for more than bare necessities. In other directions, such as furnishing, there is an approximate minimum sum that is normally expended for a house of a certain price. Few people think of the light fittings in a similar way. On the 3 per cent. basis mentioned above the average £1 000 house would require lighting fittings costing £30. Small as this figure undoubtedly is, there must be thousands of houses in this category which have not had half this sum spent on lighting. People have never been told what is a suitable amount to spend on this important form of household equipment, and if the suggestion is put forward by electrical traders that expenditure in this direction should not be less than a certain percentage of the cost of the house, we feel sure there will be a qualifying response.

## More Light Needed.

While attending to domestic lighting fittings traders should also look into the question of lamps. In spite of the valuable educational work that has been done, there are still very few homes in this country where the intensity of the lighting can be said to be anywhere near adequate. People spend their evenings groping about and ruining their eyesight by the light of 40 W lamps, and—this is the pity—do not realise how inadequate their lighting is. Even when it is explained to them they frequently fail to appreciate how radical a change "a few more watts" may make in a room, and if they do appreciate it they are obsessed with speculations as to the increased lighting bills to which the use of lamps of higher wattage will give rise. Much simpler is the method we have seen employed on more than one occasion with striking success. Noticing that a certain house is lighted throughout by lamps of 40 W or less, the contractor takes along a 100 W lamp, and, without any mention of wattages, foot-candles or other technicalities, puts the lamp into a holder and retires. The consumers' delight at the brilliance is usually expressed in an order for lamps of more appropriate wattage.

## Canadian Power Development.

Impressive figures of Canada's production of electrical energy are given by the Royal Bank of Canada's power index, quoted in that institution's Monthly Letter for August. The figures show that since 1923 production has increased by 129 per cent., and, using the amount generated in that year as a base, the yearly increase in the interval has amounted to more than 25 per cent. During May last, the average number of kilowatt-hours of electrical energy generated daily for Canadian use was 37 millions, as compared with 31 millions in May, 1927; 25 in 1926; 21 in 1925; 19 in 1924; and 16 millions in May, 1923. Electrical power development, the Bank points out, has been concurrent with, though not entirely caused by, the extraordinary growth of the newsprint industry, in which Canada now holds a foremost place. Another point brought out is that 80 per cent. of all the electrical energy in the Dominion is produced in Ontario and Quebec, where the power demand includes requirements for a wide variety of industrial and public utility uses, and illustrates the vigorous economic activity of these populous provinces.

## The Television Position.

Following the widespread publication of the proposal to place complete Baird television sets on the market within the next few weeks, the old controversy as to whether television is, or is not, in its present state of development, ready for general public use has again cropped up. While we shall be among the first to congratulate Mr. Baird when he can show us that he has successfully overcome the many difficulties with which the development of his invention was beset, we are bound in the meantime to pay some heed to the doubts expressed by scientific men of the calibre of Sir Oliver Lodge and Mr. Campbell Swinton, both of whom maintain that practical television will not be attained until cathode-ray electrons are substituted for the comparatively sluggish moving material parts. Others, not offering detailed suggestions, hold that some radical discovery is necessary before television will be practicable. The confident tone of the public announcements on behalf of the television organisation suggests that such a discovery has actually been made. In any event, we shall not have to wait long in order to see whether this confidence is justified.

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# E.H.T. TERMINAL STATION DESIGN AND PROTECTION.

## Outdoor Station Dangers—Facilities Afforded by Steel Structures—Dealing with Over-Voltage Disturbances—Conductor Clearances and Separations.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

IN the following notes attention is devoted to *outdoor* station dangers, such as those arising from potential gradients on the exposed station layout resulting from thunderclouds and improper station protection, and potential gradients across the earth surface of the station resulting from abnormal operating conditions and improper design and installation and maintenance of an earthing system.

If we seek to secure the protection of a line from induced over-potentials by installing an overhead ground wire, we certainly must give at least the same amount of protection to an exposed terminal station. This would mean the installation of a network—*above* and *around* the station—tied into a common earthing system, and also tied to the ends of the overhead ground wires upon the lines. In various ways steel is likely to be safer than concrete, and it would no doubt be better to have all equipment mounted on steel than on concrete. A steel structure may appear unsightly, but a steel structural type outdoor station provides excellent screening and earthing.

One of the first problems is the choice of sites facilitating economically the best earths, the best protection and other necessary conditions. Preparation, layout, and construction of the ground-area and common earthing system can be quite as important as the layout of the system apparatus and equipment. For a big station, the layout of the above-ground part is more likely to prove less important than the combined underground surface and overhead parts of the complete installation; as regards the latter, it is at least as important as the overhead ground wire installation of the line. Good design and construction requires that everything in, at, and around, the station be kept at an approximately zero earth potential.

Where e.h.t. equipment is placed upon specially elevated concrete piers or pillars, it is obviously essential to ensure that: (1) the operators and attendants are at earth potential at all times; and (2) excluding live parts, every part of the station and its surroundings be kept at earth potential at all times. With steel structural design better facilities are offered to attain this condition. In any case, it is necessary to provide an earthing system so that the ground station-area is always at earth potential, i.e., a common earthing system should be installed both under and around the whole station area so that it is at a uniform and approximately zero potential to earth at all times, whether operating under short-circuit, lightning discharge, or other conditions. Concrete piers can be made to give safe potential gradients, but their use exposes the station apparatus, etc., to full atmospheric charges.

Each concrete pillar or pier should be connected by individual copper rod or bar to a bus by the shortest leads possible, and should be braised, not bolted, thereto, the bus being connected in like manner to the common earthing system; this also applies to all frames, cases, tanks, etc., of equipment and apparatus. Every part, other than live parts, should be connected in this way to the common earthing system. The size of earth bus will depend on the station capacity, number of units, the amount of short-circuit current and the time allowed for this current flow, as well as the neutral resistance (if any). The overhead ground wire should always connect into the common earthing system, and not, as is often done, be dead-ended to the tower at or near the terminal station. The station lightning arresters, power transformers, switches and other equipment should preferably have their own earthing bus, but each should be tied into the common earthing system. The endeavour should be to maintain the resistance of the common earthing system at around 1 Ω.

### Importance of Below-ground Parts.

We thus see that the surface and below ground parts of a terminal station are of extreme importance. Excluding the layout, which is more or less general knowledge, the above ground part is practically settled by the manufacturer, the station arrangement itself being of the simplest type. The insulators and switches (air-break type) may be supported from above or from below, from steel structural or piping or from concrete upright supports. The latter can be made better practice provided, and only provided, provisions are made for protection from potential gradients above earth potential, and from overhead induced potentials. The former problem is discussed above, and it is suggested that a proper earthing system be installed and maintained. The latter problem is no less important, and calls for a protection and screening such that each exposed conductor is shielded from the effects of thunderclouds and other over-potential conditions just the same as, or better than, an equivalent length of transmission line-conductor.

### A Prolific Source of Trouble.

Over-voltage disturbances are the most prolific source of trouble; nearly all transmission system disturbances occur initially as the failure of some insulator from one cause or another. Short-circuiting a line is very bad, but usually not so disastrous as over-potentials. Earthing the neutral practically eliminates one of the worst dangers arising from arcing earths; the other most fruitful source of trouble (induced over-potentials) can be minimised by proper design.

For the isolated neutral system, the current flowing in the arc resulting from a flashover may be quite considerable and may subject the two sound phases of a three-phase circuit to severe strain and final breakdown or weakening of insulation sufficient to cause phase to phase short-circuit at the time (or any time following) the arcing earth occurs. Flashover of insulators gives rise to an arcing earth, and the earthing of the line in this way creates travelling waves of steep front which are particularly dangerous to apparatus and plant at the terminals.

The lightning flashover values of 10-in. unit insulator-strings for the different standard line voltages range between those given as follows:

| Line voltage of V. | Impulse flashover between kV. |
|---|---|
| 132 000 | 1 300 to 1 700 |
| 110 000 | 900 ,, 1 300 |
| 88 000 | 750 ,, 1 000 |
| 66 000 | 600 ,, 900 |
| 44 000 | 450 ,, 600 |
| 33 000 | 350 ,, 450 |

These impulse flashover values may be used for designing purposes: for instance, 1 700 kV equivalent to 12 units, and 900 kV equivalent to a string of 6 units. Knowing these values and the protective ratio, we may calculate the safe height of line conductors above ground line for any given transmission line.

Over-potential waves travel to, and rebound from, terminal stations, and such vulnerable points of the system (more than any other) must be designed to take care of disturbances which originate at any point on the transmission line. The terminal points are the first to bear the brunt of reflected waves, hence the insulation is more likely to be weakened (relatively more so than the line) thus requiring a relatively greater protection from over-potentials coming in, and those directly induced on the station. When a flashover occurs, the maximum voltage due to an arc depends on the system, and can be taken approximately as given below:

(1) With the solidly earthed neutral system the theoretical maximum voltage obtainable from line to earth is fixed at .. .. 100 *per cent.*

(2) With the neutral earthed through a resistance, up to *critical* value, the theoretical maximum voltage obtainable (line to earth) is .. .. .. .. 250 *per cent.*

Placing resistance in the neutral is all right provided it is sufficiently low to allow enough current to flow to neutralise the charging current, yet sufficiently high to operate the relays. Transformer insulation will satisfy this voltage rise.

(3) Where there is some damping on the initial arc (the initial arc being taken at 250 per cent.), the final arc may reach a value of .. .. .. .. .. 500 *per cent.*

(4) Where there is no damping, the theoretical

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maximum voltage obtainable (line to earth may be .. .. .. .. .. 750 *per cent.*

[For this latter condition the required insulation for an isolated neutral system would be 7·5 times the normal crest value of the line to neutral voltage. This clearly points to the necessity of the earthed neutral system.]

A well-designed e.h.t. transmission system seeks to have the insulation of the whole transmission system on a balanced footing, with a margin of insulation in favour of the transformers. It is safer to allow flashover on the line (not far remote) than to allow the over-voltage to travel to the terminal transformers and reflect to double or higher values. Travelling waves caused by disturbances of one kind or another are reflected from the terminals. Although arresters are installed they may not be effective in discharging the over-voltage; where arresters are installed they should not only have a straight connection from the line to them, but should also have a connection from the transformer terminals—the leads in each case being as short and straight as possible—and the arrester should have a low-resistance connection to earth, with a resistance no higher than 5 Ω.

## Diminished Hazards.

For a transmission system it is advisable to establish an earthed neutral on the power transformers at the source of supply, using the delta-star connection. By this system of connections the triple-frequency voltage is consumed and cannot flow out on the line; the insulation factor of safety is higher; only one terminal of each phase-transformer is endangered; and hazards resulting from arcing earths are very greatly diminished, or completely quenched, etc.

Conductor clearances and separations are at least as important as any part of the line—this also applying to insulation. Actually greater clearances and more insulator-units should be allowed in such stations. The worst part of an e.h.t. transmission system (66 kV and over) in which to permit flashover is in the outdoor station because the arc caused by a flash may, with but a slight wind, spread from phase to phase in less time than the best oil-switch can open and clear, i.e., less than ¼ second; these big power e.h.t. systems require ¼ second-opening switches. In actual practice sufficient separation and clearances of conductors and supports cannot economically be provided against an arc spreading to other phases, and the best known practical solution is to quench the arc by quick- (practically instantaneous) opening switches.

Of special importance is the fact that it is the duration of the arc, and not the short-circuit current, which is the danger to guard against, and that the arc voltage is directly proportional to the arc length, this latter being very sensitive to voltage; it is quite possible that the critical arc length caused by a flashover on a 132 kV system may extend to several hundred feet in length. Arcing rings and horns help to deflect the arc (in still air), and thus protect the end insulator units. An arc must be cleared almost instantaneously, otherwise the intense heat on the insulator and conductor may cause much damage. The melting point of aluminium is around 1 210 deg. F.; copper being around 2 000 deg. F.; the temperature of an arc is nearer 3 500 deg. F. As these metals are exposed to the arc it is apparent that the time period from start to quenching of the arc must not exceed ¼ second.

The heavy short circuit current to earth on an earthed neutral system may be great, but it is far less damaging, and the resulting arc length much less, than the isolated neutral system under equal short-circuit current conditions, because the arc voltage is less, hence a more favourable condition for oil switches as compared with the isolated neutral system; also conditions are further improved by working the neutral conductor as part of the transmission system; i.e., combined overhead ground wire and neutral conductor, preferably insulated from the line supports and earthed at appropriate impedance intervals.

Where the value of insulation for the combined ground wire (continuous overhead guard wire) and neutral conductor is only one-half that of each line conductor, the advantage of retaining the insulation of wood poles or structures as against placing it in direct contact with the pole, provides for the expectancy of reliability many times greater; this method of construction has repeatedly been recommended by the writer during the last few years.*

* "Overhead Electric Power Transmission Engineering," also in "Distribution of Electricity by Overhead Lines."

# BOOK REVIEW.

**An Introduction to Electrical Drawing.** Part I. By E. H. H. Gibbons. (London: Blackie and Sons.) Pp. 63. 3s. net.

The title "Electrical Drawing" simply means, in this instance, that the author deals more especially with electrical equipment. Drawing, of course, is not electrical but mechanical, and, therefore, to students it matters not whether the details are electrical or mechanical. Further, it also follows that draughtsmen are not necessarily electrical engineers, even if their work happens to be entirely in connection with electrical material.

It may be agreed that teachers, particularly of specialised work, consider that no book, however complete, adequately covers the subject, and for this reason, perhaps, too many text books find a place upon the market.

The contents of the book are divided into seven parts, and after dealing briefly with the principles and methods of projection the following points receive consideration:– Springs and screws, coils and lifting magnets, details of switchgear, and materials required for distribution purposes.

The material considered is strictly electrical, and each page contains a description and the function of a specific item. A fully dimensioned drawing showing the details of each part is presented, and in many cases the items are also shown assembled.

It will be seen that with the limited size of page the author has cramped the views, and in the majority of cases the various parts are shown too close together. Details, as a general rule, cannot be made too large, and require to be dimensioned most clearly and distinctly. Drawings must be made fool-proof because the men who are responsible for the making of the articles are not draughtsmen, and, therefore, unlike pattern makers, may not understand elementary principles of projection. The author applies this remark also to students, who, in his opinion, frequently fail to visualise an object from the general practice of orthographic projection and, therefore, the majority of details have been shown in the book by isometric views.

Numerous exercises are given at the foot of alternate pages, and with these the proposed scales are rather misleading. For example, full-size is not a scale, and further, it would be more satisfactory for a student to make himself familiar with standard practice and say scale 3 in. = 1 ft., or 1 : 4 rather than "scale ¼ full-size."

The book Part I. dealing with switchgear may be serviceable to prospective engineers who desire to understand the functions of electrical apparatus. The descriptions of the various items are most comprehensive, while the details, although congested, are very carefully dimensioned. The price is reasonable, and the book should prove very useful to students and teachers of engineering drawing.

W. Sharp.

## BOOKS RECEIVED.

"Geschichtliche Einzeldarstellungen aus der Elektrotechnik." Vol. 1. (Berlin: Julius Springer.) Pp. 98. 6 marks; bound, 7 marks.

"The Lineman's Handbook." By Edwin Kurtz. 1st Edition (London: McGraw-Hill Publishing Co.) Pp. xiii+547. 20s. net.

"Die Wanderwellenvorgänge auf experimenteller Grundlage." By Dr. L. Binder. (Berlin: Julius Springer.) Pp. 200, 22 Reichmarks.

"Rating of Machinery and Plant in England and Wales, July, 1928." By John Scott Henderson. (London: The Argus Press.) Pp. 43. 5s. net.

Standards Yearbook, 1928. Compiled by the National Bureau of Standards. (Washington: Government Printing Office.) Pp. vi+399. $1 net.

"Income Tax Up to Date." Rules and Regulations for the Current Income Tax Year, 1928–29. By H. J. Gully. (London: "The Financial News.") Pp. 20. 9d. net.

"Illuminating Engineering for Students and Engineers." 2nd Edition. Edited by F. E. Cady and H. B. Dates. (London: Chapman and Hall.) Pp. xv+515. 25s. net.

"Vorlesungen über die Wissenschaftlichen Grundlagen der Elektrotechnik." By Dr. Milan Vidmar. (Berlin: Julius Springer.) Pp. x+451. 15 marks; bound, 16.50 marks.

"The Strength of Hexagon Nuts of Less than Standard Size for Bright Steel Bolts." By C. Jakeman. Issued by the Department of Scientific and Industrial Research. Engineering Research Special Report No. 7. (London: H.M. Stationery Office.) Pp. vi+27. 1s. 3d. net.

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# THE COMPLEX NUMBER AND ITS USE IN ELECTRICAL THEORY.

## Great Scope for Application in A.C. Circuit Theory—Some Uses in Analytical Branches of Electrical Work.

By G. WINDRED.

(*Concluded from page 174.*)

EQUIPPED with the foregoing definitions, and a more or less fixed idea of the significance of the much misjudged symbol $j$, the applications of our theorems to problems in applied mathematics should follow naturally. The space at present available prohibits any but the most cursory treatment of such problems, so that our considerations are of necessity limited to only a few of the more important applications, leading to methods of analysis outside the scope of the present paper. A thorough understanding of the principles involved in the problems which follow should demonstrate the great power of mathematical methods employing the theory of functions of a complex variable—undoubtedly a very beautiful method of analysis.

As a simple example of the application of the complex quantity to physical problems we may consider the system of forces shown in Fig. 2. The forces are here represented by the vectors $A, B, C, D, E$, of scalar length $r_1, r_2, r_3$ . . and having the amplitudes $\theta_1, \theta_2, \theta_3$, . . respectively, from the axis of reference $ox$.

If the forces are considered to act on a point $P$, situated on the $ox$-axis, we may employ the reasoning leading to Def. I in order to determine the argument and amplitude of the vector representing the resultant force at the point $P$.

If $f_1, f_2, f_3$, are the respective forces, they are completely specified, both with regard to magnitude and direction, by

$$f_1 = r_1(\cos\theta_1 + j\sin\theta_1) = x_1 + jy_1$$
$$f_2 = r_2(\cos\theta_2 + j\sin\theta_2) = x_2 + jy_2$$
$$f_3 = r_3(\cos\theta_3 + j\sin\theta_3) = x_3 + jy_3$$
. . . . . , etc.

Then by addition $F = f_1 + f_2 + f_3 + \ldots = (x_1 + x_2 + x_3 + \ldots) + j(y_1 + y_2 + y_3 \ldots)$ gives the total resultant force on the point $P$ due to the combined forces of the components. The resultant force has a direction relative to the $ox$-axis which is specified by $\theta = \tan^{-1} \frac{y_1 + y_2 + y_3 + \ldots}{x_1 + x_2 + x_3 + \ldots}$, from whence the equation $F = R(\cos\theta + j\sin\theta)$ . . (22) completely specifies the vector representing the resultant force at $P$, both in argument and amplitude.

The subject of theoretical mechanics affords many such examples as the above, where it is required to find the directions and magnitude of a force compounded from a number of contributing forces whose orientation from the point of application can be determined. It follows from the foregoing example that the point $P$ is in equilibrium when the sum of the $x$ components of the applied forces and the sum of the $y$ components of the applied forces both reduce to zero. If only one of these sums reduces to zero, then a force exists, either acting along the $ox$-axis or at right-angles thereto, in the $oy$-axis.

### Application to A.C. Problems.

Our considerations next concern the application of the algebra of complex numbers to problems in alternating-current theory.

In the majority of text books on alternating currents the subject is approached from vectorial considerations, and in this way it is soon established that the spacio-temporal properties of the e.m.f.'s, currents, and impedances in any circuit can be represented in the Cartesian method by the hypotenuse of a right-angled triangle of vectors, whose $x$-axis represents pure resistance, or the e.m.f.'s and currents due thereto; and whose $y$-axis represents reactance, or reactive e.m.f.'s or currents. From this it is evident that in alternating-current circuit theory there is great scope for the application of the complex quantity, which by virtue of its mathematical sense is capable of expressing in a single term the vectors of impedance, voltage, or current; these quantities requiring, in ordinary algebra, a two-term expression involving roots for their complete specification. In spite of the more simple representation introduced by the complex quantity, certain erroneous deductions * have resulted from its use, so that it is very important to exercise discretion in the application of these principles.

The fundamental expression in alternating current theory having the form of a complex number may be derived from the well known equation

$$e = Ri + L\frac{di}{dt} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (23)$$

By expressing $\frac{d}{dt}$ in the form of an operator the equation

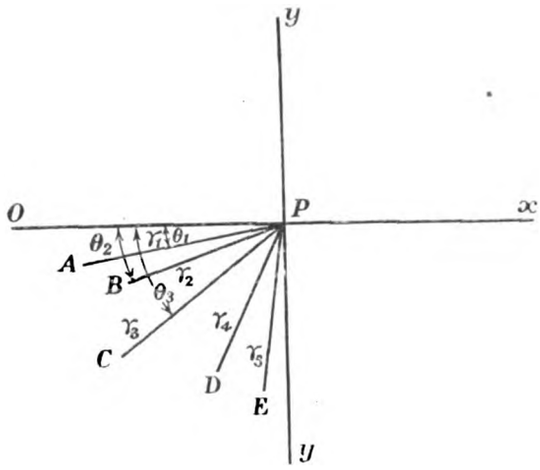


Fig. 2.

may be rewritten in the form

$$e = Ri + LDi, \text{ or } i\,(R + LD) \quad . \quad . \quad . \quad . \quad (24)$$

Since $i$ may also be expressed as $I\sin\omega t$ it follows that

$$DI\sin\omega t = -\omega I\cos\omega t$$

and

$$D^2 I\sin\omega t = -\omega^2 I\sin\omega t$$

from which we obtain

$$D^2 = -\omega^2, \text{ or } (-1.\omega)^2,$$

so that

$$D = \sqrt{(-1.\omega)^2} = \sqrt{-1}.\omega = j\omega \quad . \quad . \quad (25)$$

It now follows from equation (24) that the impedance of the circuit is represented by

$$Z = R + j\omega L. \quad . \quad . \quad . \quad . \quad . \quad . \quad (26)$$

The foregoing argument represents an alternative method of arriving at this fundamental equation, which is usually obtained in the text books from purely trigonometrical principles. The use of equation (26) in alternating current problems has been employed and developed in such a large number of standard works on the subject of alternating currents that further reference to its uses would be out of place here. We therefore turn to a consideration of the uses of complex representation in some of the more analytic branches of electrical theory.

At this stage it may not be inappropriate to adopt a more introspective method of discussion than has hitherto been followed, since this procedure is more in keeping with the analytic nature of the problems which are presented in an extension of the foregoing principles. The following considerations concern the elementary theory of functions of a complex variable; a theory whose importance in analytical work it is difficult to over estimate.

### Problems in Two Dimensions.

At the outset, we may consider it established that any complex number of the form $x + jy$, where $j$ is defined by $j^2 = -1$, and $x$ and $y$ are real numbers, is in all its forms subject to ordinary algebraical laws. Further, it may be seen

* Some of these have been dealt with in a paper by W. F. Dunton.—"Researches in Engineering Mathematics," IV. "Beama," Sept., 1923.

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that the complex number vanishes only when $x$ and $y$ both vanish separately, and that any expression derived from the manipulation of complex terms may, when $-1$ has been substituted for all occurrences of $j^2$, be represented as the sum of a real number and an imaginary.

From this it may be seen that any equation between two complex numbers may be expressed in the form of two equations between real numbers, or, simply expressed

$$2x + j3y = 4a + j6b$$

gives $$2x = 4a,\ 3y = 6b, \quad . \quad . \quad . \quad . \quad . \quad (27)$$

which, from a mental abstraction of the meaning of the complex number, is self-evident.

A function of both variables of a complex number is termed a function of the complex number when it possesses a differential coefficient with respect thereto. Thus, where $z$ is a complex number, $z^n$, sin $a$ $(z)$, log $z$, are functions of a complex variable, and may be written $f(z)$. From the reasoning leading to equations (27) however, it is apparent that such a function may be expressed as a further complex number $u+jv$, so that we may write.

$$w = f(z) = u + jv \quad . \quad . \quad . \quad . \quad (28)$$

If $f(z) = z^2$,

$$f(z) = (x+jy)^2 = x^2 - y^2 + 2jxy,$$

so that

$$u = x^2 - y^2,\ v = 2xy \quad . \quad . \quad . \quad . \quad (29)$$

Again, if we take $f(z) = (3a+4b)\ (z)$

$$f(z) = 3xa + 4bx + j\,(3ay + 4by),$$

whence

$$u = 3xa + 4bx,\ v = 3ay + 4by \quad . \quad . \quad (30)$$

The foregoing reasoning applies to any function, implicit or explicit, of a complex variable.

## A Common Relation.

We may now examine the relation expressed by the differential coefficient of $f(z)$ with respect to $z$, a relation often required in two-dimensional problems in hydrodynamics and electrical theory. Where $x$ and $y$ are independent variables, we have

$$dz = dx + jdy, \quad . \quad . \quad . \quad . \quad (31)$$

and also

$$df(z) = dw = du + jdv \quad . \quad . \quad . \quad (32)$$

now since, from equations (29) and (30), $u$ and $v$ are both functions of $x$ and $y$, the foregoing differential may be written

$$df(z) = \frac{\delta u}{\delta x}dx + \frac{\delta u}{\delta y}dy + j\left(\frac{\delta v}{\delta x}dx + \frac{\delta v}{\delta y}dy\right) \quad . \quad . \quad (33)$$

so that by equations (31) and (32)

$$\frac{dw}{dz} = \frac{du + jdv}{dx + jdy} = \frac{\frac{\delta u}{\delta x}dx + \frac{\delta u}{\delta y}dy + j\left(\frac{\delta v}{\delta x}dx + \frac{\delta v}{\delta y}dy\right)}{dx + jdy}$$

which gives, on simplification

$$\frac{dw}{dz} = \frac{\frac{\delta u}{\delta x} + j\frac{\delta v}{\delta x} + \left(\frac{\delta u}{\delta y} + j\frac{\delta v}{\delta y}\right)\frac{dy}{dx}}{1 + j\frac{dy}{dx}} \quad . \quad . \quad . \quad (34)$$

From this equation it is seen that the rate of change of the function of $z$ with respect to $z$ itself is dependent upon the ratio $dy/dx$. This means that if $x$ and $y$ are the Cartesian co-ordinates of any point lying in a plane, the differential equation (34) represents the locus of the point when it moves in accordance with the conditions specified by the relation $f(z)$. A departure from these conditions is obtained when the numerator of equation (34) is a multiple of the denominator. In this case $dy/dx$ divides out, and the expression then satisfies the conditions.

$$\left(\frac{\delta u}{\delta x} + j\frac{\delta v}{\delta x}\right) : 1 :: \left(\frac{\delta u}{\delta y} + j\frac{\delta v}{\delta y}\right) : j,$$

which means that

$$j\left(\frac{\delta u}{\delta x} + j\frac{\delta v}{\delta x}\right) = \frac{\delta u}{\delta y} + j\frac{\delta v}{\delta y},$$

whence, remembering that $j^2 = -1$,

$$\frac{\delta u}{\delta x} = \frac{\delta v}{\delta y},\ \frac{\delta v}{\delta x} = -\frac{\delta u}{\delta y}, \quad . \quad . \quad . \quad . \quad (35)$$

which gives

$$\frac{dw}{dz} = \frac{\delta u}{\delta x} + j\frac{\delta v}{\delta x} \quad \frac{\delta v}{\delta y} - j\frac{\delta u}{\delta y} \quad . \quad . \quad . \quad (36)$$

In two dimensions, Laplace's equation* takes the form

$$\frac{\delta^2 V}{\delta x^2} + \frac{\delta^2 V}{\delta y^2} = o \quad . \quad . \quad . \quad . \quad (37)$$

The solution of this equation is of very great importance in electrical problems in two dimensions, which are, to a certain extent, analogous to two-dimensional hydromechanical problems, concerning which a great amount has been written.

In effect, the equation expresses the condition for uniform flow in a two-dimensional space, $V$ being the potential function, and $x$, $y$, the space co-ordinates.

If we differentiate the first of the equations (35) by $x$, and the second by $y$, we obtain

$$\frac{\delta^2 u}{\delta x^2} = \frac{\delta^2 v}{\delta x \delta y},\ \frac{\delta^2 v}{\delta y \delta x} = -\frac{\delta^2 u}{\delta y^2} \quad . \quad . \quad . \quad . \quad (38)$$

since however

$$\frac{\delta^2 v}{\delta x \delta y} = \frac{\delta^2 v}{\delta y \delta x},$$

equation (38) reduces to

$$\frac{\delta^2 u}{\delta x^2} + \frac{\delta^2 u}{\delta y^2} = O, \quad . \quad . \quad . \quad . \quad (39)$$

evidently one solution of Laplace's equation.

If now, we differentiate the second of the equations (35) by $x$, and the first by $y$, there results in a similar manner,

$$\frac{\delta^2 u}{\delta y \delta x} = \frac{\delta^2 v}{\delta y^2},\ \frac{\delta^2 v}{\delta x^2} = -\frac{\delta^2 u}{\delta x \delta y},$$

and therefore

$$\frac{\delta^2 v}{\delta x^2} + \frac{\delta^2 v}{\delta y^2} = O \quad . \quad . \quad . \quad (40)$$

evidently a further solution of Laplace's equation. From the foregoing reasoning it is evident that any function of a complex variable satisfying equations (35) gives two solutions of Laplace's equation. Either of the functions $u$ or $v$ may be taken as a solution of the equation for the potential, the remaining term then becoming the stream function.

In hydrodynamics, the equations (35) represent the condition that the lines representing $u$ = constant, and $v$ = constant are mutually orthogonal, i.e., intersect always at right-angles, and in this way if $v$ represents the stream function, then the lines representing $u$ = constant, are the lines of flow, intersecting the equipotential lines always at right-angles in accordance with hydrodynamical principles. In the electrical analogy $v$ would represent the potential function, while $u$ would represent the orientations of the lines of force, intersecting the equipotential lines at right-angles at every point in accordance with electrical principles.

By assigning different values to the $u$ and $v$ functions it is possible to obtain a large variety of systems representing known conditions. Thus, if we took $f(z) = z^2$ as in equation (29), giving $u = x^2 - y^2$, $v = 2xy$ the equipotential lines would be a system of equilateral hyperbolas with axes coincident with the axes of co-ordinates, and the stream lines would be a second system of equilateral hyperbolas, asymptotic to the axes of co-ordinates.

## Valuation of Solutions.

This condition includes as a special case a representation of the field distribution due to two freely charged conducting planes meeting at right-angles.† A number of solutions of a standard form are similarly obtainable, and are found to be of great value in various calculations concerning magnetic and electrostatic fields.‡

In the practical application of these methods to electrical theory it is necessary to find the form of the function representing the known boundary conditions. This being obtained, the solution of the resulting problem gives the field form and distribution.

It is thus evident that the method forms a very strong weapon of analysis in many electrical problems, and it is

* In the present limited space it is impossible to give an adequate explanation of this equation. It is probably familiar to most students of mathematical physics. For its use in electrical theory the reader is referred to J. H. Jeans's "Electricity and Magnetism," Cambridge. Fifth edition, Arts. 49, 50, 132.

† Ibid. Art. 317. See also G. H. Livens's "The Theory of Electricity," Cambridge, 1918, Arts. 108-110.

‡ For a practical application of these methods of analysis the reader should consult a recent paper by F. W. Carter, "The Magnetic Field of the Dynamo-Electric Machine." "Journ. I.E.E." Vol. 64, pp. 1115-1138.

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perhaps equally evident from the scanty literature of the subject that the attention which has been given to it is quite disproportionate to its value.

### Conclusion.

It has been quite impossible on the present occasion to give anything more than a very cursory descriptive outline of the subject. The usual objections to cursory treatment of any description will no doubt apply in this case also, but it is the author's opinion that there are many students of electrical theory who, while perhaps familiar with the general theory of complex numbers, have no conception of the mathematical methods to which it has given rise. It is also very markedly the case that the methods of the mathematician have received little application on the part of the physicist in this instance, as perhaps also in many others.

It is hoped that the present paper may serve as an introduction to the powerful methods of analysis associated with the names of Schwarz and Christoffel. The application of these methods is treated in many of the more advanced electrical works, among which may be specially mentioned :— Sir J. J. Thomson's " Recent Researches in Electricity and Magnetism," Oxford, 1893 ; G. H. Livens' " Theory of Electricity," Cambridge, 1918 ; J. H. Jeans's " Electricity and Magnetism," Cambridge, 1925 ; and F. B. Pidduck's " A Treatise on Electricity," Cambridge, 1925.

Those students whose interests are mostly mathematical, and who may wish to continue further the study of the mathematics of the complex number will find much of interest in J. L. S. Hatton's " The Theory of the Imaginary in Geometry," Cambridge, 1920, and J. L. Coolidge's " The Geometry of the Complex Domain," Oxford, 1924.

# FARM PLANT.

## An Electrical Handy-man for Agriculturists.

AMONG the interesting apparatus shown in the agricultural section of the recent Paris Fair was the " Record " workshop barrow, which might well be termed an electrical handy-man for the farmer. In its essentials it is an electric motor mounted on a steel barrow with speed reduction gear for the driving of various appliances, and in the larger sizes with certain appliances arranged ready for use in a few minutes. It is made for motors from 3 to 8 H.P. Fig. 1 shows one of the smaller units, while in Fig. 2 is seen a barrow fitted with additional useful appliances.

The motors are of the three-phase type, 50 periods.

The motor windings are specially impregnated to withstand damp, and ventilating fans are arranged at both ends of the rotor, the latter being mounted on ball bearings and having an

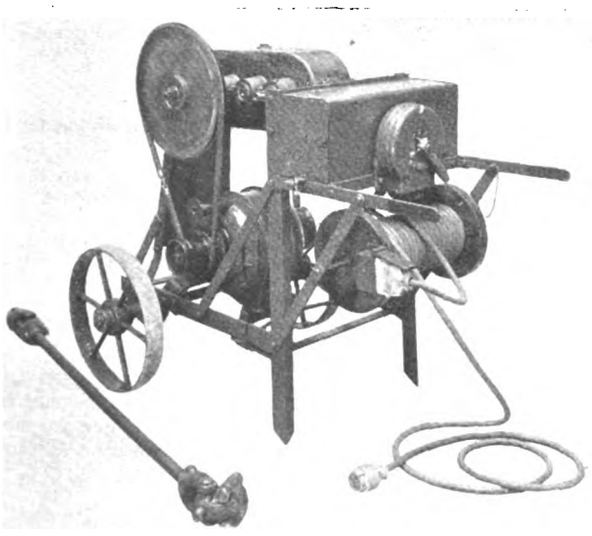

Fig. 1.—An electrical workshop barrow for farm use.

auxiliary winding which is cut out by a centrifugal arrangement when the rotor has got up to speed. The stator is wound for star or delta operation, so that at low loads the efficiency can be kept up. The starting gear is arranged so that one handle is sufficient, the motor starting up automatically.

A cable drum is fitted with a socket attached to the drum, and the other end of the cable fitted with a connector is run out to the wall sockets placed around the farm. The drum socket has a flap-door, and a multiple plug connected to the starting gear is pushed in ; to reverse the motor the plug is pulled out after switching off, and turned round. In the smaller sizes the motor is fitted with a pulley with two "V"

Fig. 2.—A larger sized barrow, the equipment of which includes a circular saw.

grooves of different diameters and a round faced extension The motor is slung hinged at one end of the base, and the weight is carried by the belt when the countershaft is used, after the fashion in which " Stone " system train lighting generators are arranged. To change from one "V" belt speed to another the motor is pushed up round the hinge and the belt changed. By means of the pulley extension some appliances can be driven direct by the flat belt. A gear box is arranged on the countershaft with extended spindles to which can be attached either a two step pulley or the Cardan shaft, which can be seen in Fig. 1. By a combination of pulleys and gears 16 pulley speeds are obtainable. The Cardan shaft is fitted with a universal grip socket by means of which any shaft end, round or square, from $\frac{3}{8}$ to $1\frac{1}{2}$ in. can be driven. A tool box is fitted at the back of the switch.

### Further Applications.

In the larger size, Fig. 2, a circular saw is arranged with a slide which can either be arranged for cross cutting firewood or for wood cut to shape ; the saw spindle runs on ball bearings ; the circular saw can be replaced by a grinding wheel. Underneath the frame is a rotary pump which can either be used for clear water or for liquid manure around the farm. In the larger size the handles of the barrow can be twisted round out of the way, small wheels are fitted in front, like those of a child's go-cart, to enable barn steps to be negotiated, and a sort of hinged spade is fitted at the front end, being held up out of the way when not required by a loop latch, which can be forced into the ground when required to take the pull of the belt.

When driving off the countershaft gear the hinged motor acts as a friction arrangement, so that if there is jamming in any appliance the motor tends to lift and the belt slips.

The motor and appliance described above is made by Messrs. Drouard and Gillot, of 252, Rue Lecourbe, Paris.

The number of motor-driven appliances to be seen at the Trade Fair and at the annual agricultural show in Paris make it clear that in France electricity on the farm has become an important factor in the national life.

# AMERICAN INDUSTRIAL PRODUCTION.

We are so accustomed to think that American industrial conditions are better than ours, that it is of interest to note that the " Electrical World," in attempting to discover " what is the matter with business," concludes that the producing capacity of American industry has outgrown the present demand for the finished product. The solution is believed to lie, in part, in recognising a curtailed production as an acceptable thing, and raising prices to a profitable basis.

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# SELLING COSTS IN RETAIL TRADE.

## Simple Methods for Analysing Costs—Ascertaining How Salesmen Spend their Time—Credit or Cash Sales?—An Interesting Study.

MANUFACTURERS are becoming more and more interested every day in systems of cost-finding, but the problem of arriving at his selling costs is one that has not been tackled by the average retailer. Though the big stores are known to have elaborate systems by means of which they can arrive at the cost of selling over the counter any particular class of goods, it is probable that the retailer thinks he has neither the staff nor the organisation suited to the collection of the necessary statistics, and he is, therefore, content to carry on without troubling about what his goods cost to sell. In so doing, however, he may be unwittingly allowing certain classes of goods to be sold at prices which are not adequate considering their "sales resistance."

A most helpful piece of research has been undertaken by the United States Department of Commerce. This is intended to put before the retailer a simple system whereby he can analyse selling costs without organising a special department to carry out the work. All that it requires is the registration by the assistants of certain details set out later, and the abstraction and collation of the figures daily by a clerk, who need not be occupied long over the task.

### A Concrete Example.

To explain the way the system operates a concrete example is used by the Department of Commerce, the figures having been taken from the records of a retailer with shops in several large American cities. For the purposes of this research all the figures from the different shops are summarised and treated as though they referred to merely one establishment. The analysis deals only with the actual cost of selling in the shop, and does not cover such expenses as those connected with buying, the supervision of sales, or the ordering of goods.

The class of goods sold is not stated. However, while the electrical retailer may be faced with certain problems that do not trouble other retailers, the idea behind the study is not to formulate a "cast-iron" cost-finding plan, but rather to indicate how inherent difficulties have been overcome by one retailer so that others may use the basic principles and build up on them the system that best meets their needs.

The principal facts necessary for the building up of a system of analysing retail selling costs are: (1) A knowledge of how the salesman or assistant spends his time; (2) the total value of the cash and credit sales. To arrive at the first datum the various duties the assistant carries out must be classified. First comes his *Selling Time*, which is the time consumed between his meeting with the customer and the decision as to the nature of the purchase. Next, we have *Service Time*, the time needed to write out the bill or sales-check and obtain and give change. With most retailers under this heading would also come the wrapping-up and handing over of the goods. The third heading is that of *Caring for Stock*, arranging it, and doing miscellaneous work such as bringing price-lists up to date. Then comes *Interviewing*, which is the time spent on a customer in answering inquiries that do not lead to a sale. In the original plan there is also a category for *Special Messenger Orders*. These are not of great importance, as they are usually swiftly dealt with. Finally, there is *Waiting Time*, the time, exclusive of the lunch hour, during which the assistants are idle. This is obtained by adding the times recorded under the previous headings and subtracting the total from the number of hours worked daily.

To obtain these figures the co-operation of the assistants was necessary. They were asked to record on the counterfoil of the sales-check the selling time and service time, and each was provided with a specially-ruled card on which to note the time spent daily on caring for stock, interviewing, and special messenger orders. Each day a clerk abstracted the details from the check-books and the cards, summarised the figures and worked out the waiting time for each assistant. This clerk also had to get out figures showing the total sales, both cash and credit, the number of items sold, the amount of sales per assistant, and the selling time for specified items.

There were two periods of investigation, each covering the same term, in the years 1925 and 1927. This was for purposes of comparison.

The first figures worked out were those showing the average distribution of an assistant's time. For 1927 this was as follows:—Selling, 42 per cent.; stock care, 17 per cent.; interviews, 8 per cent.; waiting or idle, 33 per cent. There was not a great variation here compared with the 1925 percentages, though selling time increased by 2 per cent., and idle time by the same figure, while stock care decreased by 3 per cent., and time spent on interviews by 1 per cent. These alterations may indicate that the standard of salesmanship had improved, while the reduction in the time occupied in stock care points to better arrangement.

The following figures show the way in which a table of the average time per sale is set out:—

| | 1925. Minutes. | 1927. Minutes. |
|---|---|---|
| Total time:— | | |
| Selling and service .. .. | 4·6 | 4·3 |
| Cash .. .. .. .. | 4·4 | 3·9 |
| Credit .. .. .. .. | 8·0 | 9·9 |
| Selling time alone .. .. | 2·9 | 2·8 |
| Cash .. .. .. .. | 2·8 | 2·6 |
| Credit .. .. .. .. | 5·0 | 6·3 |
| Service time alone .. .. | 1·7 | 1·5 |
| Cash .. .. .. .. | 1·6 | 1·3 |
| Credit .. .. .. .. | 3·0 | 3·6 |

These figures show that with this particular business a credit sale consumed 154 per cent. more time than a cash one.

The assistant's time was analysed in accordance with the definitions laid down, and gave the following results:—

| | 1925. Per cent. | 1927. Per cent. |
|---|---|---|
| Total time of assistant .. | 100 | 100 |
| Selling time .. .. .. | 24 | 26 |
| Cash .. .. .. .. | 22 | 24 |
| Credit .. .. .. .. | 2 | 2 |
| Service time .. .. .. | 14 | 13 |
| Cash .. .. .. .. | 13 | 12 |
| Credit .. .. .. .. | 1 | 1 |
| Total for selling and service .. | 38 | 39 |
| Messenger orders .. .. | 2 | 3 |
| Interviewing .. .. | 9 | 8 |
| Caring for stock .. .. | 20 | 17 |
| Waiting or idle .. .. | 31 | 33 |

The average amount of sale worked out as follows:—

| | 1925. Cents. | 1927. Cents. |
|---|---|---|
| Cash .. .. .. .. | 88 | 85 |
| Credit .. .. .. .. | $5·75 | $5·95 |

The average number of items per sale was found to be:—

| | 1925. | 1927. |
|---|---|---|
| Cash .. .. .. .. | 1·7 | 1·5 |
| Credit .. .. .. .. | 2·1 | 2·0 |

### Cost per Transaction.

The following table shows the cost per transaction for the two periods under review:—

| | 1925. Cents. | 1927. Cents. |
|---|---|---|
| Selling expense .. .. | 2·5 | 2·3 |
| Service expense .. .. | 1·4 | 1·1 |
| Total .. .. .. | 3·9 | 3·4 |
| Non-selling expense .. | 7·3 | 6·6 |
| Grand total .. .. | 11·2 | 10·0 |

The above table does not, however, take into account the factor of value, consequently the following figures are more valuable, as they show the percentage costs of sales expenses on the value of the goods sold:—

| | 1925. Per cent. of sales. | 1927. Per cent. of sales. |
|---|---|---|
| Selling expense .. .. | 2·2 | 2·3 |
| Service expense .. .. | 1·4 | 1·1 |
| Total .. .. .. | 3·6 | 3·4 |
| Non-selling expense .. | 6·7 | 6·6 |
| Grand total .. .. | 10·3 | 10·0 |

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One fact that emerges from this analysis is that, according to the ratio of the value to the time it takes to complete a sale in the business under review, the credit sale appears to be more desirable than the cash one, the former being 60·1 cents as compared with the latter's 21·79 cents. However, with a credit sale a considerable amount of office time is consumed, and there is the chance of a bad debt, which somewhat discounts the apparent superiority of credit business over the cash transaction from the point of view of cost.

This study, which has been compiled by Mr. G. E. Bittner, of the Department of Commerce, goes much more deeply into the subject than is possible here owing to considerations of space. Figures for two separate departments of this business are given, and likewise the selling cost of certain of the articles stocked is set out in different tables. However, the foregoing description should be sufficient to indicate how a system for analysing retail selling costs can be built up in quite a simple manner.

# MECHANICAL STOKERS.

## Development in Multiple Retort Designs.

DURING the past three or four years rapid advances have been made in mechanical stoking, largely because of the formidable competition of pulverised fuel. This applies particularly to the multiple retort stoker, partly also because of the discovery of steel tube water cooled combustion chamber walls, which have benefited mechanical stoking even more than pulverised fuel firing, while boilers up to 300 000 lb. evaporation per hour are now being operated with stokers. Particularly interesting in this connection is the latest design of the " Underfeed Type F " stoker, which has been specially adapted for burning medium coking coals under conditions of high evaporative capacity.

In general it will be remembered the multiple retort stoker has the advantages of no firebrick arches, simplicity of combustion chamber construction, direct radiation of the heat to the boiler tubes, and ease of constructing large units. In the " Underfeed Type F " design, constructed in sizes up to 14-18 retorts for a single unit, there is also a number of further improvements, and in the first place it may be stated the interchangeable retorts are of the stationary variety, 21 in. centre to centre, and inclined downwards at an angle of 20 deg. to the horizontal, while the fuel hopper, common to all retorts, is bolted on the front end of the stoker frame. The charge falls out of the bottom of the hopper in front of slow moving reciprocating rams, one to each retort, which, on withdrawing, uncover apertures for the supply of the coal, and on the forward stroke push the charge into the retort. The drive is by means of connecting rods and crankshafts, operated by short independent shafts through double worm gears, each of which actuates three or four retorts, driven by a chain, or by other suitable means from a main shaft.

One small motor or steam engine operates the whole of the retorts for one boiler, or even a number of boilers, but the driving mechanism is so arranged that each group of coal feed rams can be varied in speed so that the amount of coal supplied to each retort is under accurate control. Further, there is provided a safety shearing pin, with the result that any obstruction in the retort, such as a piece of tramp iron in the coal, important for power station conditions, simply shears the pin and thus cuts out the drive, so that the rams stand idle, and no injury results.

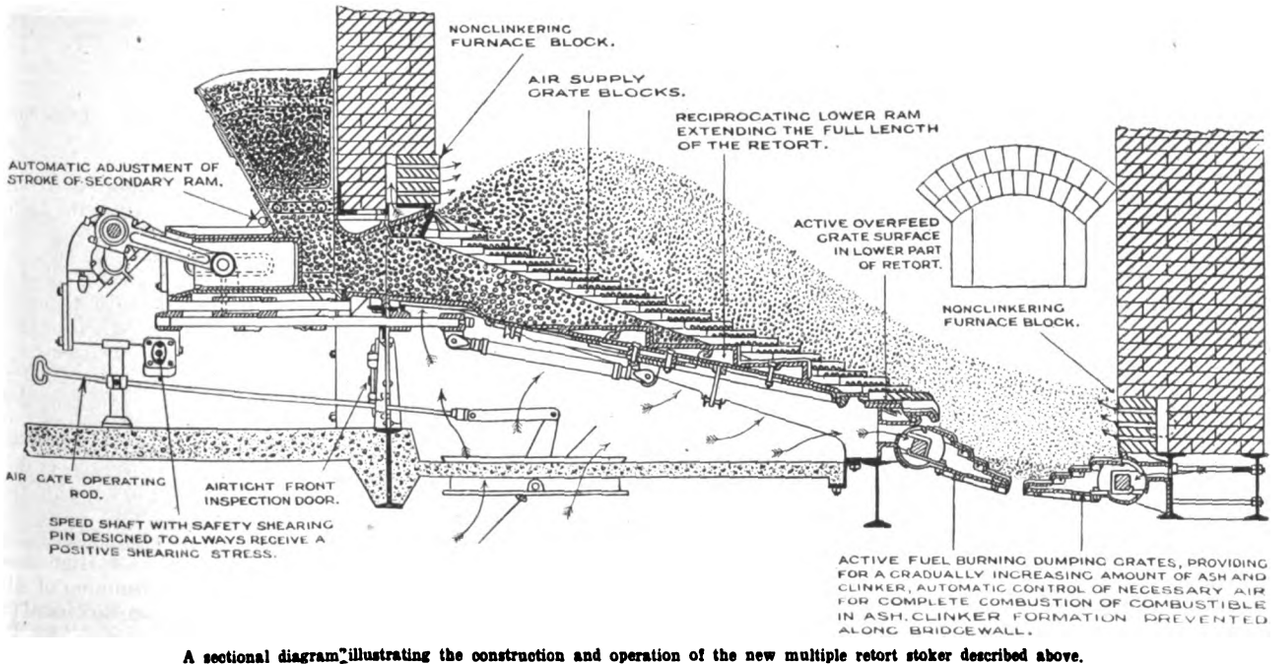
### Auxiliary Pushers.

One important feature of the new type stoker is that in addition to the main feed rams, smaller auxiliary pushers are arranged in the bottom of the retorts to assist in distributing the fuel to the best advantage. The stroke of these lower or auxiliary rams can be adjusted independently of the main rams, and the value of this independent adjustment of the travel of the auxiliary rams is that the depth of the fire in the front or coking part of the retorts may be varied as compared with the back or lower part where the combustion is completed.

Thus, after dumping a charge of ash and clinker, the lower part of the retorts can be very rapidly filled again with fuel by working these auxiliary pushers at full speed for a short time, urging the charge forward at an increased rate. In the same way the auxiliary independent rams are of great practical assistance in starting up the fires quickly after a very long banking period, while the travel of the charge, both coal and clinker, is always positive and quite independent of retort wall friction.

The mechanical forced draught is applied in the usual manner, the air passing from the fan along a duct arranged below the floor to the stoker, while suitable regulation is obtained by varying the speed of the fan as well as by means of dampers. The air passes into the stokers between the retorts, through the " tuyeres " which form the sides of the retorts, the air blast being passed through and over the fire, and the coal coked in the upper part of the retorts, with the coked material consumed in the lower part.

Another good feature in the design is the reduction in the cost of upkeep by the use of a row of hollow furnace blocks placed at the bottom of the front wall of the installation behind the coal hoppers at the entrance to the retorts, and also at the bottom of the back wall, adjacent to the dumping grates. Through these hollow blocks a supply of air is circulated from the forced draught chamber underneath the stoker, which reduces the wear and tear of those parts of the brickwork which are most subject to the heat, whilst at the same time completing the combustion of the gases and resulting in practically no CO. This cooling arrangement has the further




**A sectional diagram illustrating the construction and operation of the new multiple retort stoker described above.**

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advantage of preventing clinker from adhering to the brickwork.

Again, the arrangement of the dumping grates for the ash and clinker is particularly effective, the red hot material, instead of being discharged at once, being allowed gradually to accumulate on these grates, so as to prevent the passage of any excess air, whilst allowing the combustion ample time to be completed at leisure.

In addition, the design of the dumping plates is such that they are adjustable in position and can be raised or lowered, fine ash cannot stop up the air passages, whilst on lowering at intervals, by the operation of suitable levers, for the final discharge of a portion of the material, the air supply is automatically shut off.

For very large installations, or for coals with a high ash content, this arrangement can be replaced with a constant moving rotary automatic clinker grinder, motor driven, which crushes the material and delivers it to the ash hopper in a continuous stream. The stoker is particularly suitable for operating in conjunction with the " Murray-Usco " steel tube water-cooled walls under full pressure in series with the boiler, first used in fact for multiple retort stokers at the Hell Gate Station, New York, and now standard practice in the U.S.A. for pulverised fuel firing and mechanical stokers of all kinds.

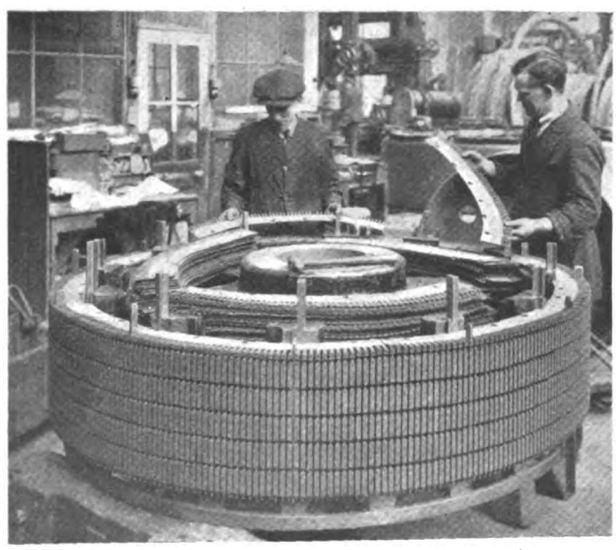
## LARGE INDUCTION MOTORS.

### Rotor Cores with Double Dovetail Taper Keys.

ONE of the most arduous duties for which an electric motor can be used is for the operation of mine winders or hoists, and, in particular, reference may be made to the electric winding equipments installed in the gold mines of the Rand in South Africa. The mines work day and night for seven days a week, and as every trip of the winder involves the reversal of the direction of rotation of the motor at least twice, the necessity for rugged and reliable design is obvious.

In other respects, also, these equipments possess points of interest. In many of the mines the workings are now being carried to such great depths that the winding has to be done in stages, and at the Village Deep Mine there is a 1 100-2 300 H.P. geared a.c. winder installed no less than 6 300 ft. below ground, this being the largest hoist at its depth in the world.

At the Crown Mines there is in operation a geared a.c. winder, the motor for which is rated at 2 160-4 010 H.P. This



A rotor core in process of assembly, showing the double dovetail taper keys.

is the largest of its type in the world, and a duplicate equipment is now being manufactured by the British Thomson-Houston Co., Ltd.

Among other features of construction of the winders mention may be made of a special form of dovetail key which has been evolved by the B.T.-H. Co. for securing the rotor and stator laminations to the spider and stator frame respectively. This key, which is protected by a B.T.-H. patent, is of double dovetail section, divided longitudinally, the division being such as to give each half a wedge shape. The amount of taper on the two halves of the key is designed so that, when driven in, the dovetails are forced tightly against the punchings and spider, thereby eliminating all possibility of tangential or radial movement.

The illustration below shows a rotor core being assembled. The keys are laid in the dovetail slots machined in the spider, and the two halves of each key are slightly slacked back. The segmental core is then built up, drifts being temporarily placed in some slots to ensure correct alignment, and it will be observed that each segmental punching is held to the spider by two double dovetail keys. As the building up progresses, the core is tightly clamped, until finally, with the end flanges in place, it is pulled up tight by clamping bolts arranged outside the core, but close to its inside periphery. At this point the dovetail keys are removed, and a broach shaped to the dovetails is driven through, after which the keys are replaced and driven tightly together.

The length of each half of the key is adjusted so that the thick end projects slightly beyond the thin end within holes provided in the end flanges. Plugs screwed with a fine thread are inserted in the holes in the end flanges, and bear against the large ends of the keys. The plugs are provided with a square shank and lock nut, so that, should it become necessary at any time, they could be screwed further into the flanges, thus tightening up the keys. In addition to the double dovetail keys in the rotor core, pins are tightly driven through holes in both the end flanges and core.

The above construction, using double dovetail tapered keys, is adopted as standard by the B.T.-H. Co. for the rotors of all induction motors having cores built from segmental punchings. In some cases the design is simplified by the omission of the screwed plugs, the keys after being driven into position very tightly are cut off flush and the ends welded, cover plates being fitted over the holes in the end flanges so as to bear against the ends of the keys. Motors embodying this form of construction are in operation on various duties of the most arduous nature, such as driving rolling mills, mine winding equipments, cement mill plant, etc.

## LOOKING BACKWARD.

### Interesting Extracts from Early Volumes of "The Electrician."

FIFTY years ago, in our issue of August 24th, 1878, it was recorded that :—

Mr. John Hollingshead was conducting tests in the Strand, London, with an electric light called the Loutin light.

Mr. Desmond FitzGerald had produced for the first time a general formula for calculating the zinc consumed in a battery under any given electrical conditions.

At the annual meeting of the Gas Light and Coke Co., it was announced that the board saw no prospect of electricity superseding gas for illuminating purposes.

After inspecting the public electric lighting in Paris, Mr. G. H. Stayton, in a report to the Vestry of the Parish of Chelsea, concluded that " at present the electric light is *not* suitable for street lighting in the metropolis ; that it *is* suitable, and can be utilised with splendid effect in large squares and places, such as Trafalgar Square or Parliament Square."

* * *

Twenty-five years ago, as recorded in THE ELECTRICIAN dated August 28th, 1903 :—

The bank rate was 3 per cent.

For Weymouth's electricity supply scheme 137 tenderers sent in about 300 tenders, all of which were within the amounts estimated by the consulting engineers.

The death was announced of Lord Salisbury, one of the few politicians who have taken an active interest in science. He was a member of the Institution of Electrical Engineers.

We exposed the alleged therapeutic use of electricity in finger rings sold by the Anti-Rheu Gem Co., which were said to be constructed " so as to cause a gentle current of electricity to be conveyed to the wearer."

Glasgow Corporation and its Electricity Department were " in the news " as the result of the Deputy Town Clerk's contention that it was impolitic and illegal for an electricity undertaking to set aside a depreciation fund in addition to the sinking fund.

Papers to be read at the British Association meeting at Southport included :—" Protective Devices for High-tension Circuits," by W. B. Woodhouse, " Parallel Running of Alternators," by B. Hopkinson, " Aluminium as an Electrical Conductor," by J. B. C. Kershaw, " Electric Traction," by J. M. Shoolbred, and " The Single-phase Repulsion Motor," by W. Cramp.

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# THE "LONDON ELECTRICAL ENGINEERS."

## Work of the Anti-Aircraft Units in the Aerial Manœuvres—Valuable Co-operation with Defensive Aeroplanes.

ALTHOUGH much of the work of the London Electrical Engineers (Anti-Aircraft Battalions, R.E. (T.A.) during the recent aerial manœuvres over South East England was of a confidential nature which, for obvious reasons cannot be disclosed, it can certainly be said that the high efficiency of these organisations was an important factor in the satisfactory operation of the defence plans.

**Lieut.-Col. M. G. Bland, the officer commanding the 26th A.A. Battalion, R.E. (T.A.)**

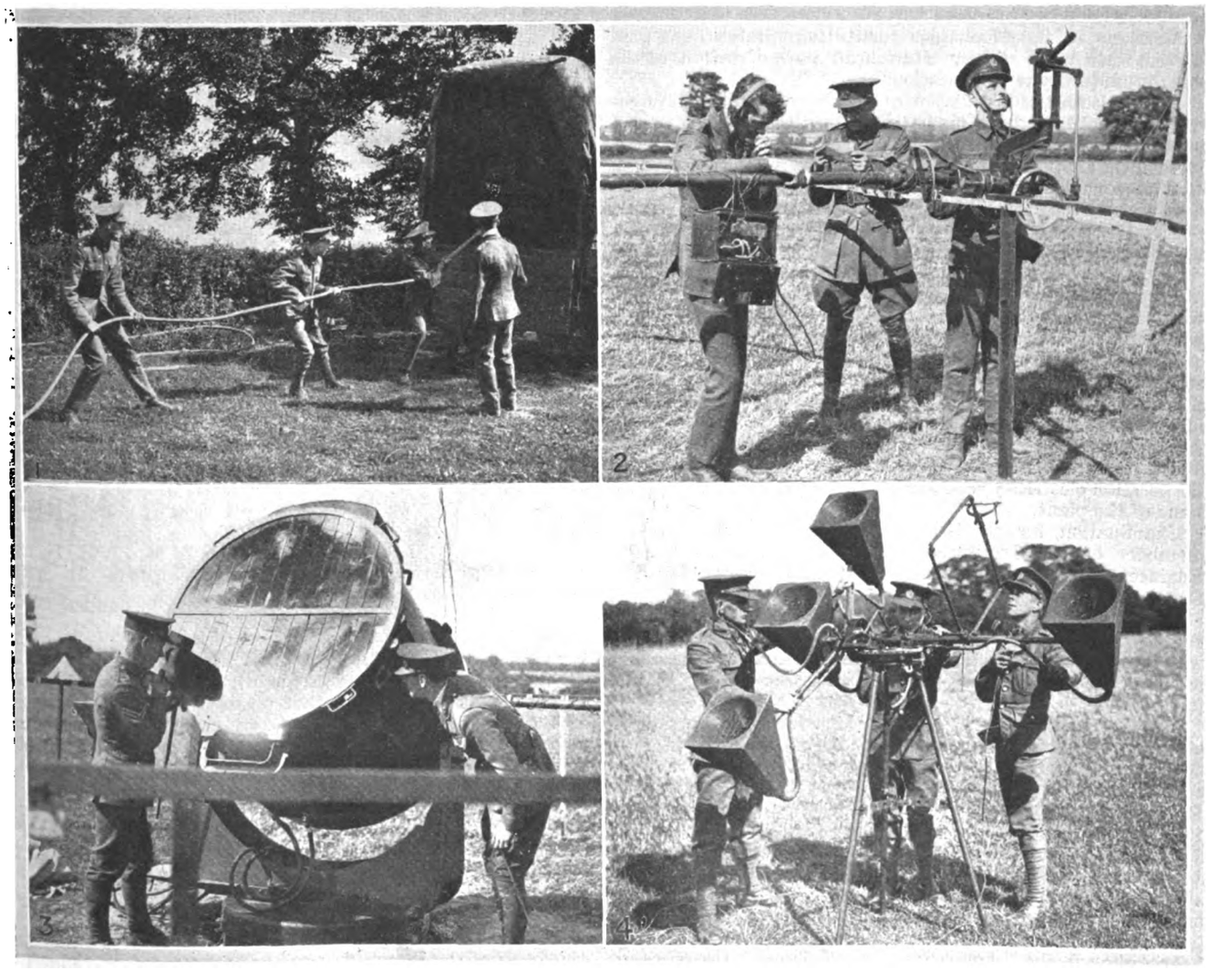
The anti-aircraft force in the recent operations included the 26th and 27th Anti-Aircraft Battalions, R.E. (T.A.), which, between them put approximately 30 searchlights in the field.

About 75 per cent. of the lights used by the 26th Battalion were of the 120 cm pattern, taking 200-210 A at 85 V, the remainder of the lights being of 90 cm. taking 175 A at 80 V. Energy for the majority of the lights was derived from Tilling-Stevens petrol-electric lorries, the supply in other cases coming from generating sets mounted on special tractor-drawn trailers.

The principal duties of the A.A. Battalions, or "Ack Acks" as they are more generally called, include the location of enemy aircraft and their illumination by means of searchlights, and the plotting of the course and determination of the height of such aircraft. To carry out these duties, members of the unit are trained in one or more of the following branches of work:—(I) Operation of searchlights; (II) running of engines and dynamos (petrol-electric lorries, stationary and semi-mobile generating sets); (III) operation of sound-locating instruments; (IV) height finding and track plotting; (V) telephony; (VI) Lewis-gunnery.

Each company is split up for training, and in war, into sub-units, the smallest being the searchlight detachment of 10 men. As sub-units are necessarily self-contained, and are usually detached, it is natural that the happiest results are obtained when all ranks of a sub-unit are united by common interests. It is therefore advantageous to have complete companies, sections, or detachments raised and maintained by individual firms or works. In this connection we may mention that one complete company of the 26th A.A. Battalion is at present officered, manned and accommodated by a single firm; the fact that this firm is a gas undertaking constitutes a slur on the big electrical firms and supply undertakings in London which we should like to see removed.

Some understanding of the work done by the Battalion during the recent aerial manœuvres will be gathered from the accompanying photographs.



*THESE pictures, taken "somewhere in Surrey," during the recent aerial manœuvres, illustrate various phases of the field work of the 26th Anti-Aircraft Battalion, R.E. (T.A.) In them are seen: (1) the men running out cable connecting the searchlight with the lorry-generator; (2) course-plotting and height-finding operations; (3) examining the arc of one of its lights manned by the Battalion during the exercises; and (4) at work with the sound-locating instruments.*

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# NEWS IN BRIEF.

THE Swansea Electricity Committee last week made a tour of their sub-stations.

Suitable showroom premises are being sought by Warrington Electricity Department.

Since 1920 the Canadian production of electricity has increased by 129 per cent.

Electric irons are being used in Germany in work connected with the restoring of old paintings.

Over 200 000 lamps will be used in the Blackpool autumn illuminations, which commence on September 22nd.

The tenth Model Engineers' Exhibition will be opened on September 15th at the Royal Horticultural Hall, London, S.W.

Electrical exports of the United States during May showed an increase of $850 073 over the corresponding period of 1927.

Australia absorbed over 75 per cent. of the total shipments of electric washing machines from the United States during May last.

The appointment of a lady demonstrator, at a salary of £3 a week, has been recommended by Barnsley Electricity Committee.

Members of the Devizes Chamber of Commerce paid a visit last week to the Dorchester Street power station of the Bath Corporation.

## A Diesel Electric Ferry.

A ferry-boat for the Argentine Government, propelled by Diesel electric machinery, was launched from the Yarrow works, Glasgow, on Monday.

By order of the L.C.C., all theatres and cinemas will need to be adequately heated after the end of the year. Electrical appliances will be permitted.

Members of the Mechanics Institution, Stalybridge, paid a visit last week to the Hartshead power station of the Ashton-under-Lyne Corporation.

Proposals for the installation of telephone systems throughout Portugal have been made to the Portuguese Government by the International Telegraph and Telephone Co.

Sheffield Corporation have failed to obtain power providing that persons removing property not belonging to them from Corporation vehicles shall be subject to a penalty.

The Postmaster-General announces that there has been a big demand for calls in the "through" telephone circuit recently provided between Paris-Plage and London.

A large number of electrical manufacturing firms are exhibiting at the Machine Tool and Engineering Exhibition, which will be held at Olympia, London, from September 5th to 22nd.

A special lecture on the Shannon scheme was delivered to students of the Glamorgan Summer Evening School, at Swansea University College, by Prof. F. Bacon, on Wednesday of last week.

The heavy downpour of rain on Sunday caused slight dislocation at Accrington, water entering the basement of the Corporation electricity works in Hyndburn Road and stopping some of the plant.

Examination for admission as Graduates and Associate members of the Institution of Heating and Ventilating Engineers are held at suitable centres in January, May and September of each year.

Sheffield Electricity Committee have authorised the electrical engineer to purchase a further 200 tons of electrolytic copper wire bars to be used in the manufacture of cables, as and when required, at or about the present market price of £69 5s. per ton.

The Guernsey States Telephone Department has arranged a service by which subscribers may be informed of the first definite news of the mail boats' approximate time of arrival, a special wireless receiver having been installed at White Rock for this purpose.

In order to determine the most suitable system for the electric lighting of new schools, Hull Education Committee have decided that various firms should be permitted to fit up rooms at the Boulevard Secondary School to demonstrate the methods they consider most suitable for classroom illumination.

According to the "Australian Electric Times," the Minister in Charge of Electrical Undertakings in the State of Victoria has announced a proposal of the State Electricity Commission to sell to the public domestic electrical appliances "at cost" and on deferred payment terms. This proposal is being met with strenuous opposition.

# PERSONAL.

THE marriage was solemnised on August 2nd, at St. John's Church, Burslem, of Mr. Leonard Wilcox and Miss Mary A. Lane.

Mr. A. Hall-Brown, of Babcock and Wilcox, Ltd., has joined the board of directors of Clayton and Shuttleworth, Ltd., of Lincoln.

At a meeting of the Bury St. Edmund's Town Council on Thursday of last week, Mr. Alfred E. Knights was appointed borough electrical engineer, in succession to Mr. S. E. Day.

Estate of the gross value of £8 676, with net personalty £6 768, was left by the late Capt. Lewis Hoad, master of the cable ship "Telconia" of the Telegraph Construction and Maintenance Co., Ltd.

Mr. W. H. Lynas, late managing director of Graham Amplion Ltd., has joined the board of Burndept Wireless, Ltd. Lt.-Col. A. F. Simpson, late deputy managing director of Marconi's Wireless Telegraph Co., Ltd., has also joined the board.

Mr. Frank Pick, managing director of the London Underground Railways, who has just been appointed a member of the Police Commission, arrived at Southampton on Sunday by the White Star liner "Olympic" from New York, where he has been studying traffic conditions.

Mr. Arthur Cherry, of Hindhead, Haslemere, who has since 1908 been managing director and secretary of the Hindhead and District Electric Light Co., Ltd., which undertaking has been taken over by the Aldershot Gas, Water and District Lighting Co., left on August 17th for Auckland, New Zealand, where he intends to settle.

The marriage of Mr. R. R. Robson, only son of Mr. W. Robson, electrical engineer, Docks and Marine Department, Newhaven Harbour, and Miss M. Ware, was solemnised on August 11th at the Parish Church, Newhaven. The bridegroom received a case of carvers and a case of stainless dinner knives from his colleagues at the Newhaven Harbour power station.

At the monthly meeting of the Executive Committee of the Municipal Tramways Association in London on August 3rd, Mr. W. Chamberlain, general manager of Leeds Corporation Tramways, and formerly of Oldham, was entertained to luncheon at the Arundel Hotel in honour of his appointment as general manager of Belfast Tramways. The chair was occupied by Alderman Bowes, President of the Association. Mr. Chamberlain will assume the Presidency at the Manchester Conference next month.

## Obituary.

MR. F. EASTWOOD, aged 44 years. He was formerly in business at Nelson as an electrician.

MRS. S. G. MARSTON, on August 16th, after undergoing an operation. She was the wife of Mr. S. G. Marston, borough electrical engineer of Stockton-on-Tees.

DR. CHARLES CHREE, F.R.S., on August 12th, aged 68 years. He was superintendent of the Kew Observatory from 1893 to 1925 and a leading authority upon terrestrial magnetism, atmospheric electricity and related subjects.

MR. J. O. TUCKER, on August 13th, aged 93 years. He was the father of the late Mr. J. H. Tucker, founder of J. H. Tucker and Co., Ltd., and grandfather of Mr. J. B. Tucker, present joint managing director of the company. The interment took place on Wednesday of last week, at Yardley Cemetery.

MR. REDFERN KELLY, on August 18th, aged 83 years. For a period of 20 years he was chief assistant engineer of the Belfast Harbour Board, subsequently becoming chief engineer in 1904. He retired from that position in 1914. Among the undertakings which he carried out may be mentioned the laying of the electric tramway along Queen's Road, arrangements for the erection of the 120-ton electric derrick crane in the harbour, and a number of tramway developments.

MR. HENRI TUDOR, aged 69 years. Mr. Tudor became interested in the early 'eighties in the practical use of accumulators. His first invention, perfected in 1885, consisted of the application of lead oxide to a pure lead plate which had received a partial Planté formation, thus obtaining the full capacity at once without complete formation. In 1892, he increased the surface of the positive plates, so as to reduce the thickness of the Planté formation; subsequent developments were on the same lines, and also led to more rapid processes of formation. For the last 15 years Mr. Tudor was an invalid as a result of his work with lead, but though he suffered considerably, he retained his interest in the development of the accumulator to the end.

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# TRANSFORMER SHIPMENT.

## Shipping Units in Nitrogen to Reduce Weight.

THE shipment of a 25 000 kVA, 110 000 V three-phase 60-cycle transformer from the Sharon, Pa., works of the Westinghouse Electric and Manufacturing Company to the Oakland, Cal., sub-station of the Great Western Power Company was, according to "The Times" Trade Engineering Supplement, recently accomplished in an unusual way, the completely assembled transformer being shipped in an atmosphere of nitrogen under pressure instead of in oil. The use of an atmosphere of nitrogen above the oil of power transformers while they are in service has become a well-established practice in the last few years. The nitrogen preserves the oil in good condition by keeping the oxygen away from its surface and also provides a gas cushion above the oil to absorb the force of any sudden rise of pressure. In the shipment of this transformer nitrogen was used in a different manner, since no oil was shipped. By the use of nitrogen the usual drying out process at the receiving end was eliminated, and the shipping weight was reduced by 65 000 lb. The transformer could not have been handled at the receiving end if the additional weight of oil had been present and had it been shipped without oil and without the use of nitrogen a drying out process at Oakland would have been necessary, involving delay and expense. Before being shipped the transformer was thoroughly dried and tested. The cover was bolted in place and dry nitrogen was blown through until the oxygen content of the gas in the tank was reduced to 1 per cent. Additional nitrogen was introduced until the pressure inside the case amounted to 2·95 lb. per sq. in. at 15 deg. C. By the use of this initial pressure in the tank it was expected that the transformer could be shipped without fear of leakage of air or moisture from the outside into the tank, any slight leaks being in the opposite direction on account of the pressure. As an additional precaution a bag of calcium chloride was placed in the tank for the purpose of taking up moisture if any unexpected leak did occur, and also of indicating to the men who opened the transformer at its destination whether any moisture had entered the tank. Tests made after the arrival of the transformer at Oakland showed that the pressure in the tank was 1·50 lb. per sq. in. at a temperature of 15 deg. C., while the oxygen content was 1·8 per cent. The tank was then opened, and the calcium chloride was found to be perfectly dry. It was therefore decided that the shipment had been successful, and the transformer was filled with dry oil and placed in service.

# CANADIAN HYDRO-ELECTRIC PLANT.

## Further Development of Water Power Units in Quebec and New Brunswick.

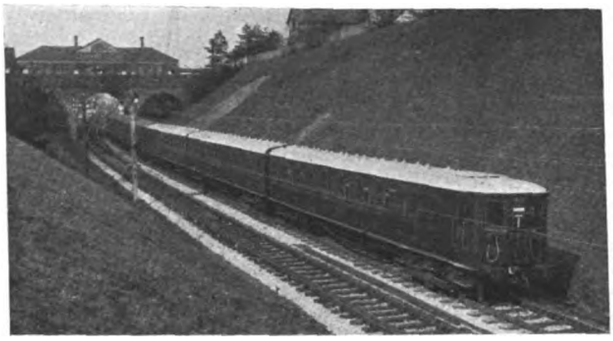
THE starting of the first generators in the Paugan, Quebec, hydro-electric plant of the Gatineau Power Co., and the approaching completion of the Grand Falls, New Brunswick, and Kent's Falls, New York, hydro-electric developments draw attention to the great quantity of power which the International Paper Co. has developed and under construction. In the United States, Canada and Newfoundland this company and its subsidiaries now have 913 100 H.P. already developed and in process of construction nearing completion. An idea of the size of this power may be had from the fact that it is three and a half times the developed capacity of the Muscle Shoals project and over 60 per cent. greater than the developed power on the American side of Niagara Falls. Of the 913 100 H.P. of the company, 436 000 H.P. is on the Gatineau River, in the Province of Quebec, in the hydro-electric plants of Gatineau Power Co.; 126 600 H.P. is in the developments of Gatineau Power Co. on the Ottawa River and its tributaries. The Grand Falls, New Brunswick, station of Saint John River Power Co. will have 80 000 H.P. International Power and Paper Co. of Newfoundland has a hydro-electric plant at Deer Lake generating 98 000 H.P., while in the United States the International Paper Co. has hydro-electric plants on the Hudson, Saranac and Connecticut Rivers of a combined capacity of 62 500 H.P.

Oldham Corporation Electricity Committee have approved the plans showing the various mains proposed to be laid for the purpose of connecting the new power station with the existing distributing system.

# RAILWAY CONTRACTS.

## Some Recent Orders for the "Southern" and "Sydney" Systems.

FOLLOWING on the order recently received by the Metropolitan-Vickers Electrical Co., Ltd. for thirty motor coaches completely equipped, and other equipment for the Metropolitan Railway, the same company has now received two



A "Southern" six-coach train incorporating Metro-vick traction equipment.

more orders for electric railway equipment for the Southern Railway and the Sydney (N.S.W.) Suburban Railways. The contract for the Southern Railway is for seventy-two motor coach equipments and fifty-eight trailer coach equipments. The electric trains used on the Southern Railway suburban system are made up of train units each consisting of two motor coaches with a trailer coach between. Trains consisting of one, two or three of these units, or eight-coach trains consisting of two-train units with two trailer coaches between, are used as required. The new equipment is required in connection with the conversion of part of the central section (late L.B.S.C.R.) of the suburban system from single-phase a.c. operation with overhead line to d.c. operation with third rail. The greater part of the conversion is now completed, the lines still remaining on the old system being from Victoria to Sutton and Coulsdon via Streatham Common and via Crystal Palace. The present contract is the fifth which has been placed with the Metropolitan-Vickers Electrical Co. for train equipments for the Southern Railway. The last contract, placed in December 1926, was for 116 three-coach trains and 47 two-coach trailer units.

The new equipment will be similar to that supplied on the previous contracts. Each motor coach will be equipped with two 275 H.P. motors of the totally enclosed, self-ventilating type. The motors are arranged in pairs on the bogies underneath the driving compartments at the two ends of the train unit. The control gear is of the Metropolitan-Vickers all-electric type, with automatic acceleration.

For the Sydney Suburban Railways of New South Wales, one hundred motor coach equipments and one hundred trailer coach equipments are to be supplied. The motors, two for each motor coach, are units of 360 H.P. The electrification scheme of the Sydney Suburban Railways will ultimately involve more than 400 miles of track and is bound up with the new bridge now being built across Sydney Harbour, for one of the most important railway extensions is a new section of line which will pass over the new bridge, forming a direct route from Sydney City to the North. The present contract is the fourth placed with the Metropolitan-Vickers Electrical Co. for coach equipments and will bring the total of Metrovick-equipped coaches on this railway to more than 450 of each type.

The whole of the electrical equipment for the Metropolitan Railway and Southern Railway contracts and the greater part of the equipment for the Sydney contract, will be manufactured at the works at Trafford Park and Sheffield. The remainder of the equipment for the Sydney railway contract will be manufactured at the Metropolitan-Vickers works at Sydney.

At King's College, London, in the Faculty of Engineering, complete courses of study are provided in civil, mechanical, and electrical engineering for the engineering degrees of the University of London, and for the certificate and diploma of the College. Considerable extensions have been made in the engineering department. Full information from the Secretary, King's College, Strand, London, W.C.2.

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# SELLING LINES.

## New Apparatus and Valves—A Double Suspension Loud-Speaker.

WE have received from the Marconiphone Co., Ltd., particulars of a new moving coil loud-speaker employing double suspension. This, it is claimed, while giving considerable freedom axially and absolute freedom from side play, assures parallel movement of the coil at all times. Resonances due to suspensory material are eliminated. The edge of the cone is unrestricted but carries a light ring of felt which prevents circulation of the air waves from one side of the diaphragm to the other. Considerable experiment has led to the determination of the exact relative thickness and stiffness of webs and cone for the most even response to all frequencies, the effect being to prevent the " boominess " which so often mars moving coil instruments. Extreme motion of the diaphragm is possible owing to its full suspension, and with a suitable amplifier it is claimed that this speaker will give considerable volume. At the same time the high sensitivity renders it suitable for use with an average receiver employing in the last stage a standard power valve such as a D.E.P. 240 or D.E.5A with 120 V h.t., sufficient strength for an average room being obtainable without overloading. Owing to the parallel motion of the moving coil an unusually small air gap is used, effecting a reduction in the size and weight of the electro-magnet, with an accompanying economy of field current consumption. These loud-speakers are supplied in complete cabinet form or as bare units for home assembly. The cabinets, obtainable in oak or mahogany, are constructed to prevent vibration and are provided with ornamental grilles so placed as to eliminate box resonances. Three models are available, the first for use with a 6 to 10 V accumulator and consuming 0·6 to 1 A. This is recommended where electricity supply mains are either not available or may not be used for the field supply. Alternating and direct current mains models consuming approximately 100 mA are also supplied. The former contains a special rectifying unit and valve, with a transformer tapped for supplies of 100-120 or 200-240 V.

### New Valves.

A new S215 valve, as it will be called, to which the same principle as the S625 screened grid valve is applied, will be added to the Marconi-Osram series in September. An important point however, is that the construction and appearance of this new valve differ from those of the 6 V type in that the new S215 2V series is fitted with a standard 4-pin cap and a small terminal on the top of the glass bulb. It will be remembered that the S625 was fitted with the control-grid and filament pins at one end of the valve, and the screen grid and anode pins at the other end. For various reasons, an equivalent design has not been found practicable for the 2 V valve, but otherwise the advantage of a double-ended valve is retained by keeping the anode of the valve at the end remote from the grid. The screen grid itself is connected to what is usually the anode pin on the base, and by means of a special internal construction, the screen grid forms a complete electro-static screen, which is built up close to the glass bulb inside and can be extended to the outside of the valve by means of the screen in the set, in a manner similar to that employed for the S625. If this form of construction is adopted, a considerable improvement in " mutual conductance " is effected. It must be pointed out, however, that if " feed-back " and self-oscillation are to be avoided, it is necessary to have more careful screening, particularly if two stages of h.f. amplification are used. A feature of the S215 is that the bulb diameter at the screen is the same as with the S625. This obviates the necessity for any alteration in screen fittings when changing from 6 V to 2 V valves in single stage h.f. amplifiers, and in adequately screened two-stage h.f. amplifiers.

The introduction of a screening grid, though giving low self-capacity, and small output in current fluctuations, also affords an opportunity for increasing the amplification factor, whilst at the same time retaining a high value of " mutual conductance." The next step obviously, is to produce some similar type of valve for use in the l.f. amplifying side of the receiver, possessing characteristics which provide a large current fluctuation output, with a capacity of standing a reasonable input on to the grid. The reduction of self-capacity is not, of course, in this case so important. Such a valve called the " Pentode " valve will also shortly be added to the Marconi-Osram range. It was found when producing such a valve that the introduction of a third grid between the screen grid and the anode had the effect of increasing the working range in undistorted output ; and since in this case the self-capacity is not such an important feature, there is no necessity for the anode connection to be brought out to the end of the bulb ; in the " Pentode " valve this is joined to the anode pin in a 4-pin base in the usual manner. The screen grid is connected to a small terminal in the side of the base, and the additional grid, which is introduced purely for the sake of changing the h.f. screen grid valve into one for l.f., is joined internally to the filament. The introduction of the Pentode 235 into any set is consequently a simple matter, as it merely requires to be plugged into the socket of the last valve with a separate lead between the small terminal on the base and the positive of the h.t. battery. If distortionless results are required care must be taken that the input to the valve does not exceed its available grid swing, which is about the same as for the DEP. 215. Further, if used in the last stage of circuits using two stages of l.f. it is desirable to apply some form of volume control so as to restrict the input on loud signals from the local station. As is implied in its nomenclature, the Pentode 235 consumes 0·35 A at 2 V, and under normal working conditions the anode current drawn from the h.t. battery, is about 10 mA.

By using a specially chosen material other than wood and metal, Goodworks, Ltd., of Retreat Place, Homerton, London, E.9, have developed a wide selection of table standards. The colours from which to choose include such shades as jade, amber, amethyst, etc., these being arranged in multi-coloured and single-coloured units. Other standards are treated in ivory by itself or with sections of colour. The chairman of the company is considered to be an expert in ivory and ivory working, and his technical knowledge, combined with his artistic qualifications, assisted by a skilled and enthusiastic staff, are developing a range of exceedingly attractive fittings which formerly was supplied by foreign manufacturers. A more intimate description will be given later.

Among the new products of Harlie Bros. is a very robust slow-motion dial. The drive is positive instead of frictional, and consists of a large toothed wheel of moulded material turned by a small brass pinion. The gears are kept firmly in mesh by the pressure from the bow springs, and the reduction is 12 to 1.

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# LEGAL INTELLIGENCE.

## Alleged Infringement of B.T.-H. Patents.

IN the Vacation Court on Wednesday of last week, Mr. Justice Charles had before him a motion to continue until the trial of the action or further order an *ex parte* injunction obtained by the British Thomson-Houston Co., Ltd., restraining J. Solomon and Sons and S. Solomon from infringing plaintiffs' patent for gasfilled lamps.

It was alleged that J. Solomon and Sons were selling as principals and S. Solomon as their agent gasfilled lamps that were manufactured in infringement of the plaintiffs' patent.

Mr. J. Solomon, who appeared in person, admitted that he had not entered an appearance to the writ but declared that his lamps were not an infringement of any patent. Mr. S. Solomon was carrying on an entirely different business and was not his agent.

His Lordship : There will be an injunction until the trial of the action or further order restraining you from dealing with these lamps, and the matter will then be tried and decided, and if it turns out that you are right I make an order that the plaintiffs are liable to you in damages because of the injunction granted against you.

### Damaged Telegraph Poles.

At Portsmouth County Court on August 10th, the Postmaster-General claimed damages from William Latter, licensee of the King's Head, Wickham, for injury to telegraph wires consequent upon a fire at his premises in October last, caused by the defendant falling on the stairs while carrying a paraffin lamp. The heat from the fire reached the telegraph wires in front of the defendant's premises. It was contended that the lamp was dangerous.

The Judge said that if the Act applying to the case did not protect a man when simply carrying an ordinary lamp, it seemed to him to be a farce. He dismissed the action with costs, but gave leave to appeal.

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# TECHNICAL ADVISERS.

## Consulting Engineers' Letter to London and Home Counties Joint Authority.

THE Committee of the Association of Consulting Engineers have addressed a letter to the London and Home Counties Joint Electricity Authority expressing regret that the Joint Electricity Authority, desirous of obtaining technical advice, proposes to retain the services of Mr. F. W. Purse, electrical engineer and manager of the West Ham Corporation, assisted by a panel of other Corporation engineers, to advise upon various matters, such as the proposed transfer of purchase rights from Local Authorities to the Joint Authority, and the re-arrangement of electricity distribution areas; the proposed co-ordination of the generating sources and main transmission lines of Local Authorities within the Authority's district; the consideration of proposals relating to the erection of new stations, the extension of existing stations, the construction of main transmission lines, and bulk supplies; the investigation into questions relating to electricity charges, and provisions of supplies, and technical matters arising from time to time. The Committee believe that previous to the appointment of Mr. S. J. Watson, as chief engineer, the Authority retained the services of Mr. J. H. Rider, and express surprise that in the present instance the Authority should seek to retain as its consultant an official who is closely identified with one branch of municipal electricity supply.

It appears to the Committee to be wrong in principle for public bodies to retain as their consultants officials of other public authorities; from the nature of their ordinary employment, such engineers, it is held, can hardly be expected to take the same unbiased view that is to be expected from a consultant who operates in a much wider sphere of work, particularly when a consulting engineer is required to advise a Board composed of a number of authorities, where professional perspective is required as well as technical experience.

The Committee express the hope, therefore, that on further consideration the Authority will not proceed with the suggested appointment, but when expert assistance is required will retain the services of some well-known consultant fully familiar with the questions under consideration.

# BUSINESS ITEMS.

THE Liverpool offices of the Nox Electric Lamp Co., Ltd., have been removed to Lucerne Buildings, 3, Redcross St.

A. J. Coleman and Co., electrical and radio wholesalers, of Northampton, have removed their business to 37 and 39, The Arcade.

Phillips Lamps, Ltd., have removed their West of England centre to 16, Temple Street, Bristol (Telephone: Bristol 4907-4908).

Showler, Ltd., radio engineers, of Commercial Road, Tunbridge Wells, have opened additional premises at Croham Road, Crowborough.

The Cape Town Branch of the British General Electric Co., Ltd., has removed from 83-89, Castle Street, to the corner of Lower Berg and Riebeek Street.

A fire at Messrs. Cowtans and Wilkings, of London Street, Reading, destroyed valuable wireless apparatus and batteries. The outbreak was confined to the basement, used as a battery charging room.

At a window dressing competition held at Bolsover (Derbyshire), the prize for the best display by electricians was awarded to Mr. A. Brayshaw, and that for wireless goods to Mr. A. Leaning.

International Combustion, Ltd., announce that their American company. International Combustion Engineering Corporation of New York, has been awarded a contract for the world's largest boilers, in that the New York Edison Company has placed an order for four complete steam generating units, each of which is guaranteed to produce 550 000 lb. of steam per hour on normal load, with an overload capacity of 800 000 lb. per hour. The boilers will be of the double Ladd type, and will be designed for a maximum pressure of 500 lb. and and operating pressure of 425 lb. The furnaces will be equipped with C-E fin tubes, C-E fin tube arch screens, Lopulco water screens, Lopulco (couch type) burners, and Lopulco type R feeders. Eight C-E air pre-heaters will be installed. The pulverising plant will consist of six Raymond super mills, all of which will be equipped for air drying in the mills themselves, and will have sufficient capacity to meet the requirements of the six existing boiler units and the four new units.

# TRADE PUBLICATIONS.

A supplement to list No. 40 dealing with thermostats has been issued by Venner Time Switches, Ltd.

British Insulated Cables, Ltd., have issued publication P. 226, dealing with 11 000 to 13 000 V cables.

The Radio Communication Co., Ltd., have published List P/628, describing their marine ½ kW. c/w-i/c/w valve installation.

Campbell and Isherwood, Ltd., have sent us List E.P.T. 8, illustrating and describing their latest range of portable electric grinders.

Leaflets V.T. 31 and 32 describing S.W. 3 and S.W. 1 valves respectively have been issued by the Mullard Wireless Service Co., Ltd.

British Insulated Cables Ltd., have replaced their publication P.207 with a new edition P.239, dealing with paper insulated cables.

The current issue of the "B. E. N. Bulletin," published by B. E. N. Patents, Ltd., includes a specimen of a new list of users of their Myer's car washers.

Book 5, section I/C, dealing with the "Pul-Syn-Etec" system of electric impulse clocks and time discipline apparatus, has been published by Gent and Co., Ltd.

"The Flexibility of Plain Pipes" is the subject dealt with in Circular No. 1 440/9/1, issued by the Metropolitan-Vickers Electrical Co., Ltd. The author is J. R. Finniecome.

## Special Lighting Equipment.

Among the latest publications by Kortung and Mathiesen Electrical, Ltd., is an illustrated price list of their various lighting equipment for film and photographic studios.

Vol IV., No. 7 of the "Siemens Schuckert Review" has been received. This issue contains, among other articles, a description of the new machine glass works at Siemensstadt.

Sulzer Bros. have sent us their latest catalogue of Diesel engines, the reference being L. 31e/vi/1928. The issue is illustrated throughout, and is comprised of 84 large pages.

Dynamo brushes, showing various types of pigtails to suit all special requirements, are dealt with in a new booklet sent to us by the Electrical Equipment and Carbon Co., Ltd.

The latest publications of the British Thomson-Houston Co., Ltd., are lists No. 4506 describing oxide film lightning arresters—cell type for a.c. circuits, and No. 5185 dealing with unbreakable grid resistances, type R.g.

The Fuller Accumulator Co. (1926), Ltd., have issued a list showing a revised and up-to-date range of starting and lighting, motor cycle and 'bus batteries in moulded ebonite containers. The number of the list is 102P.

The first issue of a new publication entitled "The Mond Nickel Bulletin" has been received from the Research and Development Department of the Mond Nickel Co., Ltd. The issue contains a number of abstracts and references.

No. 2 of the "Sulzer Technical Review" contains a full description of the single-acting Sulzer two-cycle marine Diesel engine in comparison with some others single- and double-acting four- and two-cycle marine Diesel engines.

The August issue of the "Osram G.E.C. Bulletin" contains articles dealing with the Public Lighting Engineers' Conference at Sheffield, the E.C.A. Conference at Cheltenham, the Exhibition at Aylesbury, and a number of other descriptive contributions.

One method of speeding up the movement of materials and goods in a factory is dealt with in a new book published by Herbert Morris, Ltd.; it is interesting to note that all the illustrations are reproduced from photographs taken in a variety of works.

The London Electric Stores, Ltd., have sent us their latest catalogue of electrical apparatus and material for domestic and industrial purposes. The book contains 200 pages, including both a general and sectional index, while the publication is illustrated throughout.

The electrical equipment at the Appleby Iron Co.'s works is dealt with in a special publication just issued by the Metropolitan-Vickers Electrical Co., Ltd. The reference of the issue is No. 790/6-1, while the contents give an intimate account of the technical requirements and details.

J. Blakeborough and Sons, Ltd., have recently developed the fire appliances side of their business, and have issued an interesting series of folders describing the Nuswift range of chemical fire extinguishers. These machines are of three main types; soda acid, foam and a quart size machine for use on cars and commercial vehicles containing a carbon tetrachloride solution.

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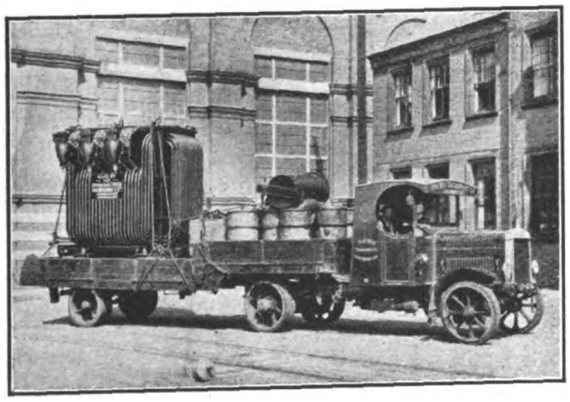
# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BOSTON BOARD OF GUARDIANS.—Installing electric light in the infirmary and chapel. Particulars from the Clerk.

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—Supply and delivery of paper insulated, lead sheathed and armoured cables. Supply and delivery of d.c. house service meters for twelve months. Particulars from Mr. H. Large, borough electrical engineer, Edwards Lane, Newington, N.16.



*A 2 500 kVA three-phase 31 040/10 480 V transformer manufactured by the Brush Electrical Engineering Co., Ltd., leaving their works at Loughborough for delivery to the Yorkshire Electric Power Co. For convenience of transport the oil was conveyed in drums, and the total weight of the load exceeded 20 tons.*

BIRMINGHAM ASYLUMS COMMITTEE, August 25th.—Electric lighting and power installation at Winson Green Mental Hospital, Lodge Road, Birmingham. Specification, etc., from City Engineer, Council House, Birmingham; deposit £5.

HARROGATE CORPORATION, August 25th.—Supply of two 2 500 kVA transformers and supply and erection of 11 000 V switchgear and 30-ton travelling crane. Specification from Borough Electrical Engineer.

HACKNEY (LONDON) BOARD OF GUARDIANS, August 29th. For the installation of an automatic telephone and fire alarm system at the branch institution and separate school at Brentwood, Essex. Specifications, etc., from Mr. E. W. Harbour, 2, Sidney Road, Homerton, London, E.9.

BRISTOL GUARDIANS, August 30th.—Supply of electrical fittings for six months. Particulars from the clerk, Mr. Thomas S. Lamb, St. Peter's Hospital, Bristol.

BAGULEY SANATORIUM (TIMPERLEY), August 31st.—To supply, deliver, erect and connect up to main board in engine room, and switchboards, three twin V.I.R. taped lead covered, steel tape armoured and jute served, 600 megohms, grade cable. Specification, etc., from the Sanatorium, by appointment.

MANCHESTER CORPORATION, August 31st.—Supply and placing in position at various sub-stations, of eight 250 kVA, eight 500 kVA, and two 125 kVA static transformers. Specification (No. 225). etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ROCHDALE CORPORATION, August 31st.—For supply of 500 electric wash boilers to be taken over a period of 12 months. Specifications, etc., from the Engineer and Manager, Electricity Works, Dane Street, Rochdale.

SALFORD BOARD OF GUARDIANS, August 31st.—Lighting and power supply to garage and east end rooms of the Eccles New Road Institution. Specification, etc., from Mr. E. H. Inchley, Poor Law Offices, Eccles New Road, Salford.

STANDING JOINT COMMITTEE FOR DEVON, September 1st.—Supply of police accoutrements for three years, including electric lamps. Tender forms, etc., from the Chief Constable of Devon, Exeter.

LLANTARNAM URBAN DISTRICT COUNCIL, September 3rd.—(1) High and low-tension switchgear; (2) transformers; and (3) overhead and underground mains. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

COMMISSIONERS OF H.M. WORKS, September 4th.—Supply of electrical and mechanical labour with daywork at Cardiff. Forms of tender, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1.

LLANDUDNO URBAN DISTRICT COUNCIL, September 4th.—Supply, delivery, supervision, of laying and complete jointing of e.h.t. and l.t. cables, cubicles, transformers and unit type feeder pillars. Specifications, etc., from the Electrical Engineer, Electricity Works, Llandudno.

RHONDDA URBAN DISTRICT COUNCIL, September 4th.—Supply and delivery of one 150 kVA three-phase, static transformer, 3 500/414 V, 25 cycles; one 150 kVA three phase static transformer, 11 000/414 V., 25 cycles. Specifications and form of tender from Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

ST. PANCRAS (LONDON) BOROUGH COUNCIL, September 4th.—Supply and erection of 15 000 kW generator, condenser and auxiliaries, at King's Road generating station. Specification, etc., from Electricity Offices, 57, Pratt Street, London, N.W.1; deposit £1.

TORQUAY CORPORATION, September 4th.—Supply and erection of electric decorative strip lighting in the Town Hall ball room. Specification, etc., from Mr. Herbert A. Hield, Town Hall, Torquay.

CROYDON (LONDON) BOARD OF GUARDIANS, September 6th.—Electrical fittings and appliances for six months. Forms of tender, etc., from the Clerk to the Guardians.

STEPNEY (LONDON) GUARDIANS, September 6th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1. Stamped addressed envelope to be sent.

BOROUGH OF COLCHESTER MENTAL HOSPITALS, September 8th. For the supply, delivery and erection of electric cables, conduits and contact gear at Brentwood Mental Hospital. Specifications, etc., from Mr. H. H. Gepp, Essex and Colchester Mental Hospital, Chelmsford; deposit, £2 2s.

DEWSBURY BOARD OF GUARDIANS, September 11th.—Electrical work at new casual wards at Staincliffe. Particulars from the architects, Messrs. W. Hanstock and Son, Branch Road, Batley.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of two water tube boilers having normal evaporative capacity of 260 lb. per sq. in. Specifications, etc., from City Electrical Engineer; deposit £2.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of one secondary battery with storage capacity of 1 200 A for a normal pressure of 100 V. Specifications, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

BATH, CLUTTON, MIDSOMER NORTON AND RADSTOCK JOINT HOSPITAL COMMITTEE, September 17th.—Installing electric light at a new isolation hospital at Paulton, near Bristol. Particulars from the architect, Mr. A. J. Pictor, 14, Queen's Square, Bath.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2.; deposit £2 2s.

## Overseas.

UNLESS otherwise stated particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35 Old Queen Street, Westminster, London, S.W.1.

[*Note.—An asterisk denotes that local representation is, in practice, essential.*]

VICTORIAN RAILWAYS, August 29th.—Supply and delivery of private automatic telephone exchange. (Reference B.X. 4 652.)

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JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 1 000 kVA and 250 kVA transformers. (Contract No. 8). (Reference B.X. 4 618.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of six 10 kVA induction voltage regulators for 400/200 V supply (contract No. 4). (Reference B.X. 4 617.)

JOHANNESBURG MUNICIPALITY, August 30th.—Supply of 700 tons of steel tramway rails, 2 000 pairs of fish plates, 5 000 steel tiebars and 12 manganese steel leg crossings (contract No. 13). (Reference A.X. 6 632.*)

LOURENÇO MARQUES PORT AND RAILWAYS ADMINISTRATION, August 30th.—Supply of electrolytic copper cable, rubber insulated copper wire and other similar material. (Reference B.X. 4 565.)

CAPE TOWN CITY COUNCIL, August 31st.—For supply and delivery of 29 300 yards of multi-core, paper insulated, lead covered cables. (Reference B.X. 4 633.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd. —Supply of 155 000 metres of rubber insulated cord for indoor installations. (Reference B.X. 4 590.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd. —Supply of 155 000 metres of rubber insulated cable. Reference A.X. 6 538.)

## Switchgear for Australia.

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21). Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

CAPE TOWN MUNICIPALITY, September 4th.—Supply of 1 000 kW converter set (specification No. 427/1928). (Reference B.X. 4 604.)

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

ASSAM-BENGAL RAILWAY CO., LTD., September 6th.—Supply of overhead electric cranes. Specifications, etc., from the offices of the company, Bishopsgate House, 80, Bishopsgate, London, E.C.; deposit £1 1s.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 6th. —Motor-driven milling, pipe screwing, grinding and planing machines, etc. (Reference A.X. 6 592.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th. —Supply of 338 000 metres of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA), MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 14th. —Supply of a.c. meters. (Reference B.X. 4 648.)

JOHANNESBURG TOWN COUNCIL, September 1st.—Supply and delivery of electric cables. (Reference B.X. 4 649.)

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 17th.—Supply and delivery of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, together with junction and terminal boxes. (Reference B.X. 4 608.)

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 19th.—Supply and delivery of 250 V lead covered conductors. (Reference B.X. 4 607.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 20th. —Supply and delivery of one electrically-driven heavy duty double face-plate wheel lathe for Germiston wagon repair shops. (Reference A.X. 6 660.*)

JOHANNESBURG TOWN COUNCIL, September 27th.—Supply and delivery of 6 600 V switchgear. (Reference B.X. 4 668.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 27th. —Supply and delivery of arc welding sets. (Reference B.X. 4 647.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th. —Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

IRISH FREE STATE ELECTRICITY BOARD, October 1st.—Supply and erection of complete electrical equipment, including switchgear and three transformers, each 12 000 kVA (38 000/5 000 V), for Shannon transformer station at Fleet Street, Dublin. Specification, etc., from the Secretary to the Board, 60-62, Upper Mount Street, Dublin; deposit £5, returnable.

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st.—Supply of porcelain insulators. (Reference B.X. 4 643.)

SOUTH AFRICAN MUNICIPALITY, October 1st.—Supply, delivery and erection of high tension transmission lines and three-phase transformers. (Reference B.X. 4 669.)

TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—For the supply and delivery of 250 ornamental electric lamp standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date.)—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

SOUTH AFRICAN DEPARTMENT OF PORTS AND TELEGRAPHS. October 4th.—Supply of telegraph line material. (Reference B.X. 4 655.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

ARGENTINE DEPARTMENT OF NAVIGATION AND PORTS, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 694.*)

## General Supplies for South America.

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, October 5th.—Supply of lead fuse wire, silver fuse wire, copper wire for bell installation, insulating tape, porcelain counter-weights, quick-break lever switches (single pole, double pole and triple pole), tumbler twitches (single pole), switches (single pole and double pole), rotary combination switches for staircases (3-way and 4-way), rotary switches for indoor use (single pole and double pole), switches (double pole) for flush mounting, rotary combination switches (3-way) for flush mounting, rotary switches (single pole) for flush mounting, normal Edison screw lampholders, without key switch, enamelled lampshades, porcelains for sockets and plugs for double pole fittings, insulating compound, transformers for bell installations, hard vulcanised rubber tubing, cast-iron cable boxes, glass globes for arc lamps, etc.

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 11th. —Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44.) (Reference B.X. 4 637.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-stations. (Reference B.X. 4 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th. —Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, Nov-

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ember 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories for Yallourn power station (Specification No. 28/48). Copies of tender (£1 1s.), etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

## Tenders Accepted.

GRAVESEND CORPORATION.—Yorkshire Switchgear Co., supply of kiosk, £180 (recommended).

STOCKTON-ON-TEES CORPORATION.—W. T. Glover and Co., Ltd., supply of paper insulated cables.

SOUTHEND CORPORATION.—A. J. Howard, electric light installation at West Leigh School, £150.

SUNDERLAND CORPORATION.—Dorman, Long and Co. Ltd., 100 tons of tramrails (recommended.)

TAWA FLAT (N.Z.) RAILWAY DEVIATION.—National Electrical Engineering Co., electric locomotives.

HULL CORPORATION.—A. Shaw and Son, electric lighting installation at the mental hospital, £6 580 10s.

SALFORD CORPORATION.—J. Gerrard and Sons, supply of 22 police telephone boxes, £385 (recommended).

BRIGHTON CORPORATION.—Pinching and Walton, electric wiring work at reconstructed Aquarium, £2 179.

ST. HELENS EDUCATION COMMITTEE.—Woodman and Co., electric light installation at day open-air schools.

FIRESTONE TYRE AND RUBBER CO., LTD., BRENTFORD.—B. French, electrical installation at new factory.

TRING URBAN DISTRICT COUNCIL.—W. A. Turnbull, supply of electricity for lighting the town, 9d. per kWh.

WESTMINSTER CITY COUNCIL.—Hardy and Padmore, supply of 12 electric lamp columns, £442 (recommended).

WREXHAM GUARDIANS.—Thornton and Evans, electric light installation at Croesnewydd Hospital, £345 10s.

LEEDS CORPORATION.—Electromotors, Ltd., supply of electric motor for Kidacre Street destructor, £118 7s.

PWLLHELI TOWN COUNCIL.—Electricity Distribution, Ltd., conversion of the street lighting to electricity, £2,392.

PLYMOUTH CORPORATION—Chloride Electrical Storage Co., Ltd., repair of batteries at the sanatorium, £421 9s. 9d.

LEEDS CORPORATION.—Lead Wool Co., Ltd., supply of air compressor for electricity department, £555 10s. 6d

AMPTHILL RURAL COUNCIL.—Mr. B. Swaffield, wiring houses at Maulden for electric light at £4 15s. per house.

NEWCASTLE WATCH COMMITTEE.—E. N. Mackley and Co., electrically-driven trailer pump, for the fire escape, £116.

BOLTON WORKS COMMITTEE.—S. H. Heywood and Co., Ltd., 10-ton electric crane at the Chandod Street warehouse.

NEWCASTLE CORPORATION.—Clarke, Chapman and Co., Ltd., for electrification of a 65-ton crane at the quayside, £497.

HIS MAJESTY'S OFFICE OF WORKS.—Stella Lamp Co., Ltd., supply of Stella electric lamps for 12 months (part contract).

ILFORD CORPORATION.—Metropolitan Cable and Construction Co., Ltd., cable, £542 18s. 6d., less 2½ per cent. discount.

MANCHESTER EDUCATION COMMITTEE.—Seddon and Sons, for the installation of electric light at Cheetham Municipal School.

POPLAR (LONDON) BOROUGH COUNCIL.—Westminster Engineering Co., repair of transformer at High Street sub-station, £250.

SOUTHEND CORPORATION.—Equipment and Engineering Co., Ltd., about one mile of overhead trolley wire, 1s. 1½d. per lb.

EDINBURGH CORPORATION.—J. Best, construction of tunnel, etc., under the Firth of Forth, for the electricity department, £39 903.

OLDHAM ELECTRICITY COMMITTEE.—The Union Cable Co., Ltd., additional lengths of cable for use at the new power station.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—A. Reyrolle and Co., Ltd., supply of h.t. switchgear, £4 759 (recommended).

SOUTHEND CORPORATION.—Pirelli-General Cable Works Ltd., supply of cable, for linking up scheme, £578 (recommended.)

KENDAL BOARD OF GUARDIANS.—Gilbert Gilks and Co., Ltd., for generating and distribution plant, £825 (recommended).

BURY ST. EDMUND'S CORPORATION.—Callender's Cable and Construction Co., Ltd., cable for lighting Perry's Barn, £341 18s.

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Ferguson, Pailin, Ltd., supply of two 1 200 A switches, £938 (recommended).

KILMARNOCK CORPORATION.—William Johnstone and Son electric light installation at houses at Fulton's Lane and Townholm.

OBAN CORPORATION.—P. H. Cossar, electric lighting work in connection with the erection of 28 houses in Sorobo Road, Oban, £121.

WARRINGTON CORPORATION.—British Thomson-Houston Co., Ltd., two feeder panels for extension of main e.h.t. switchboard.

HIS MAJESTY'S OFFICE OF WORKS.—Metro-Vick Supplies, Ltd., part contract for Cosmos vacuum and gasfilled lamps for 10 months.

ILFORD CORPORATION.—Metropolitan Electric Cable and Construction Co., Ltd., cable for the works of the Ship Carbon Co., Ltd., £74.

BASINGSTOKE CORPORATION.—Pirelli-General Cable Works, Ltd., supply of cable in connection with extension to Malshanger, £174.

LLANFYLLIN CORPORATION.—R. A. Jones, supply of electricity for public lighting, 30s. per light per annum (renewal for five years).

BURTON-ON-TRENT CORPORATION.—British Insulated Cables Ltd., work in connection with change over in St. Paul's Square district, £1 950.

DURHAM RURAL DISTRICT COUNCIL.—County of Durham Electrical Power Distribution Co., Ltd., supply of electricity to Ushaw Moor.

## L.T. Cable.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Siemens Bros. and Co., Ltd., supply of low tension cable, £1 894 12s. 9d. (recommended).

HORNSEY CORPORATION.—Doulton and Co., Ltd., and Albion Clay Co., Ltd., supply of conduits for one year (recommended).

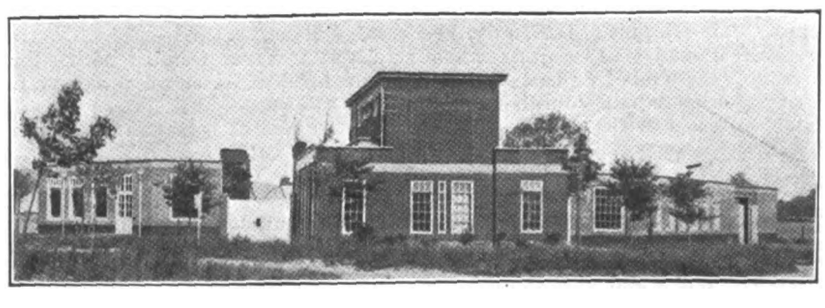
SLEAFORD URBAN DISTRICT COUNCIL.—Edison Swan Electric Co., Ltd., maintenance of storage battery for ten years, £75 per annum.

GUILDFORD CORPORATION.—Hackbridge Electric Construction Co., Ltd., for transformers for outer area extension scheme, £2 097 10s.

HULL CORPORATION.—Miller and Garness, electric light wiring and fittings in new administrative block of Infectious Hospital, Cottingham.

HACKNEY (LONDON) BOROUGH COUNCIL.—Chloride Electrical Storage Co., Ltd., renewal of batteries of 19 electric vehicles, £182 and £250 3s. each.

RIPON CORPORATION.—Power Lines Construction Co., Ltd., e.h.t. and l.t. cables, boxes, roadwork and public lighting (contract No. 4), £10 210.



*A GENERAL view of the new offices and showrooms of the Welwyn Garden City Electricity Supply Co., Ltd., which were opened on July 30th. The premises adjoin the sub-station and marks the final stage in a scheme for the centralisation of the company's activities, the showrooms, offices, works, and transforming equipment now being located in one building.*

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SHEFFIELD CORPORATION.—Hydes and Wigfull, Ltd., supply of seven wrought iron coal shoots for Blackburn Meadows power station, £153 9s. 6d.

METROPOLITAN WATER BOARD.—Barlow Bros. and Co., installation of improved internal telephone service in accountant's department, £278 10s.

WINCHESTER CITY COUNCIL.—Chamberlain and Hookham, Ltd., ampere-hour house service meters (prepayment meters excluded) for another year.

DUNFERMLINE AND WEST FIFE HOSPITAL.—J. E. Fenton, electrical installation, in new laundry block in connection with the extension of the hospital.

THIRSK PARISH COUNCIL.—Northern Counties Electricity Supply Co., for public lighting with 109 lamps from September 8th to April 13th, £409 16s. 6d.

KIRKCALDY CORPORATION.—Moncrieff Bros., Ltd., electrical work in connection with rehousing schemes at Invertiel Road, Massereene Road and Miller Street, £923.

BOMBAY CORPORATION.—Callender's Cable and Construction Co., Ltd., for supporting, safeguarding and repairing the cables of the Andrha Valley Power Supply Co., Ltd., during the carrying out of Corporation water works, Rs. 1 613-6.

STONE (STAFFS) URBAN DISTRICT COUNCIL.—J. Collier and Co., h.t. underground cables, £2 326; l.t. overhead cables, Stone, £1 671; Stone (optional lines), £827; Barlaston, £627; Barlaston (optional), £217; Tittensor, £394; Tittensor (optional), £207; l.t. underground cable, £4 929, less discount of 2 per cent. on all four contracts.

SUNDERLAND CORPORATION.—Pirelli-General Cable Works, Ltd., low and medium tension lead-sheathed cable; British Insulated Cables Ltd., e.h.t. lead-sheathed cable; Edison Swan Electric Co., Ltd., lead-sheathed and braided wire, and tough rubber-sheathed wire; Macintosh Cable Co., Ltd., flexibles; General Electric Co., Ltd., lamps.

LONDON COUNTY COUNCIL.—Holt and Willetts, electric service lifts at new weights and measures office, Euston Road, £450. Also tendered: A. Morgan and Co., £430 (not to specification); Pickerings, Ltd., £464; R. A. Evans, Ltd., £484; Keighley Electrical Engineering Co., Ltd., £489; Porn and Dunwoody, Ltd., £600; Medway's Safety Lift Co., Ltd., £600; E. A. Foulds, £650; Express Lift Co., Ltd., £652; Etchells, Congdon and Muir, Ltd., £750.

HASTINGS CORPORATION.—Ferguson, Pailin, Ltd., feeder panel, £165; switchgear for Earl Street sub-station, £3 066 1s. 6d., and for Githa Road sub-station, £207; Stirling Boiler Co., Ltd., for suction and delivery pipes, £109; Ferranti, Ltd., 3 000 kVA Scott-connected transformer, for Earl Street sub-station, £1 300, and four 150 kVA transformers for sub-stations, £144 each (all recommended).

## Power Station Plant.

POPLAR (LONDON) BOROUGH COUNCIL.—Plant and material in connection with power station extension, Fraser and Chalmers, Ltd., 15 000 kW generator, £49 000; Vickers-Armstrongs, Ltd., evaporating plant, £1 625; G. and J. Weir, Ltd., feed pump, £617 10s.; Metropolitan-Vickers, Ltd., switchgear, transformer and cable, £18 250; New Conveyor Co., Ltd., coal conveyor, £1,325; International Combustion Co., Ltd., boiler house and fuel equipment, £78 000 (all recommended).

CAPE TOWN CORPORATION.—Hughes and Co. (S.A.), Ltd., 1 000 100 W lamps, £47 11s.; British General Electric Co., Ltd., 4 000 100 W lamps, £566 13s. 4d., and 500 200 W lamps, £118 15s.; General Electric Engineering Co., 12 000 60 W lamps, £462 10s.; 1 000 300 W lamps, £225, and 1 500 500 W lamps, £450; A. Vaux, Ltd., volt transformer, £86; A Reyrolle and Co., Ltd., switch fuse, £105; Hubert Davies and Co., supply of cable, £2 319 15s.; Miller's West Australian Hardwoods Co., Ltd., supply of cable boards, £785 8s. 4d.

LONDON COUNTY COUNCIL.—Stegman and Co., wiring and fittings for electric lighting and bells, in connection with the adaptation of former industrial school, Drury Lane, for use by the City Library Institute, £612 (recommended). Also tendered: A. Hawkins and Sons, £674; Berkeley Electrical Engineering Co., Ltd., £684; Alpha Manufacturing and Electrical Co., Ltd., £685; Cox-Walkers, £688; W. H. Gaze and Sons, Ltd., £732; L. G. Tate and Co., Ltd., £745; A. Dean and Co., Ltd., £778; Griggs and Son, £796; J. Briggs (Electrical Contractors), Ltd., £800; Pinching and Walton, £860.

CAPE TOWN ELECTRICITY COMMITTEE.—Mr. J. Lostus, for adapting premises at Woodstock as electricity showrooms, £2 012.—British Insulated Cables, Ltd., 30 tons of hard-drawn copper wire, at £86 7s. per ton, and 10 tons at £86 10s. per ton; and Dowson, Dobson and Behr, 5 tons at £88 and 5 tons at £83 13s. per ton. British Insulated Cables (S.A.), Ltd., 5 000 round top insulators, £112 10s.; Hubert Davies and Co., 500 large shackle insulators, £113 5s. Mr. C. E. Scott, for 10 000 60 W 230 V lamps with reinforced spiral filament at 1s. 0½d. each, 2 000 60 W B.C. lamps at 1s. 0½d. each, and 1 000 300 W lamps at 6s. 11d. each (all recommended.)

LIVERPOOL CORPORATION.—English Electric Co., Ltd., supply of special bogie tramcar, £2 450; A. R. Jones, cleaning etc., and installation of electric light at dwelling-house, 172, Chatham Street, £69; Ferguson, Pailin, Ltd., supply of h.t. switchgear for twelve months, including type A feeder cubicles £130, B £119, C transformers £101, D inter-connector £74, and E meter cubicles £126; J. G. Statter and Co., l.t. switchgear for twelve months, including type A transformer and distributor panel £223, B £223, C £211, D two transformers and two distributors £435, and E three ditto £560; T. Bolton and Sons, Ltd., supply of 10 000 copper bonds, 35 in. long, 2s. 4½d. each, 1 000 ditto 65 in. 3s. 6½d., 100 ditto 84 in. 4s. 7d. (all recommended).

GLASGOW CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., d.c.c. wire; Thomas Bolton and Son, Ltd., copper bands; Messrs. Bolckow, Vaughan and Co., Ltd., and Thomas Green and Son, Ltd., tram rail anchors; British Insulated Cables, Ltd., insulated bolts; Grindlay, Ross and Co., Ltd., electric light installation at Govan depot, £212 3s. 1d. Electro-flo Meters Co., Ltd., 16 steam, temperature and pressure recorders, for Dawsholm gasworks, £1 026 12s. 6d.; Star Architectural Ironworks, Ltd., lattice poles; P. R. Jackson and Co., Ltd., armature coils; Hadfields, Ltd., points and crossings; English Electric Co., Ltd., switch fuse equipments for alternators, £175; Metropolitan Electric Cable and Construction Co., twin cable conductors, £1 209 (all recommended).

## Boiler Tenders.

DOUGLAS (I.O.M.) CORPORATION.—Two water tube boilers with underfeed stokers and all accessories: Stirling Boiler Co., Ltd., £18 123; Babcock and Wilcox, Ltd., £18 357; Vickers Boiler Co., Ltd. and Richardsons Westgarth and Co., Ltd., £18 397; John Thompson Water Tube Boilers, Ltd., £18 900 (includes for boiler casing of steel); Yarrow and Co., Ltd., £18 917; Clarke Chapman and Co., Ltd., £21 769; one 1 000 kW steam turbo-alternator with all accessories: A. H. Allen, Sons and Co., Ltd., £9 864; the Metropolitan Vickers Electrical Co., £10 332; the Metropolitan Vickers Electrical Co. (alternative), £10 188; the English Electric Co., Ltd., £10 426; Richardsons, Westgarth and Co., Ltd., £10 700; Fraser and Chalmers Engineering Co., £11 244, Peter Brotherhood, Ltd., £11,284; Daniel Adamson and Co. (Mather and Platt alternator), £11 293; the British Thomson-Houston Co., Ltd., £11 473; Bellis and Morcom, Ltd., £11 495, the Brush Electrical Engineering Co., £12 907; C. A. Parsons and Co., Ltd., £16 610.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Hackbridge Electric Construction Co., Ltd., two 1 000 kVA Scott-connected transformers, £690, and British Electric Transformer Co., Ltd., two ditto, £885 (both recommended). Tenders were invited and received for (*a*) four transformers of the above description, (*b*) six 250 kVA transformers, and (*c*) six 150 kVA transformers, and the amounts quoted were: Hackbridge Electric Construction Co., Ltd. (*a*) £1 380, (*b*) £840, alternative £780 (not to specification), (*c*) £498 (not to specification; Metropolitan-Vickers Electrical Co., Ltd., (*a*) £1 392, (*b*) £1 380 (too large for sub-stations), (*c*) £1 008 (too large for sub-stations); Foster Engineering Co., Ltd., (*a*) £1 596, (*b*) £1 404 (too large for sub-stations), (*c*) £972 (too large for sub-stations); British Electric Transformer Co., Ltd., (*a*) £1 770, (*b*) £1 437 (recommended), (*c*) £954 (recommended); Johnson and Phillips, Ltd., (*a*) £1,960, (*b*) £828 (too large for sub-stations), (*c*) £594 (too large for sub-stations). Ferguson, Pailin, Ltd. (*a*) three-phase 6 600 V switch panel, £191 15s. (recommended), (*b*) two-phase 2 200 V truck type oil switch panel, £197 16s. 3d. (recommended). Also tendered: Switchgear and Cowans, Ltd., (*a*) £163 (not to specification), (*b*) £193 (not to specification); New Switchgear Construction Co., Ltd. (*a*) £201 (not to specification), (*b*) £176 (not to specification); General Electric Co., Ltd., (*a*) £193 2s 3d., (*b*) £202 12s. 9d.; Park Royal Engineering Co., Ltd., (*a*) £217 4s. (*b*) £237 8s.; A. Reyrolle and Co., Ltd., (*a*) £235 12s., (*b*) £234 16s. 6d. J. G. Statter and Co., supply of 40 single-phase switches, £15 5s. 10d. each (recommended).

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# ELECTRICITY SUPPLY.

## Extensions at Brighton—Proposed Additions at Harrogate—Barnsley Technical College and D.C. Motors—Newcastle and Change of System—New Plant for Oldham—Opening of Whitby Extensions.

DRONFIELD U.D.C. have been granted an Order to distribute electricity in its area.

Accounts of the Stretford electricity undertaking for the year show a profit of £23 882.

Accrington T.C. have received sanction to a loan of £10 000 for consumers' sub-station equipment.

The laying of mains to connect Weymouth with the villages of Upwey and Broadwey was commenced last week.

Haywards Heath Parochial Church Council of St. Wilfrid's Church are considering substituting electric light for gas.

The West Wilts Electric Light and Power Co., Ltd., last year took bulk supplies from Bath amounting to £7 446.

The U.D.C. of East Grinstead have received sanction to a loan of £500 for wiring installations under the assisted wiring scheme.

The profits of the Coventry Corporation electricity undertaking for the year ended March 31st show a surplus of £45 311.

Stretford Electricity Committee have obtained the sanction of the Commissioners to an alteration in the system and pressure.

South Shields Electricity Committee have scheduled 35 electric wiring contractors for carrying out assisted wiring installations.

Ottery St. Mary U.D.C. have consented to the extension of the West of England Electric Supply Co.'s system to the Council's area.

Wilts County Council offer no objection to overhead lines crossing the main roads in Ditton Marsh, Holt and Bradford Without, as shown in plans submitted by the West Wilts E. L. and P. Co., Ltd.

Extensions at the Whitby electricity works were started by Mrs. Milburn, wife of the chairman of the Electricity Committee, on August 8th.

The Chertsey Board of Guardians have instructed the Master to make inquiries as to the cost of the installation of electric light in the Institution.

Cecil Cooper and Co., who are connected with the West of England Electricity Co., have asked the Bicester, Oxon, U.D.C. for an interview in regard to a supply to Bicester.

The Electricity Commissioners have given sanction to Aberdeen Electricity Committee to borrow £51 641 for—buildings, £6 675; mains, £20 080; and plant and crane, £24 886.

Newcastle Transport and Electricity Committee have assented to the proposal of the Newcastle-upon-Tyne Electric Supply Co., Ltd., to change over from d.c. to a.c. in the east central area.

A supply of electricity is to be given to the village of Blyth, Lord Barnby having arranged with the Electrical Distribution of Yorkshire, Ltd., to extend the mains to the parish by an overhead line from Tickhill.

Heston and Isleworth Electricity Committee seek sanction to a loan of £1 603 for mains, transformer and feeder panel in connection with the supply of electricity to the factory of Wire Industries, Ltd.

Barnsley Electricity Committee recommend that nine d.c. motors removed from consumers' premises which have been replaced with a.c. motors be handed over to the Technical College for educational purposes.

The Yorkshire Electric Power Co. have sent a letter to Wakefield Corporation inviting co-operation either in considering a scheme for the district under the Electricity (Supply) Act, 1926, or in carrying out the proposals.

Maidenhead Electricity Committee are to carry out an extension of the high pressure extra main to the riverside district, necessitating a feeder and pilot cable from the works to the new sub-station at an estimated cost of £1 998.

St. Pancras (London) Electricity Committee are to lay a new l.t. feeder from Tavistock Place sub-station to Upper Bedford Place to meet the increased demand in the neighbourhood during the winter, at a cost of £1 440.

Bucklow R.D.C. have withdrawn their opposition to the Manchester Electricity (Extension) Special Order, by which Manchester Corporation seek powers to supply electricity to Northenden, Northern Etchells, and Baguley.

Melbourne Parish Council have accepted the offer of the Leicestershire and Warwickshire E. P. Co. to extend cable for street lighting along Derby Road to Newton Lane for an annual payment of £2 10s. per lamp for 10 years.

Maidenhead Town Council have received sanction for loans of £5 000 for mains, and £3 650 for plant extensions. A further loan of £2 020 for a high pressure feeder and pilot cable from the works to a new sub-station site has been applied for.

Chipping Norton R.D.C. have appointed a committee with power to consult an expert for advice with reference to electricity schemes put forward by Cooper and Co., and the Wessex Electricity Co., both of whom are applying for powers to supply the district.

Woking U.D.C. are submitting details to the Ministry of Health in connection with the application for a loan of £1 400 for the installation of electric motors and stereophagus pumps in a building to be erected at the rear of the existing pumping station at Old Woking.

Guildford Electricity Committee have agreed to extend mains at Chilworth, to supply the premises of Messrs. Porter and Fowler, at a cost of £546, to extend mains to supply 30 houses, at Grantley Road and Grantley Gardens, at a cost of £200, and to extend mains at a cost of £380 along Echo Pit Road.

In the change-over to three-phase supply, the Harrogate Town Council, on Monday of last week, decided to make application for a loan of £38 000, the estimated cost of the provision of a new Parson's 8 000-10 000 three-phase generating set. It was further decided to borrow £11 350 for a turbo-alternator, with foundations, switchgear, etc.

The Coatbridge and Airdrie Electric Supply Co., Ltd. sought an assurance at a recent Glasgow Corporation meeting that the clause in the Con Bill with reference to the supply of electricity to tramways will not be operated in such a way as to prejudice the company's rights, and it has been agreed to give an undertaking to continue to take the supply for the period prescribed.

Notts C.C. have decided to raise no objection to the application of the North Nottinghamshire Special Order by which the Derbyshire and Nottinghamshire Electric Power Co. seeks power to supply electricity for lighting in areas already within the company's area for power purposes; these include the rural district of Misterton, and the parishes of Blyth, Carlton, Harworth, Hodsock, Styrrup and Wallingwells.

Oldham Electricity Committee have obtained sanction to borrow £78 872, in connection with the new generating station. The building and civil engineering works are to cost £12 403; plant, £32 569; and cooling towers, £33 900.—The South-East Lancashire Electricity Advisory Board are recommended by the Engineering Advisory Committee to support the Corporation's application for a Fringe Order in respect of property in Limehurst rural district.—An alternative method of charging domestic consumers according to the rateable value of their premises will be brought into operation on September 25th.

Mr. John Christie, borough electrical engineer of Brighton, has prepared an estimate of the cost of completing the present extensions of the buildings and plant at the Southwick power station. Besides £10 900 required to supplement amounts already approved and £1 000 for contingencies, Mr. Christie estimates that the following additional expenditure (amounting to about £300 000) will have to be incurred: an e. h.t. switchgear, Southwick, £24 526; buildings for housing same, £10 000; cable connections (h. and l.t.), excavations, etc., £10 000; additional sub-station plant, Southwick, £12 250: extension of h. and l.t. switchgear, cabling, etc., £3 000. An additional scheme for supplementing the condensing water system will be the subject of a report to be shortly submitted by the consulting engineers, Mr. H. H. Dalrymple-Hay and Mr. Donkin, of Kennedy and Donkin, who are advising, possibly running into an expenditure of £50 000. The extension and reconstruction scheme for buildings, etc., at North Road amounts to £30 000, e. h.t. switchgear, reactances, etc., will cost £18 000, cable connections, etc., £5 000, and transformers, 30 000 kW., £30 000; housing for transformers, £5 000; additional sub-station plant, £35 500; new static sub-stations £15 000 and floating loan for cables, extras for feeders, distribution, network, etc., £50 000.

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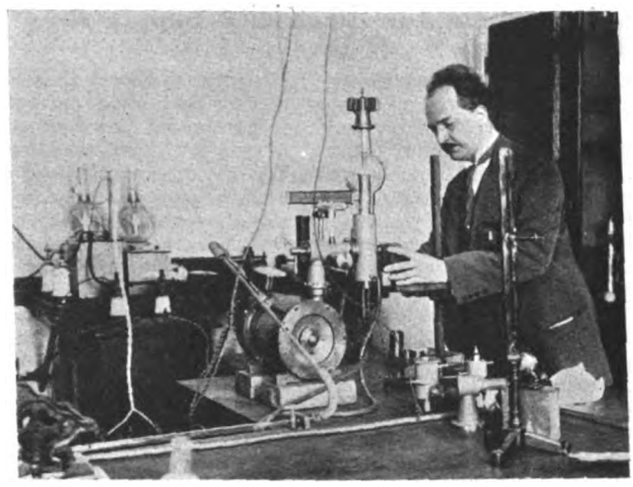
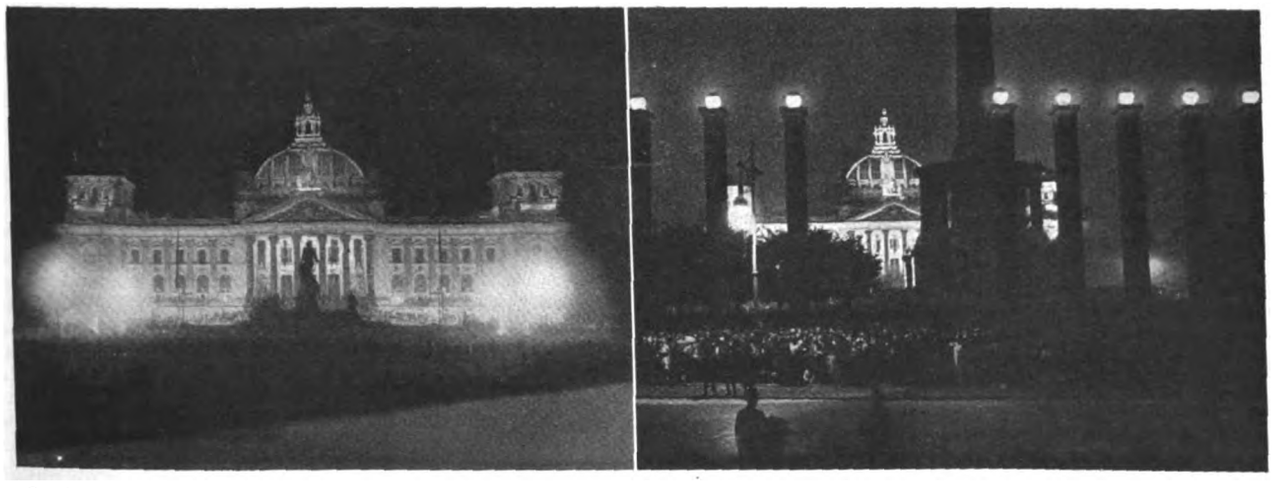
## ELECTRICAL PICTURES.

A sketch of the proposed offices and showrooms of the Yarmouth Corporation Electricity Department. The building is at present under construction, and this drawing shows both the spaciousness of the new premises and the beauty of the architectural design.



Dr. F. Holweck, an eminent Parisian X-ray expert, has been able to calculate, after numerous experiments, how much energy in the form of X-rays is needed to kill various bacteria. He claims that by exposing germs to measured doses of these rays their destruction is assured.

Some of the staff of A. H. Hunt, Ltd., photographed outside the company's offices and works, on the occasion of their annual outing to Brighton. During luncheon Messrs. A. H. and C. H. Hunt were presented with suitable gifts subscribed for by the staff. See page 218.



On the occasion of the celebration of Germany's Constitution Day, Berlin was suitably illuminated with floodlights, searchlights, and other electrical devices. The illuminations were kept going well into the night, the lateness of the hour having no effect upon the interest displayed by the large crowds which gathered. The left-hand photograph shows the illuminated Reichstag building, whilst on the right is seen the Platz der Republik.

Marylebone Electricity Committee have now had an opportunity of considering the request of the Electricity Commissioners to be furnished with an estimate of the cost of an extension of the generating station, compared with the cost of obtaining additional bulk supplies. The question of the permanent occupation of and the construction of buildings on part of the Works Department land at the Grove Road Depot, must be dealt with, and the Committee have asked the Works Committee to consider the matter and give information as to the consequential arrangements which will be necessary. In the meantime, the Committee have deferred consideration of this matter until after the recess.

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# ELECTRIC TRACTION.

## Agreement for Electricity Supply to Railway.

ST. Pancras (London) Electricity Committee report that in 1926 they approved an arrangement for a supply of current for the L. and N.E. Railway, for an annual payment of £2 660, for a maximum demand of 700 kVA, whether the maximum demand reached 700 kVA or not, and for every kVA over 700 a further £3 16s. per kVA, plus ¾d. for every kWh up to one million per annum, and all over at ½d. per kWh. There is also a coal clause providing for an increase or decrease of 0·01d. per kWh for each 1s. per ton rise or fall in the cost of coal. Owing to the company's work not having been carried out as rapidly as was originally hoped, the agreement was amended so that the commencing date should be September 1st, 1927. In view of the reductions which the Council has made in charges for supplies for cooking, heating, etc., the company now ask that the agreement should be revised. They express surprise that they should be asked to pay more than small consumers whose load factor could not be so good as the company's. The committee point out that the Council have not reduced the charges for current for power purposes, the current supplied to the company can be used for any purpose, including lighting, and there is a clause in the agreement which provides that, if the Council give a corresponding supply during the continuance of the agreement to any other company or person in similar circumstances or conditions at a less price than is payable by the company, the price payable under the agreement shall be reduced correspondingly. The committee do not recommend the Council to vary the terms of the agreement.

It is interesting to note that the suburban electrification of the South African Railways at Cape Town is now completed as far as Fish Hook, and that, after a series of successful trial runs, a service of passenger trains is now working. Of the automatic sub-stations installed on the line, those in actual operation include Milnerton Junction, Claremont, Muizenberg and Diep River sub-stations, all of which are equipped with G.E.C. gear.

## Electrification in Costa Rica.

The Costa Rica Government has placed with the Allgemeine Electricitäts Gesellschaft the contract for the electrification of the Pacific Railway from San José to Puntarenas and the branch line to Alajuela. The contract will include generating plant, electric locomotives, h.t. transmission lines, etc., and the expenditure is not to exceed 1 620 million dollars. Provision is also to be made for the subsequent electrification of the Esparta branch.

Mr. Henry Mattinson, general manager of the Manchester Corporation tramways, is of opinion that one of the necessities in connection with the improvement of traffic conditions in the city is the removal of the heavy horse drawn vehicles which are stationary in the streets the greater part of the day. The trams are not the chief cause of the congestion, because for every street along which tramways run there are half a dozen alternative routes for other traffic. The construction of a circular tram route would not solve the problem.

Middlesbrough General Purposes Committee met recently to discuss a report by Mr. J. B. Park, general manager of the Tees-side Rail-less Traction Board, in which he recommends the scrapping of the rail-less cars and the substitution of motor 'buses. The town clerk stated that the Traction Board had passed a resolution that, in view of the present chaotic condition of road transport in the district, no extensive financial commitment should be embarked upon at the moment. A deputation representing the Regional Advisory Committee was to wait upon the Minister of Transport to learn what protection would be given to local authorities' transport undertakings. The General Purposes Committee endorsed the resolution of the Rail-less Traction Board.

At a recent meeting of Dundee T.C., Mr. A. Malcolm, Convener of the Tramways Committee, moved that a special committee be appointed to confer with the director of Dundee, Broughty Ferry, and District Tramways Co. on the question of taking over the Company's undertaking. Mr. J. G. Fraser, who seconded, said he did not think the Council should appoint a committee unless there was a genuine desire to purchase the undertaking. He believed they could purchase the tramways for considerably less than was suggested on the previous occasion. Mr. P. J. Fletcher remarked that it would be a tactical blunder for the Council to appoint a committee.

# THE SOCIAL SIDE.

THE employees of Page and Miles, Ltd., electrical contractors, of Brighton, Worthing, and Eastbourne, on the occasion of their annual outing to Tonbridge, travelled in three motor-coaches to the "Angel" Hotel in that town via Lewes, Notley, and Speldhurst. At the luncheon the chair was occupied by Mr. E. J. Page (chairman and managing director), supported by Messrs. H. J. Miles, J. T. Baker, G. H. Miles, and C. E. Page, all directors. The toast of "The Firm" was proposed by Mr. F. Patching, Mr. H. J. Miles making suitable reply.

Over 80 employees of the Wallasey electricity department and their friends recently had an enjoyable outing to Blackpool. The party left Exchange station, Liverpool, by train at 8.40 a.m. After the luncheon, at Jenkinson's Restaurant, Blackpool, Mr. Cook, chairman, thanked the Committee, and complimented them upon the success of the outing. Mr. Pansey, vice-chairman, Mr. Starkey and Mr. F. M. Evanson, secretary, were amongst those present.

As in other years, the annual outing of A. H. Hunt, Ltd., included the complete staff, everybody assembling at the works at 8.0 a.m., and after having a photograph taken, departed in char-a-bancs for Brighton. During the lunch at the Royal Pavilion, a presentation was made to Mr. A. H. Hunt by Mr. F. J. Chamberlain on behalf of the staff, and immediately afterwards a presentation was made to Mr. C. H. Hunt by the works manager, Mr. E. A. Baggaley, also on behalf of the staff. A picture of some of the staff before the start was made is given on page 217.

On August 11th, Pirelli-General Cable Works Social and Sports Club held their annual sports gala at Eastleigh, when over five hundred members attended. The most important event of the day was the deciding of the Inter-Departmental Championship for the Railing Cup. The plant and maintenance department of the Southampton factory were the successful entrants with a total of 25 points—the administration department (also of the Southampton factory) coming second with 10 points. Additional events included 320 yards obstacle races, a ladies' three-legged race, and a potato race. Much amusement was occasioned by a "tilting the bucket" contest, in which the competitors were mounted on motor cycles, each carrying a pillion rider; a 60 yards sack race and a treasure hunt. Mr. Martinez, director and general manager of the company, also chairman of the club, presented the prizes, also the Martinez Cup, for inter-departmental cricket, won by the plant and maintenance department, Eastleigh, together with medals presented by Mr. Giffen, head of that department. During the prize-giving a telegram was received to the effect that Mr. Goater, a member of the staff, and his wife had been successful in the divisional semi-final of the "Daily News" all-England Tennis Tournament against Hows Tennis Club at Chesham, Buckinghamshire. After the prize-giving, a dance was held in the pavilion, appropriate music being provided by the works dance orchestra.

# WIRELESS NOTES.

## The Progress of Broadcasting in Sweden.

ACCORDING to the statistical report of the Swedish Telegraph Department for 1927 which has just been published, there were, at the end of 1927, seven broadcasting stations belonging to the telegraph service, with an average yearly service of 2 043 hours per station, and 24 smaller private relay stations. The big Motala station was put into operation in the middle of 1927. The stations at Gothenburg and Malmö are to be enlarged to 10 kW, and will use their present wavelengths. The number of licences granted at the end of the year was 328 133 or 53·9 per 1 000 inhabitants, as against 242 559 and 39·9 respectively at the end of 1926. Of these Stockholm took 56 931 or 90·5 per 1 000 inhabitants (80·0 in 1926), Gothenburg 29 051 or 77·4 per 1 000 (81·6) and Malmö 16 703 or 98·7 per 1 000 (101·9).

A proposal is to be submitted to the Danish Rigsdag for the installation of a wireless transmitter for broadcasting debates on certain days in each week.

British listeners had the novel experience of hearing Big Ben strike the midnight hour from America, when the short wave station at Schenectady picked up the B.B.C.'s transmissions from Chelmsford, but a Birmingham listener heard the Big Ben chimes from Stuttgart. The broadcast was received from Chelmsford via New York and the German station.

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# COMPANY NEWS.

## Electrical Share Market Mainly Dull—Supply Descriptions Show Slight Improvement—Manufacturing Group Variable—Telegraph Holdings Approximately Level—Clyde Valley Dividend—Company Reports.

THERE is still not much activity in the electrical share market. The principal change in price quotations, as compared with a week ago, is a rise of half a crown in City of London Lighting ordinary shares, to over 33s. Metropolitan Supply ordinary shares also show 1s. 3d. improvement, despite deduction of dividend from the price. Shropshire B's are quoted 32s. In the manufacturing group, Henley's at £5 10s. are 2s. 6d. down. Eastern Telegraph stock remains at approximately the same level, but Anglo-American ordinary and Commercial 4 p. c. deb. stock show an improvement.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927 Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. .. | 26/6 | 26/6 | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) .. | 27/-* | 27/6 | 60/- | 10/- |
| 4½ | " " " 4½% C.P. (£1) | 17/6* | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. .. .. | 26/6 | 26/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 30/7½ | 52/10½ | 20/3 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/6 | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 38/6 | 38/- | 68/6 | 14/6 |
| 6 | " " 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/6 | 27/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord .. .. | 48/9* | 47/6 | 43/- | 8/- |
| 4½ | " " " 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | " Elec. Sup. Ord. .. | 25/7½ | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/6 | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13,9 |
| (c) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 32/- | 31/6 | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) .. | 27/-* | 27/6 | 52/- | 18/- |
| 4½ | " " " 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 30/- | 35/- | 32/9 | 12/6 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk .. | 125 | 125 | 152½ | 24 |
| 6 | " " " 6% Pf. Stk... | 120 | 120 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 71 | 89½ | 40½ |
| 4 | " " 4% Deb... .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 70½ | 73½ | 10 |
| 4 | " " " 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | " " " 4% Deb. .. | 80 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 85 | 85 | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | " " " 5% Deb. .. | 66½ | 65½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 66½ | 67½ | 84½ | 19 |
| 3½ | " " 3½% Pf. Stk. .. | 65* | 66 | 88½ | 40½ |
| 3½ | " " 3½% Deb. .. | 71 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 77½ | 77 | 66½ | 12½ |
| 4½ | " " 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | " " 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | " " " 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord .. | 85/- | 85/- | 86/3 | 26/6 |
| 6 | " " " 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | " " " 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/1½ | 28/1½ | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | " " 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | " " 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | " " 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | " " 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | " " 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord... .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | " " 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/- | 20/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/- | 26/9 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | " 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 38/6 | 38/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 110/- | 112/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 32/6 | 32/6 | 37/- | 13/1 |
| 8 | " " 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/1½ | 28/1½ | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 60½ | 59½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 79½ | 77½ | 77½ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 245 | 245½ | 213½ | 113 2/6 |
| 3½ | " " 3½% Pref. Stk. .. | 67½ | 65½ | 84/17/6 | 49 |
| 4 | " " 4% Deb. .. | 79¼ | 79¼ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24½ | 24½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38 | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 45½ | 45½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 65/- | 65/- | 9/16/3 | 20/9 |
| 12½ | " Int. Mar. .. .. | 51/- | 51/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24½ | 24½ | 23 | 11/3 6 |

(a) 1s. 7⅞d. per share. (b) £8 8s. 6·66d. per cent. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. 9·12d. (g) 1s. 7·223d. ‡Including 1s. bonus. * Ex dividend.

CLYDE VALLEY ELECTRIC POWER CO., LTD.—Interim div. on ord. shs., 3 p.c. actual, less tax, payable Sept. 13.

RADIO CORPORATION OF AMERICA.—Surplus pfts. for quarter ended June 30, $1 401 905, for six months ended June 30, $4 524 779.

BRIGHTSIDE FOUNDRY AND ENGINEERING CO., LTD.—Pft. for year to June 30, £7 868. Ord. div. 4 p.c. (same); £7 234 forwd (against £4 816).

SOUTH-EASTERN POWER AND LIGHT CO., LTD.—Net operating earngs. of Alabama Power Co. (principal operating subsidiary) for July, $825 096 (increase $208 246).

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Combined net earnings for June Rs. 2 29 630 (decr. Rs.17 235); aggregate from Jan. 1 Rs. 13 69 197 (decr. Rs. 2 44 738).

DANZIG ELECTRIC TRACTION CO., LTD.—In order to comply with the regulations of the Stock Exchange, particulars were on Monday published for information only, of the Danzig Electric Tramway Co. The capital consists of 5 000 000 gulden, divided into 5 000 pref. and 5 000 common shares of 500 gulden each, all of which have been issued and fully paid up. In addition, there is a loan capital of £225 000 in 7 p.c. mortgage 20-year Sterling bonds. The company has outstanding an issue of bonds for a principal sum of 652 933 gulden and certain mortgages to secure short-term loans amounting in all to 3 000 000 Swiss francs, which will be retired out of the proceeds of the present issue.

EDMUNDSON ELECTRICITY CORPORATION.—An extra-ordinary meeting has been called for Sept. 10 to give consideration to a proposal to increase the capital to £1 650 000 by the creation of 850 000 new ord. £1 shares. It is further proposed to capitalise £600 000 of the undivided profits standing to reserve, and, as soon as the outstanding deb. stock has been redeemed to apply such sum in paying up in full 600 000 new ord. £1 shares. These will be issued to the ord. shareholders registered on Aug. 10 in proportion to their present holdings. The ord. shareholders will also be offered 250 000 ord. £1 shares for subscription at par in proportion to their present holdings, and the proceeds will be applied towards redemption of the deb. stock. Notice has already been given to the 4½ p.c. first deb. stockholders of the company's intention to redeem the stock on November 15.

FELLOWS MANUFACTURING CO., LTD.—The directors announce that owing to the winter being the busiest season of the year for the delivery of goods to customers, the resources of the factory and staff are taxed to the utmost during the summer in order to manufacture in advance, so as to keep pace with the demand, which begins to increase in the autumn and continues throughout the winter. It has therefore been decided, in order to avoid the delay which would of necessity occur by taking stock and balancing accounts on July 31, to make Dec. 31 the end of the company's year, and the period covered by the first accounts will therefore be for about 17 months, from July 26, 1927, to Dec. 31, 1928. Sales to date have continued to increase substantially, and prices have been well maintained. Deliveries for the autumn trade should shortly be on a largely increased scale, and the directors have in view the declaration and payment of an interim dividend on both classes of shares.

PUEBLA TRAMWAY LIGHT AND POWER.—Rept. for 1927, states net pfts. in Mexico amtd. to $1 372 377 Mex., as compared with $1 464 683 Mex. in 1926, and such pfts. converted into sterling at 24.5p. per peso equivalent to £140 097. After chargg. all ex., int., and sink. funds on Prior Lien and First Mortgage bonds and 8 p.c. Note service there is £12 427 carried to bal. sheet. Notwithstanding general depression in industry of country, and particularly in cotton industry, light and power receipts during year show a satisfactory increase. Operating exs. considerably higher than in previous year, and include a considerable amount for losses on exchange. Owing to silver being at a discount compared with gold, and to the fact that Mexican gold was also below U.S. parity, a considerable exchange loss on remittances between Mexico and New York was incurred. Since date of balance-sheet an agreement has been entered into with Municipality of Puebla, which provides for regular payment in future of their light and power accounts and liquidation over a period of outstanding in

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debtedness. Extension of electrification of Mexican Railway from Cordoba to Paso del Macho was completed in May of this year, and additional power is now being delivered.

## Company Meeting.

THE LUDWIG BLATTNER PICTURE CORPORATION.—At the statutory mtg. on Friday of last week, Mr. L. Blattner, presiding, stated that since the inauguration of the company a contract had been entered into with the British Phototone Company. The British Phototone process was acknowledged to be one of the most economic methods of adding sound to the projection of films, and the company's far-reaching ramifications and patents were of immense value to the world's film industries. The production contracts were for five years and covered the production of at least eight feature films per annum. Production costs were guaranteed by cash payments and by an additional contract with the "Producers Distributing Company," and by other impending arrangements the corporation was assured substantial annual cash profit as far as that section of the work was concerned. Similar arrangements to those made with the British Phototone Company were on the point of completion with the French Phototone Company, and the company had already received a part consideration for its co-operation and services rendered, 120 000 fully-paid 5s. shares, divided as follows :—60 000 fully-paid shares of 5s. each in the British Phototone Company and 60 000 fully-paid shares of 5s. each in the French Phototone Company. The British Phototone Company, in the opinion of the Board, was likely to become one of the most important sound film companies in the world, and they considered themselves fortunate in having been able to secure co-operation with them. The report was adopted.

## New Companies.

BRITISH SOUSEDIK ELECTRIC MOTORS, LTD.—Cap., £100. Electricians, engineers, etc. Reg. office: 135, Buchanan Street, Glasgow.

HOMEALITIES, LTD.—Cap., £1 000. To acquire the business of electricians. Reg. office: 113, Ecclesall Road South, Ecclesall, Sheffield.

MOLINARD, LTD.—Cap., £1 000. To carry on business of dispensers of all classes of electrical treatment.—Reg. office: 252, Bath Street, Glasgow.

DAVENTRY AND CO., LTD.—Cap. £1 000. To carry on the business of wireless, telephone and telegraph engineers, manufacturers of wireless apparatus, etc. Office: Mellings Yard, Friargate, Preston.

ENGLAND-RICHARDS FLUID-FREE CELL CO., LTD.—Cap., £1 000. To acquire any patents and rights relating to the production of dry cell electric batteries, etc. Secretary: J. C. Thornley, 413, Sidney Street, King's Lynn.

UNION AMALGAMATIONS, LTD.—Cap., £100. To institute, carry on, or participate in financing electric railway and other businesses, etc. Solicitors: Sutton, Ommanney and Oliver, 3/4, Great Winchester Street, London, E.C.

BYRON DAVIES, LTD.—Cap., £100. Advertising contractors, designers and manufacturers of electrical, flashing, rotating, scintillating and other advertising signs, etc. A director: Mrs. J. Davies, 95, Grant Road, Croydon.

KAYS OF EALING, LTD.—Cap., £6 000. To adopt agreement with W. A. Kay and E. J. Robertson, and to carry on the business of motor and wireless engineers, etc., formerly carried on by them at Bond Street, Ealing, and elsewhere.

GOWING ENGINEERING AND CHEMICAL PRODUCTS, LTD.—Cap., £000. Importers and exporters of and dealers in electrical, magnetic, radio and other products, etc. Secretary: A. J. Gowing, 45, Monkhams Avenue, Woodford Green, Essex.

LAWRIE AND CO., LTD.—Cap., £1 000. To carry on the business of electrical engineers and contractors, manufacturers and dealers in railway, tramway, electric, magnetic, galvanic and other apparatus, etc. Solicitors: W. Georgeson and Co., Wick.

ELECTROSERVICE, LTD.—Cap., £100. To carry on the business of electricians, electrical engineers, manufacturers of and dealers in electrical and wireless apparatus, electric and other lamps, lamp shades and fitments, etc. Reg. office: 3, Waterloo Road, S.E.1.

CLIMAX ELECTRIC CO., LTD.—Cap., £10 000. To acquire from R. Lomax benefit of certain existing inventions relating to the production of electricity service boxes, etc. Solicitors: J. Arnold Brierley and Robinson, Priory Buildings, Union Street, Oldham.

BARRAUD THOMAS, LTD.—Cap., £1 500. To carry on the business of manufacturers of and dealers in electrical and other instruments and components used in connection with wireless telegraphy and telephony, etc. Reg. office: 35, Bond Street, South Shore, Blackpool.

JOHNSON'S (MILFORD HAVEN), LTD.—Cap. £5 000. To acquire the business of a wireless engineer, dealer in wireless and electrical apparatus and fancy goods carried on by W. F. Johnson at 67, Charles Street, Milford Haven. Office: 67, Charles Street, Milford Haven, Pembroke.

## ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by GEE AND CO., Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.***

*Opposition to the registration of the following trade mark can be lodged up to September 8th.*

"UNIGEN."—492 287. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Universal and General Radio Co., Ltd., 1 to 42A, Bravington Road, London, W.; manufacturers. June 11th, 1928. (To be Associated, Sect. 24.)

*Opposition to the registration of the following trade marks can be lodged up to September 15th.*

ETHOWIRE. 492 394. Class 40. Electric wire covered with india-rubber. Burndept Wireless, Ltd., Aerial Works, Grotes Place, Blackheath, London, S.E.3; manufacturers. June 14th, 1928.

KINEVOX. 492 529. Class 8. Loud-speaking telephones, and instruments and apparatus for the amplification of sound. The Marconiphone Co., Ltd., Marconi House, Strand, London, W.C.2; manufacturers. June 19th, 1928.

FIDELUS. 491 511. Class 8. Electric batteries (not for medical purposes). A. S. McHugh and Co., 59, Side, Newcastle-on-Tyne, and Windsor House, 83, Kingsway, London, W.C.2; dealers in electrical accessories. May 16th, 1928.

ETHOPLUG. 492 395. Class 8. Instruments and apparatus included in Class 8, for use in wireless telephony and telegraphy. Burndept Wireless, Ltd., Aerial Works, Grotes Place, Blackheath, London, S.E.3; manufacturers. June 14th, 1928. (To be Associated. Sect. 24.)

EFAP. 493 312. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Emile Eigenheer, Place de la Gare 1, Gorcelles, Ganton de Neuchatel, Switzerland, manufacturers. July 14th, 1928. Address for service in the United Kingdom is c/o Marks and Clerk, 57-58, Lincoln's Inn Fields, London, W.C.2.

## METAL AND CHEMICAL PRICES.

TUESDAY, August 21st.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected .. | per ton | £65 5 0 | — | — |
| Electro Wirebars .. | ,, | £69 5 0 | — | — |
| H.C. Wires, basis .. | per lb. | 9 15/16d. | — | — |
| Sheet .. .. .. | ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis .. .. | per lb. | 1s. 0 15/16d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis .. .. | per lb. | 8½d. | — | — |
| Sheet ,, .. .. | ,, | 9⅝d. | — | — |
| Wire ,, .. .. | ,, | 9⅞d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants.. | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. | ,, | £14 15 0 | — | |
| *Lead Pig*— | | | | |
| English .. .. | per ton | £23 5 0 | 10s. 0d. | — |
| Foreign or Colonial .. | ,, | £21 7 6 | 5s. 0d. | — |
| *Tin*— | | | | |
| Ingot .. .. .. | per ton | £212 15 0 | — | £1 0 0 |
| Wire, basis .. .. | per lb. | 2s. 9¼d. | — | — |
| *Aluminium Ingots* .. | per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. | ,, | £24 5 0 | — | 2s. 0d. |
| *Mercury* .. .. | ..per bottle | £23 0 0 | 5 0 | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2½d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3½d
*Rubber*—Para fine, 11½d.; plantation 1st latex, 9 7/16d.

*** The metal prices are supplied by British Insulated Cables Ltd., who also point out that the price for Galvanised Steel Wire given in our issue dated August 3rd should have been £14 15s. per ton, and not £14 10s. per ton as stated.

### LEAD MARKET REPORT.

IN their weekly review of the lead market James Forster and Co. state that the disappearance of the contango, which has existed without a break for many months, and which has amounted to as much as 12s. 6d. per ton premium for forward lead over the current month, and its replacement by a "back" of 2s. 6d. for August is due to the diversion of a considerable quantity of lead afloat for this market to the Continent to meet German and Russian requirements. There is no change in the general condition.

Closing prices on August 17th were at £21 18s. 9d. for August and £21 16s. 3d. for November, against £21 5s. and £21 6s. 3d. respectively at the end of last week.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALCOCK, Sidney A., 88, Magazine Lane, Wallasey, electrical engineer. £29 11s. 6d. July 11th.

BARLEY, Percival, 282a, London Road, Southend, wholesale wireless dealer. £10 11s. 1d. June 14th.

BROOKES, Frank, 5, Back Greengate Street, Barrow-in-Furness, electrician. £11 2s. 6d. July 11th.

BUCKLEY, Mr. P., High Street, Prestatyn, electrician. £15 18s. 4d. July 2nd.

DEAL AND SANDWICH ELECTRICAL CO., LTD., 2, Park Street, Deal. £12 17s. 3d. March 13th.

EURADIC ELECTRIC CO., LTD., 76, Duncombe Road, N.19. £19 8s. July 4th.

HALL, N. A., AND CO., 40, High Road, Buckhurst Hill, electrical engineers. £11 15s. 6d. July 11th.

HEWSON AND LOWN, 68, Victoria Street, Westminster, electrical engineers. £19 9s. 2d. July 7th.

JONES, Mr. A. E., Wilmot Street, Dimple, Matlock, wireless engineer. £14 19s. 10d. July 16th.

SILVER LAMP CO., 45, Silver Arcade, Leicester, dealers in electrical goods £17 12s. 4d. June 30th.

VOKES, Mr. E. G. Horsill, Woking, wireless dealer. £30 3s. 9d. July 2nd.

WESTBURY, L. W., AND CO., 146, Litchfield Road, Walsall, electrical and wireless dealers. £11 0s. 4d. July 9th.

## Deeds of Arrangement.

BANKS, Harry Rosterne, trading as CLEVELEYS ELECTRIC CO., Slater Road, Cleveleys, and residing at Charnwood, Bourne Road, Thornton, near Blackpool, electric and radio engineer. Dated August 9th, filed August 15th. Trustee, J. W. Westhead, 6, Birley Street, Blackpool, C.A.; liabilities unsecured, £340; assets, less sceured claims, £113.

COLBORNE, Arthur Raymond, 66, Newport Street and 119, Croft Road, Swindon, electrician. Dated August 13th, filed August 16th. Trustee, E. C. Fielder, High Street, Swindon, auctioneer. Secured creditors, £1 260; liabilities unsecured, £367; assets, less secured claims, £581.

MERRITT, Frederick George, trading as ATKINS AND POWELL, 48, Thames Street, Windsor, electrician. Dated August 10th, filed August 17th. Trustee, F. Kidson, 29, Martin Lane, Cannon Street, E.C., C.A.; liabilities unsecured £988; assets, less secured claims, £430.

## Receiverships.

BETAX MANUFACTURING CO., LTD.—E. Lever, of Chiswell House, Finsbury Pavement, E.C.2, was appointed receiver and manager on July 18th, 1928, under powers contained in charge dated November 16th, 1925.

EURADIC ELECTRIC CO., LTD.—B. R. Brewster, of 7, Bishops Road, Paddington, was appointed receiver and manager on August 8th, 1928, under powers contained in debentures dated October 19th, 1925.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an*—followed by the date of the Summary, but such total may have been reduced.*]

BROWNIE WIRELESS CO. OF GREAT BRITAIN, LTD., London, N.W.—Registered August 2nd, debenture to Bank; charged on property at Mornington Crescent, N.W.; also general charge. *Nil. May 30th, 1927.

RED TRIANGLE ELECTRIC CO., LTD., London, S.W.—Registered July 30th, £400 1st debenture, to A. E. Chapman, 125, Stanley Park Road, Carshalton, radio engineer; general charge.

RUSHDEN AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Registered August 3rd, £2 700, £1 550, £350 and £200 debentures, part of £50 000; general charge. *£25,000. March 6th, 1928.

SAMDON WIRELESS CO., LTD., Manchester.—Registered August 2nd, £200 debenture, to M. Morris, Woodcroft, Broom Lane, Higher Broughton, director of a limited company; general charge.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD. (Sussex). Registered August 3rd, series of £10 000 debentures present issue £1 200; general charge. *£13 800. April 26th, 1928.

WIRELESS PIANO PLAYERS, LTD., London, S.W.—Registered July 21st, series of debentures for £8 000 (inclusive of £5 000 already registered), present issue £2 200; general charge.

## Satisfactions.

CALLINGTON AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Satisfaction registered July 26th, £1 000, registered September 3rd, 1926 and May 3rd, 1927.

RADIO SERVICE (LONDON), LTD.—Satisfaction registered July 31st, £125 part of amount registered July 26th, 1927.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD., London, E.C.—Satisfaction registered August 8th, £300, part of amount registered February 15th, 1906, December 31st, 1908 November 18th, 1913, and March 10th, 1924.

## Private Meeting.

[***Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.***]

MANUFACTURERS' ACCESSORIES CO., LTD., 85, Great Eastern Street, London, E.C. Liabilities at July 6th of £27 412 (of which £17 421 was due to unsecured trade creditors) and net available assets of £8 975, were reported at the statutory meeting this week of the creditors in the voluntary liquidation of this company, which was registered in 1907 with a nominal capital of £3 000, in £1 shares, of which 1 212 shares have been issued. There is owing to debenture holders £7 900, but Mr. E. H. Hawkins, joint liquidator, explained that for the purpose of the statement of affairs the debentures had been put down at £8 500, which he anticipated would cover interest and the receivership costs. Mr. Hawkins stated that for the 16 months ended January, 1923, the company's turnover was £61 188, with a gross profit of £13 993 and a net loss of £2 240. At that date the debit to profit and loss was £9 348. For the next year the turnover was £64 392, the gross profit £12 694 and the net loss £1 784. Sales the following year increased to £68 927, and the net loss was £202. In the year ending January, 1926, sales again increased to £74 479, with a gross profit of £15 308 and a net profit of £757. In the following year sales slumped to £49 256, and there was a net loss of £1 871, while in respect of £69 861 turnover in the year to January, 1928, there was a further loss of £2 191, increasing to £14 640 the debit to profit and loss account. The liquidator said that Mr. Vincent, of Vincent and Goodrich, C.A., the receiver for the debenture holders, was in negotiation for the sale of the business as a going concern. The voluntary winding-up of the company was confirmed, with Mr. Hawkins and Mr. W. A. J. Osborne as joint liquidators, and an informal committee of inspection was nominated, including representatives of Edison Bell, Ltd., and the Mullard Wireless Service Company, Ltd. The creditors include: British Thomson-Houston Co., Ltd., £105; Chloride Electric Storage Co., Ltd., £170; Cossor Valve Co., Ltd., £167; Dunlop Rubber Co., Ltd., £2 085; Edison Bell, Ltd., £1 283; Ferranti, Ltd., £87; A. H. Hunt, Ltd., £158; Igranic Electric Co., Ltd., £85; Lodge Plugs, Ltd., £258; Markt and Co. (London), Ltd., £124; H. Miller and Co., Ltd., £176; Mullard Wireless Service Co., Ltd., £524; Rollins and Sons (London), Ltd., £111.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

PEARL ELECTRICAL CO., LTD. By Special Resolution June 11th, confirmed August 2nd. A. W. Archibold, corporate accountant, 72, Leadenhall Street, E.C.3, appointed as liquidator.

SUPER ELECTRIC CARPET BEATING AND CLEANING CO., LTD. By reason of its liabilities, August 9th. S. W. Simpson, incorporated accountant, Essex House, High Street, Stratford, E.15, appointed as liquidator. Meeting of creditors at liquidator's office on Wednesday, August 29th, at 3 p.m.

### Bankruptcy Information.

GATESHILL, Harry, 113, Witham, Kingston-upon-Hull, wireless engineer. Receiving order, August 16th. Debtor's petition.

HURLES, Mr. E. J. G., 8, Blackfriars Road, London, S.E.1, wireless dealer. Receiving order, August 15th. Creditor's petition. First meeting, August 28th, 11.30 a.m., and Public examination, October 26th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

LINDSAY, Ernest Reginald Douglas, 96 and 98, Victoria Road, Aldershot, Hampshire, wireless and cycle agent. Receiving order, August 17th, Debtor's petition. First meeting, August 29th, 11.30 a.m., 29, Russell Square, W.C.1. Public examination, October 2nd, 11 a.m., Guildhall, Guildford.

POOK, Bernard Edwin Mark, 53a, Albert Road, Southsea, wireless dealer. Receiving order, August 13th. Debtor's petition. First meeting, August 31st, 11.30 a.m., Official Receiver's Office, 87, High Street, Portsmouth. Public examination, October 1st, 11.30 a.m., Court House, St. Thomas's Street, Portsmouth.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### July 31st.

22 206 G. Lakhovsky. Apparatus for collecting electrical oscillations.
22 218 H. Leben and A. Reyrolle and Co., Ltd. Electric protective systems.
22 210 Metropolitan-Vickers Electrical Co., Ltd. Control systems for electric rectifiers, etc. (6/8/27, U.S.)
22 167 D. and S. Montague. Wireless receiving apparatus.
22 168 D. and S. Montague. Aerials for wireless receivers.
22 221 D. Ripley. Electric protective systems, etc.
22 180 W. H. Scott and H. D. Wheeler. Electromagnetic brakes.
22 132 T. Smith. Electricity supply systems, etc.
22 175 Soc. Anon. pour l'Equipment Electrique des Vehicules. Vacuum cleaners. (6/1/27, France.)
22 115 W. A. Stevens. Means for electric braking.
22 157 F. A. Thomassin. Control systems for electrical sound reproduction.

### August 1st.

22 254 British Power Railway Signal Co., Ltd., Relay Automatic Telephone Co., Ltd., and J. H. Graham. Signalling apparatus.
22 317 British Thomson-Houston Co., Ltd. Means for protecting electrical apparatus. (1/8/27, U.S.)
22 320 J. H. C. Brooking and Greenwich Cable Works, Ltd. Manufacture of insulated conductors.
22 234 J. A. Crabtree and B. G. Harrison. Switch cover plates for electrical accessories, etc.
22 239 H. E. Dance. Measuring products of voltages and currents in a.c. systems.
22 333 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Process of deforming a crystalline metallic body.
22 330 Electrical Research Products, Inc. Mechanical systems for driving one member from another. (6/8/27, U.S.)
22 318 International General Electric Co., Inc. Transformers. (2/8/27, Germany.)
22 295 S. T. Penn. Electrical device for calling taxicabs.
22 287 F. E. A. B. Sewell. Thermionic valve amplifiers.
22 233 T. F. Wall. Electromagnetic testing of wire ropes.
22 271 D. Williams. Transmission of electric current.

### August 2nd.

22 442 A. C. Spark Plug Co. Ammeter. (19/8/27, U.S.)
22 458 Automatic Telephone Manufacturing Co., Ltd., G. A. Burns and H. S. Deyes. Telephone systems.
22 390 British Thomson-Houston Co., Ltd. Switches. (4/8/27, U.S.)
22 414 L. H. A. Carr and Metropolitan-Vickers Electrical Co., Ltd. Potential regulators.
22 423 R. N. Chadwick. Adjustable sliding plate or bed for dynamos, etc.
22 394 J. W. Coldman. Electric lifts.
22 380 C. Farrar. Screening wireless receiving apparatus.
22 459 R. Gold and J. Schmauss. Electric motors.
22 419 S. C. and P. Harding, Ltd., and W. P. Leuch. Manufacture of light sensitive surfaces.
22 392 International General Electric Co., Inc. Thermo-magnetic relays. (5/8/27, Germany.)
22 460 H. L. Kirke, B. N. MacLarty and T. C. Macnamara. Thermionic valve circuits.
22 373 R. K. Lynes and Rainsford and Lynes, Ltd. Switches.
22 382 R. F. McGilloway. Switch.
22 413 Metropolitan-Vickers Electrical Co., Ltd., and H. Pearce. Electric power distribution systems.
22 428 D. G. Page and H. Hopf and Sons, Ltd. Switches.
22 450 Radiophon Co. Electromagnetic sound-boxes. (4/6/28, Germany.)
22 372 A. W. Sharman. Apparatus for detection and measurement of small electric fields.
22 404 Siemens-Schuckertwerke Akt.-Ges. Electrical distribution systems. (12/8/27, Germany.)
22 398 Soc. Anon des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny et Cirey. Electrode for fusion of glass. (19/8/27, France.)
22 446 Telefunken Ges. fur Drahtlose Telegraphie. Electric coupling devices. (3/8/27, Germany.)
22 348 T. F. Wall. Electrically operated safety device.
22 461 P. J. de Wet. Television apparatus.

### August 3rd.

22 525 Akt.-Ges. Brown, Boveri et Cie. Mercury vapour rectifiers. (23/2/28, Germany.)
22 526 Akt.-Ges. Brown, Boveri et Cie. Reversing motor driving ships' propellers. (8/8/27, Germany.)
22 543 British Thomson-Houston Co., Ltd. Electric control systems. (5/8/27, U.S.)
22 544 British Thomson-Houston Co., Ltd. Electric welding. (8/8/28, U.S.)
22 496 J. A. Crabtree. Switch mechanism, etc.
22 615 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Examining electrical properties of insulating material, etc.
22 617 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
22 601 Electrical Research Products, Inc. Acoustic devices. (17/8/27, U.S.)
22 570 S. English and Holophane, Ltd. Prismatic reflecting glass.
22 611 W. T. Henley's Telegraph Works Co., Ltd., H. C. Hoban and A. W. C. McArthur. Jointing multicore electric cables.
22 542 International General Electric Co., Inc. Transformers. (4/8/27, Germany.)
22 554 C. Oliver and Oliver Pell Control, Ltd. Electromagnetic reproducers for gramophone records.
22 510 J. F. de Tovaros. Current collectors for electric vehicles. (8/8/27, Hungary.)
22 622 L. M. H. Watson. Spring drum devices for flexible conductors.
22 551 Westinghouse Brake and Saxby Signal Co., Ltd. Light actuated electric generator. (23/1/28, U.S.)
22 552 Westinghouse Brake and Saxby Signal Co., Ltd. Light signals. (25/11/27, U.S.)
22 558 Westinghouse Electric and Manufacturing Co. Energy responsive devices. (3/8/27, U.S.)

### August 4th.

22 646 P. E. J. Eggers. Interrupters for electric circuits in internal combustion engines.
22 650 J. W. Howard and Lancashire Dynamo and Motor Co., Ltd. Alternating current motors.
22 700 B. B. Johnson and Relay Automatic Telephone Co., Ltd. Telephone systems.
22 666 F. Krupp Akt.-Ges. Manufacture of turbine blades, etc. (15/8/27, Germany.)
22 653 H. Longton. Electrolytic cells.
22 630 H. C. Rowsell. Emergency switch.
22 604 A. W. Sharman. Apparatus for electromedical treatment.
22 685 A. T. Smee. Insulators.

### August 7th.

22 732 Babcock and Wilcox, Ltd., and Stirling Boiler Co., Ltd. Steam boilers.
22 739 Babcock and Wilcox, Ltd., and Stirling Boiler Co., Ltd. Supports for baffler of boilers.
22 808 British Thomson-Houston Co., Ltd. Commutating mechanism. (8/8/27, U.S.)
22 809 British Thomson-Houston Co., Ltd. Electric regulators. (8/8/27, U.S.)
23 751 Electrical Research Products, Inc. Applying material to cores. (20/8/27, U.S.)
22 728 E. C. Howells. Electric motors.
22 754 D. A. and A. F. Pollock. Reducing intensity of impulses in electrical amplifiers.
22 755 D.A. and A. F. Pollock. Loud-speakers.
22 756 D. A. and A. F. Pollock. Thermionic valve amplifiers.
22 832 A. Preen. Thermionic valves.
22 780 Siemens-Schuckertwerts Akt.-Ges. Tariff indicating device. (11/8/27, Germany.)
22 725 G. F. A. Stone. Electric switches.
22 777 E. A. Tubbs. Frame aerial tuning device.

### August 8th.

22 934 Allgemeine Elektricitats Ges. Thermionic valves. (9/8/27, Germany.)
22 897 British Power Railway Signal Co., Ltd. Protective device for railway point operation.
22 880 British Thomson-Houston Co., Ltd. Electric switches.
22 855 W. Burton. Voltage regulating apparatus.
22 869 A. E. Chapman. Electric insulators.
22 870, 22 871 K. Curtis. Electrical terminals.
22 907 Electrolytic Zinc Co. of Australasia, Ltd. Manufacture of bearing metal. (22/8/27, Australia.)
22 917 Ferranti, Ltd., and F. W. Gee. Electric transformers.
22 844 Naamlooze Venwootschap Kodowa Refrigerator Co. Refrigerator apparatus.
22 937 T. M. Harrison. Electrically heated vessels. (10/2/28, Australia.)
22 881 International General Electric Co., Inc. Electric plug and socket connection. (8/8/27, Germany.)
22 882 International General Electric Co., Inc. Heat accumulators. (8/8/27, Germany.)
22 846 R. C. Lindsay. Electric standard lamps.
22 857 M. A. Macfarlane. Telephone transmitter mouthpiece.
22 866 Metropolitan-Vickers Electrical Co., Ltd. Electrical circuit breakers. (9/8/27, U.S.)
22 909 P. de Pouthiere, L. Robin. Servo motors. (1/6/27, Belgium.)
22 903 G. R. Searle. Loud-speakers.
22 847 W. M. Searle. Means for producing magnetic fields for loud-speakers.
22 919 W. W. Triggs. Heat transformers.

### August 9th.

23 022 C. R. Allenby and Benham and Sons, Ltd. Method of fixing heating coils to panels.
23 023 T. E. Allibone. Electric discharge tubes.
22 972 E. G. Amsden, M. Barovitch, and Premier Pleating Co. Electric heating machines for pleating.
22 977 Babcock and Wilcox, Ltd., and Stirling Boiler Co., Ltd. Steam boilers.
22 982 British Thomson-Houston Co., Ltd. Pantograph current collectors. (12/8/27, U.S.)
23 027 Ceskomoravska-Kolben-Danck Akciova Spolecnost and F. Fabinger. Electric transformers. (12/8/27, Czecho-Slovakia.)
23 020 A. R. Downif. Picture projecting and sound-reproducing apparatus.
22 950 Harris and Sheldon, Ltd., and R. G. Turner. Electric cigar lighters.
22 943 F. W. Lanchester. Sound reproduction.
22 995 H. T. Logan. Electric switches.
22 904 Metropolitan-Vickers Electrical Co., Ltd. Electrical signalling systems. (9/8/2, U.S.)
22 954 G. Monaghan. Anodes for electrolytic baths.
22 971 D. L. Sharma. Television apparatus.
22 967 Standard Telephones and Cables, Ltd., and Western Electric Co., Inc. Water cooled valves.

### August 10th.

23 081 Aktieselskabet Kjabenhavns Lampe-og Lysekronefabrik. Incandescent lamp fittings. (12/8/27, Denmark.)
23 135 Automatic Telephone Manufacturing Co., Ltd., and O. A. Pearce. Telephone systems.
23 128 E. S. C. Betteley. Electric bells.
23 153 S. G. Brown. Electro-magnetic devices for reproducing sound.
23 148 G. R. Carr, and C. H. Everett. Electric batteries, etc. (4/1/28, U.S.)
23 102 Danipad Rubber Co. Ltd., and E. J. Tyrrell. Holders for thermionic valves.
23 063 N. K. Kempton. Electric plug connections.
23 110 J. S. Lottrup. Inductance coils. (11/8/27, Denmark.)
23 114 Metropolitan-Vickers Electrical Co., Ltd. Electrical circuit-breakers. (11/8/27, U.S.)
23 089 H. H. Perry. Electrically heated apparatus for warming and drying.
23 078 S. R. Phillips. Vacuum cleaning apparatus.
23 076 J. Robinson. High frequency electric signalling.
23 208 A. Rosen and Siemens Bros. and Co., Ltd. Arrangements for measuring electrical quantities.
23 234 Siemens and Halske Akt. Ges. Tapping device for electric furnaces. (14/12/27, Germany.)
23 142 W. W. Triggs and Williams Oil-O-Matic Heating Corporation. Electric controls for heating apparatus.
23 143 W. W. Triggs and Williams Oil-O-Matic Heating Corporation. Refrigerating machines.
23 154 M. Troughton. Electric vibratory devices.
23 077 Westinghouse Electric and Manufacturing Co., Vacuum electric discharge tube devices. (13/8/27, U.S.)
23 218 Auto-Electric Devices, Ltd. Winding device for talking machines.
23 178 British Electric Transformer Co., Ltd., and J. L. Thompson. Means for dissipating heat generated by electrical apparatus immersed in liquid.
23 211 British Thomson-Houston Co., Ltd. Electric protective arrangements. (11/8/27, U.S.)
23 212 British Thomson-Houston Co., Ltd. Automatic control for dynamos. (15/8/27, U.S.)

## Coming Events.

### Monday, August 27th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

### Tuesday, August 28th.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Ordinary meeting.

### Wednesday, August 29th.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary Meeting. 3.30 *p.m.*

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# THE ELECTRICIAN

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# Current Topics.

## Electricity in the Landscape.

So much ink has been spilled in completely uninformed efforts to show that transmission line supports will play havoc with what little of the English landscape there is as yet undefaced by petrol filling stations and bungaloid and other growths of recent origin, that it is rather refreshing to find a writer in the "Architect's Journal" bringing a little common sense to bear upon the æsthetic side of electricity transmission by overhead means. That it is a public duty of those concerned with the development of electricity supply, particularly in rural areas, to take every possible step to avoid outraging the susceptibilities of those who will be potential users of the service cannot be denied. This aspect has been stressed on more than one occasion in these columns, and the fact that the Central Electricity Board has secured the advice of Sir REGINALD BLOMFIELD on the æsthetic design of the transmission line towers for the "grid" suggests that the need for preserving what is left of the amenities has been realised in the right quarter. As is pointed out in the "Architect's Journal" article, it may be *possible* to design a transmission tower on the lines adopted for the imitation trees used as observation posts in the last war, or to evolve a tower constructed of half-timber and brick-nogging with a special treillage for ivy; but what hoots of mirth would ascend if such were the officially approved method for facing and solving this problem. While it is true that certain types of support can be improved in appearance, it must not be overlooked that if such beautifying alterations are found to interfere with either efficiency or economy, they may justly be said to have been added as frillings, not as an integral part of the solution of the entire problem. An obvious improvement in the appearance of perpendicular supports is, for example, achieved by curving the main supporting members throughout their length, somewhat on the principle of the Eiffel Tower, but even here its increased cost does not recommend it as an entirely satisfactory arrangement. Whatever we may think about the efficiency from the electrical point of view, of the towers adopted as standard by the Central Electricity Board, it would be exceedingly difficult to visualise, let alone produce, a form of support that would combine fulfilment of so many æsthetic requirements with lightness of structure, economy in material and fitness for purpose. We are inclined to agree with Mr. S. ROWLAND PIERCE, in the aforementioned article, that the design of the upper part of the official single circuit tower is not so satisfying as that of the double circuit type. The depths of the unequal cable arm attachments could with advantage be revised, though it is appreciated that any arrangement of a symmetrical arm presents a very difficult problem. In making comparisons between the effectiveness of photographs of an actual tower on the Halesowen to Stourport line, and a model of the double circuit tower adopted by the Central Board, Mr. PIERCE says the former is somewhat less successful at the top, and that there is a slight tendency towards dynamic uneasiness at the base, due to the angles of the bracing struts. So far as we are able to judge by examination of the two pictures, the difference in the appearance of the two examples is, with the exception of a minor modification at the top of the structure, almost entirely due to the slightly different angles from which the towers are viewed.

## Die-Castings for Instruments.

THE use of die-castings for parts formerly cast or machined has been developed after much pioneer work by the Brown Instrument Co., of Philadelphia, who during the last few years have almost entirely given up the use of cast iron instrument cases in favour of aluminium die castings for the cases and cover bezels of practically all kinds of instruments. The aluminium cases now standard for all the firm's continuous chart recorders, for example, are among the largest aluminium die-castings ever produced on a quantity basis. The unusual size of these die-castings may be gauged from the fact that their dimensions are 15 in. high by 13 in. wide and 7 in. deep. It is true that die-cast aluminium cases cost substantially more than cast iron cases, if the cost of the cases only is considered. But this difference in first cost is largely overcome by the savings effected by the perfection of detail assured by the die-casting process, which greatly reduces the grinding and machining, so necessary with iron castings. Also, frequent flaws occur in iron castings, while flaws in good die-castings are comparatively rare. To a great extent the cases used for the different types of instruments are of uniform dimensions. For instance, continuous chart recording pyrometers, resistance thermometers, $CO_2$ meters, tachometers, etc., all take a standard case. So, too, round case instruments, such as flow meters, thermometers, pressure gauges and vacuum gauges, also use standard cases. The uniformity of appearance provided by this standardisation of cases greatly enhances the attractiveness of a complete installation of instruments covering principal process and power plant operating fac-

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tors, and at the same time largely helps to keep the cost of supplying these die-cast aluminium cases within the limits of practicability. Furthermore, the change to die-cast aluminium assures instrument cases that are closely uniform in dimensions and quality, absolutely rust-proof, resistant to corrosion, free from flaws, economical in transport charges, and easy to handle in installation.

### "The Return to Laissez Faire."

THE use of the expression "Laissez Faire" by Sir ERNEST BENN in the title of his forthcoming book has led in certain quarters to the impression that the book is concerned only with the fiscal controversy, and with questions of Free Trade and Protection. Nothing could be farther from the fact. Although Sir ERNEST is an old Free Trader, fiscal matters hardly find a mention in "The Return to Laissez Faire." The author holds that freedom of trade is a very much wider question than mere freedom at the ports or at international barriers. He claims that restrictions and restraints now put upon trade here, and in almost every country, by the mania for legislation, are far more serious than the restraints represented by any limitations on imports and exports. It is, or so Sir ERNEST argues in this latest book of his, foolish to talk of free trade, even though ports be open, when every action of the trader is limited by labour arrangements or legislative interference. This argument will certainly be endorsed by those having real knowledge of the history of electricity supply in this country.

### The Telephone Wire Contract.

IF one could overlook the seriousness of the action of a Government Department in placing abroad a large contract for bronze wire needed in the telephone service we would find something amusing in the idea of the Post Office being shocked over the existence of a "ring" or monopoly and deprecating profiteering, for it is perfectly plain that it is itself a monopoly of the most autocratic nature, and in many directions gives to those who are compelled to be its customers but poor value for their money. On the facts that are available it is exceedingly difficult to form any definite opinion as to the rights of the matter. The Post Office, on the one hand, alleges that the British manufacturers' prices were unconscionable, while the manufacturers, on the other, not only deny the allegation, but declare that they cut down their tender to a figure which left them no profit whatever. If the Post Office had always placed economy before all other considerations its attitude in the present case would have been more understandable. While the Government is appealing to employers to make jobs for the unemployed, one of its biggest spending departments is making it difficult for the employers to provide work for their existing workpeople.

### Radio Valve Royalties.

ALTHOUGH at the time of writing it is not clear whether or when the two thousand or so existing licensees will benefit from the two individual decisions of the Patent Office tribunal to reduce the Marconi patent royalty fee of 12s. 6d. per valve-holder to a minimum of 5s. for the first valve and 2s. 6d. for each additional valve in a radio receiving set, it is obvious that the recent general demands for relief will now be renewed with the added force that the decisions made in favour of two firms will give to such requests. As the tribunal points out in its report, a jurisdiction which places the patentee in the position in which he is no longer master in his own house, and gives to the Comptroller-General of the Patent Office the responsibility of determining whether the patentee has abused his monopoly rights and what his future course of conduct shall be, is of a far-reaching character, but it is a duty which must not be accepted in any spirit of temerity. In the circumstances, it seems to us that this responsibility has been exercised in a way which, in the long run, will be favourable both to the Marconi Co. and its licensees. Assuming that the new terms will in due course be extended to all manufacturers alike, the radio industry will be in a position radically to cheapen the cost of receiving sets, and by so doing will render unprofitable the activities of the "home-constructor." There are now in use in this country some thousands of home-made sets upon which no royalty has been paid, and the difficulty of detecting these evasions is so great that the patentees can never hope to recover more than a trifling proportion of what is due to them. With the elimination of the royalty-dodger it is reasonable to suppose that revenue from royalties paid by licensees under the new scale and on a greatly increased output, will more than compensate for the theoretical loss which the reduction would seem to entail.

### Electrical Trade with Russia.

IN spite of the somewhat difficult position with respect to trade with Russia, it seems that electrical firms at any rate, have found the means of keeping the trade door at least ajar if nothing else. As evidence of this fact, orders for electrical equipment to the value of £11 402 were placed in Great Britain by the U.S.S.R. during the April-June period, while goods actually shipped to Russia from this country amounted in value to £3 441. Though the majority of orders from the Soviet are for machinery of the hydro-electric type, there are nevertheless a considerable number of domestic electrical appliances finding their way into the country. Germany, of course, also shares the Russian market, but preference appears to be given to British-made machinery. In the words of a reader recently returned from Russia, the name of Britain "stinks" in that country, but notwithstanding the personal dislike of things British, it is recognised that British electrical machinery and apparatus cannot be surpassed. When we consider the difficult position which exists, both politically and commercially, between the two countries, it is something of a compliment to the electrical industry as a whole that we are able to value Russian patronage at over £10 000 when the neighbouring country of Germany has so much in her favour.

### Electricity Supply and Short Waves.

THE uses to which radio communication has been put are many and varied, ranging from private conversations between amateurs to arrangements for rescuing Polar explorers. The latest proposed development in the employment of radio is in the supply industry of the United States. In the near future a conference is to be held in Washington to discuss the allocation of bands of short wavelengths to different agencies throughout the States. According to the "Electrical World," the light and power industry is interested in this conference, in that it believes that it will be in the public interest if short wave radio services are opened by public supply companies. Under storm conditions telephone communications are apt to fail, and on past occasions when flood and tempest have done their worst, short-wave radio communication has proved very valuable. In addition to communication there are other applications of radio which supply companies would use to improve service or reduce the cost of service, as, for instance, the remote control of street lighting, of switches, etc., all of which operations are on the verge of complete development. In a country like the United States, where the areas of supply are so vast and the distribution system so subject to interruption from natural causes, the introduction of a communication system which would prove infallible would do much to better the whole service, and in many cases allow of sufficient warning being given, either to avert or at least reduce possible danger. In this connection it is interesting to note that so far back as 1921, a system of radio telephony was introduced into the Canadian Forestry Department as being the only safe means of communication in case of fire. The telephone it was found, when most wanted was either broken down or damaged by the intense heat through which its lines passed.

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# ELECTRIC HEATING BY LOW TEMPERATURE SURFACES.

## A System which is Advantageous to Consumers and Supply Authorities—Tubular Heating—Important Departures from Central Heating Practice—Wiring Methods.

By H. AMBROSE CARNEY

SOME of the earliest electrical equipment used for the heating of large rooms and halls was of the low temperature type. The results obtained were generally satisfactory, but for the fact that the lack of suitable materials rendered necessary frequent renewal of the elements; the system therefore lost favour.

A period ensued during which the tendency was to follow gas-fire practice, and, consequently, radiant heating by means of glowing resistances became general. In this form, however, electric heating is not at its best, except for occasional use where immediate local heat is required. This condition, however, is one which tends to impose a heavy peak load on the supply system without any compensating advantage in prolonged hours of use.

During the past few years considerable attention has been given, once more, to the development of electric heating equipment in which relatively large surface areas, heated to a moderate temperature, are employed. This equipment, the installation of which usually follows the general principles of central heating systems, has proved distinctly advantageous, both to the consumers and to the supply authorities. The latter secure a diversified load, of good load factor, which can be fitted into the valleys of the system curve with but little increase in the maximum demand.

If installed with proper controls, the low temperature system, therefore, justifies specially low rates for current, and it then becomes the most economical method of warming large buildings.

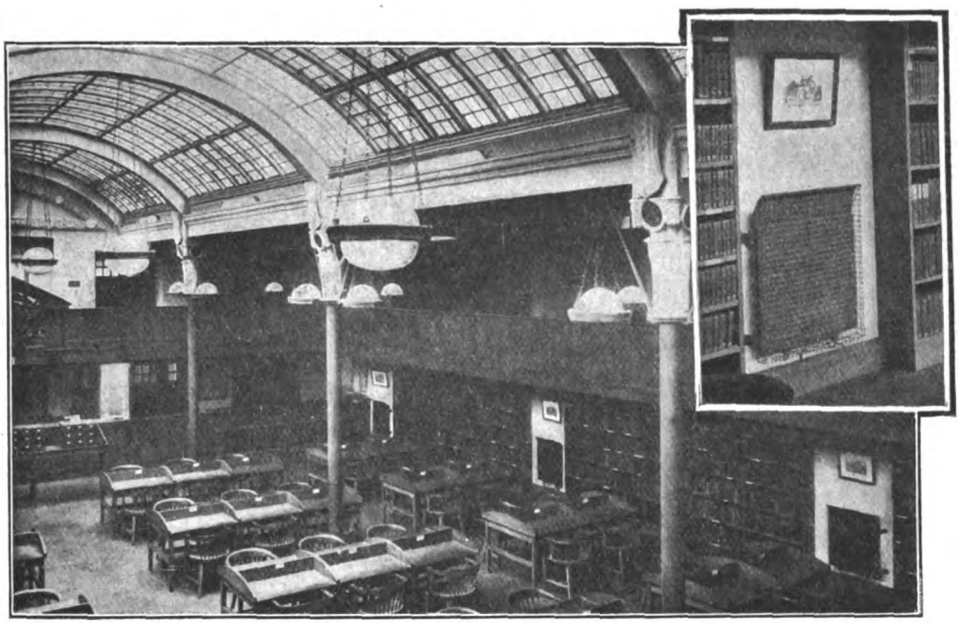

**Fig. 1.—An example of the Morganite radiator system; inset, a close-up of one of the units.**

### Alternative Methods.

The low temperature surfaces may be in the form of panels as in the Grierson system, or the Morganite radiator system, of which an example is depicted in Fig. 1. Another arrangement often adopted is the use of hot water radiators of the type general in central heating work, the heat being supplied by immersion elements. There are also various forms of low temperature convectors, and of these the best known is probably the "P.H." convector developed by officials of the City of London Co. who have encouraged low temperature heating by means of special rates.

Probably the most efficient and most generally applicable form of low temperature equipment for large and small installations is the pipe or tubular type, such as the Lightfoot and Unity systems. The tube system is usually constructed with wrought iron tubes of approximately 2 in. diameter, the length varying according to requirements from 2 to 17 ft. The usual load of such tubes is 60 W per ft. run, the surface temperature being then approximately 200 deg. F. (though it varies slightly according to the nature of the surface). The actual heating element, in a properly designed tube, is run at a black heat, and long life is thereby ensured. It is suitably arranged inside the tube and supported on porcelain or mica insulation surrounded by a relatively large air space. Sections of the Lightfoot and Unity tubes are illustrated in Fig. 2 on page 226.

### Governing Factors.

It is of interest to note that the ultimate surface temperature which will be attained by the tubular heater is dependent solely upon the extent and nature of the surface and the loading employed, but the time necessary to attain the final temperature will depend upon the mass of material used in the construction. Thus, a tubular heater having heavy porcelain insulators, and, therefore, a thick outer tube, would take longer to attain a given surface temperature than if light mica insulators enclosed in a thin tube were used. When the current is switched off, however, the thin tube would lose its heat much more rapidly than the heavy tube, so that the overall efficiency would be the same in both cases provided that the method of control were adapted to the requirements of the type of tubular heater employed. Heating and cooling curves of heavy and light tubes are indicated in Fig. 3.

Although the general principle on which low temperature electric heating is based is that of the central heating system, its application presents some important differences which must be considered if the best results are to be obtained.

It should be noted that in any given case the number of B.Th.U. necessary to provide a specified temperature rise will be lower where a tubular electric system is employed than where central heating or electric radiators are used. This is due mainly to the reduced area of hot surface in close proximity to the walls and windows, as is illustrated in Fig. 4.

The consequent reduction in heat requirement may be as much as 30 per cent., but it is usually in the neighbourhood of 20 per cent. It follows that the methods usually employed by architects when calculating the heating capacity required for rooms or buildings will give unnecessarily large loadings if applied to tubular electric installations, although of course, where electric hot water radiators are installed, the architects' calculations will be approximately correct, because the inherent disadvantages of concentrated heating units are present.

The most important factors which govern the number of heat units necessary to provide a specified temperature rise in a large room in a given time are:—

(*a*) The volume of the room.

(*b*) The ventilation, i.e., the number of times the air is changed per hour.

(*c*) The nature of the walls.

(*d*) The exposure, i.e., the proportion of outside walls and roof lights. (Walls facing north or east, or those exposed to high winds will lose more heat than similar outer walls in a more sheltered position.)

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For average conditions rooms having 9 in. brick walls (at least 70 per cent. of the wall surface being internal and the remainder having medium exposure), with an air change not exceeding 2½ times per hour, the allowances in watts per cu. ft. of space given in Table I may be used with certainty where a well-arranged tubular electric heating installation is contemplated.

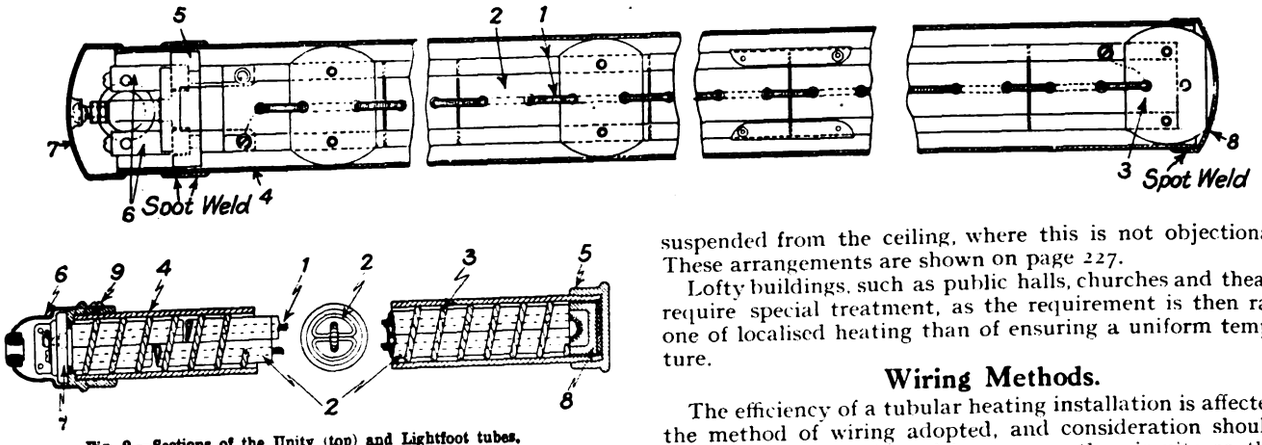


Fig. 2.—Sections of the Unity (top) and Lightfoot tubes.

TABLE I.—INTERMITTENT HEATING.

| Room Temperature desired | Loading in Watts per cu. ft. |
|---|---|
| 40 deg. F. | 0·2 |
| 50 deg. F. | 0·4 |
| 60 deg. F. | 0·75 |
| 70 deg. F. | 1·4 |
| 80 deg. F. | 2·5 |

The loading specified in Table I is sufficient to permit of the room temperatures being attained with reasonable speed when the outside air is at 32 deg. F. These constants are, therefore, applicable where the rooms are used daily for a few hours, so that heating up is required each morning.

In some cases (hospital wards and artificial silk mills, for example) it is essential to maintain a definite temperature day and night throughout the winter months. Under such conditions, a smaller loading as indicated in Table II is sufficient.

TABLE II.—CONTINUOUS HEATING.

| Room Temperature desired. | Loading in Watts per cu. ft. |
|---|---|
| 50 deg. F. | 0·3 |
| 60 deg. F. | 0·5 |
| 70 deg. F. | 0·9 |

In calculating the loading required for a building, each room must be considered separately. It is not desirable to assume less than 2½ changes of air per hour, but if the ventilation is likely to exceed this the loading for the room should be increased by 6 W per 1 000 cu. ft. of excess air moved per deg. F. difference between inside and outdoor temperatures.

If the window area exceeds 20 sq. ft. per 1 000 c. ft. of space, then the load of the room should be increased by 0·33 W per sq. ft. of glass per deg. F. difference between inside and outside temperatures.

## Determining Lengths and Positions.

The next step in planning the installation in any room is to determine the total length of tube necessary, and the most suitable positions in which to place it. For most conditions the standard loading of 60 W per ft. of tube is quite suitable, as it gives a reasonable heat distribution with a safe surface temperature. The cost per foot of a tubular electric heater decreases as its length increases. Thus a 9 ft. tube costs only twice the price of a 3 ft. tube, while a 15 ft. tube costs but three times the price of the 3 ft. tube. Moreover, the cost of wiring decreases approximately directly as the number of tubes. It follows, therefore, that the lengths of the individual tubes should be as great as possible—having regard to the walls, their recesses or buttresses.

As far as possible the tubes should be arranged evenly around the walls in order to give a good distribution of heat throughout. It is essential to see that sufficient heating surface is placed where the cold air enters, especially near doors and windows. In large rooms it may not be possible to accommodate the required length of heaters in a single row, and a double, or even a triple, row may then be necessary. In this case, however, it will usually be preferable to place some of the tubes above the skirting level, even on the cornices or suspended from the ceiling, where this is not objectionable. These arrangements are shown on page 227.

Lofty buildings, such as public halls, churches and theatres, require special treatment, as the requirement is then rather one of localised heating than of ensuring a uniform temperature.

## Wiring Methods.

The efficiency of a tubular heating installation is affected by the method of wiring adopted, and consideration should be given to the grouping of heaters on the circuits so that a reasonable degree of heat control is obtained throughout the room without upsetting the balance of the air currents.

In the case of small rooms it is sufficient to provide plugs on the skirting boards to control each tube. An alternative arrangement is to place the switches near the door, as in the case of lighting circuits. In large rooms it is desirable to run circuits feeding alternate heaters, and to control the groups by a multi-way distribution board placed in a convenient position. Where thermostatic control is employed (and its use is usually desirable to ensure the maximum economy), it is not necessary to use any other switches.

When specially low rates are obtainable, if the heaters are switched off during peak hours, the use of combined time and thermostatic switches is desirable, and their cost will be less than for separate time and temperature controls. The use of the combined time-temperature switches will also ensure that heaters in business premises are switched on early enough in the morning to attain a reasonable temperature by the time work starts.

Some consideration may usefully be given to the capital cost of tubular electric installations in competition with other systems of heating. Comparisons of the initial costs for a number of cases have shown that in general the tubular system is from 15 per cent. to 20 per cent. cheaper for equal service.

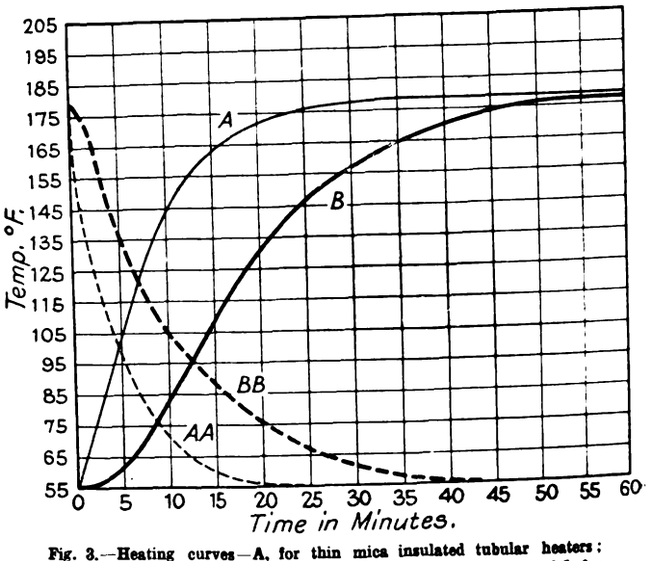


Fig. 3.—Heating curves—A, for thin mica insulated tubular heaters; B for thick tubes with porcelain inner tubes. Cooling curves—AA, for the thin tube; BB, for the thick tube.

This is largely due to the saving in building costs which results from the elimination of boiler rooms, bunkers and flues.

A very high degree of reliability has been attained, and at least two systems of tubular electric equipment carry a five years' guarantee. Maintenance costs are therefore very low, and in a well designed installation should be practically nil. There is, of course a direct saving due to the absence of labour for stoking. The extended heating surface mini-

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mises the damage to decorations which is so noticeable where hot water radiators are employed.

Taking into account the saving in interest charges, depreciation and labour, experience has shown that where current is obtainable for 0·75d. per kWh, electric heating on the low temperature tubular system is not more expensive in running

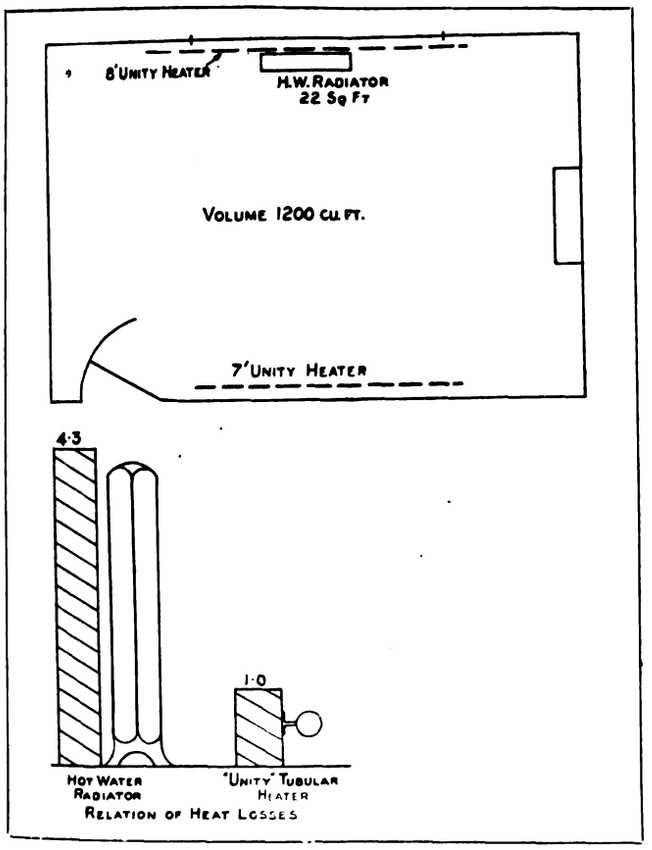


**Fig. 4.—Illustrating one advantage of the tubular electric system over central heating.**

cost than the ordinary hot water systems, and in most cases will even be cheaper. Where fuel is above the average price, or the capital cost of providing boiler accommodation is high, 1d. per kWh may be the economic limit. On the other hand, in some cases, especially near the northern coalfields, current must be obtained at 0·5d. per kWh or even at a lower rate before any real saving can be shown in comparison with central heating.

As the price of current is the determining factor in the extension of large scale electric heating for buildings the data

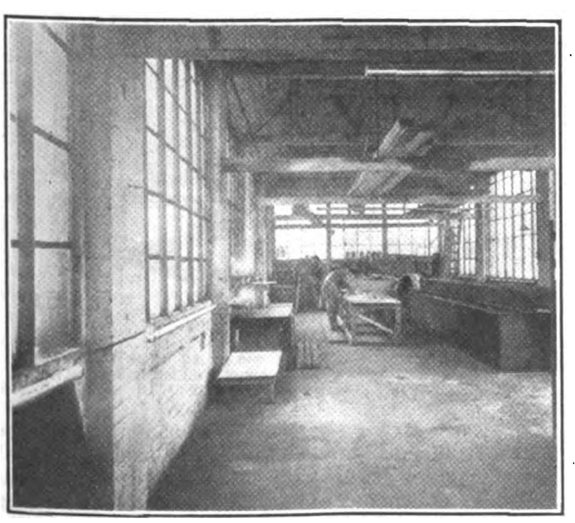

**Fig. 5.—Tubular heaters in a workshop (note the heater on the roof beam).**

in Table III may be of use as indicating the value of the load from the supply authority's standpoint.

TABLE III.—TUBULAR HEATER LOAD FACTORS.

| Nature of Building. | Annual Load Factor. Per cent. | Winter Load Factor.* Per cent. |
|---|---|---|
| Schools | 8 | 14 |
| Offices | 10 | 18 |
| Shops | 11 | 20 |
| Workshops | 11 | 20 |
| Works | 16 | 30 |
| Textile Mills | 20 | 35 |
| Hospitals | 24 | 42 |

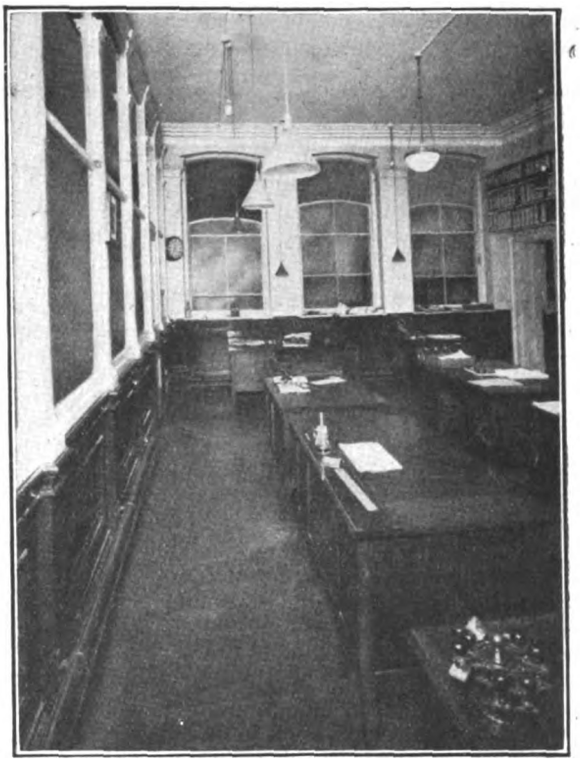

**Fig. 6.—Tubular heaters in a city office.**

The case is actually better than the table of load factors indicates, since it is comparatively easy to avoid peak hours without detriment to the efficiency of the heating. This is, of course, an advantage which power, light and radiant heating demands cannot possibly confer.

As a rough basis of estimating the annual consumption of various classes of buildings based on the volume of the space heated, Table IV may be used.

TABLE IV. ANNUAL CONSUMPTIONS, PER CU. FT.

| Nature of Building. | Annual kWh per cu. ft. |
|---|---|
| Schools | 0·5 |
| Offices | 0·7 |
| Shops | 0·7 |
| Workshops | 0·75 |
| Hospitals | 1·0 |

The potential value of the electric heating load is enormous, as will be appreciated from the figures in Table IV. It is a load which only awaits the concession of rates in which its load factor and non-peak demand are adequately recognised. Already there is a number of large installations at work, and reliable data is available regarding running costs and efficiency.

When installed, the tubular electric heating system is unobtrusive, as will be appreciated from the examples shown in Figs. 5 and 6.

The tubular electric system may be combined with other heating arrangements. For instance, the ideal system of residence warming would probably be by low temperature surfaces placed round the walls with an artificial fire effect in the grate—produced by an electric lamp. With this scheme heat could be cut off at peak loads, while the cheerful appearance of the fire would be obtained for a relatively small consumption.

Tubular heaters fitted near the roof in lofty buildings, such as public halls and churches, will counteract the objectionable downdraughts produced by ordinary radiator heating. In the same way the chilling effect of roof glass can be prevented.

* Assuming seven months per year as winter.

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# THE SERIES CAPACITOR.

## Construction and Operation of New Equipment Designed to Increase Load-carrying Capacity of Line and to Improve Voltage Regulation.

IN view of the interest shown by readers in the brief details, given under "Current Topics" last week of the "series capacitor," we reproduce below the substance of an article by Mr. E. K. Shelton, in the August issue of the "General Electric Review" (U.S.A.), which gives a fuller idea of the construction and operation of this equipment.

On March 2nd, 1928 (the article states), there was placed

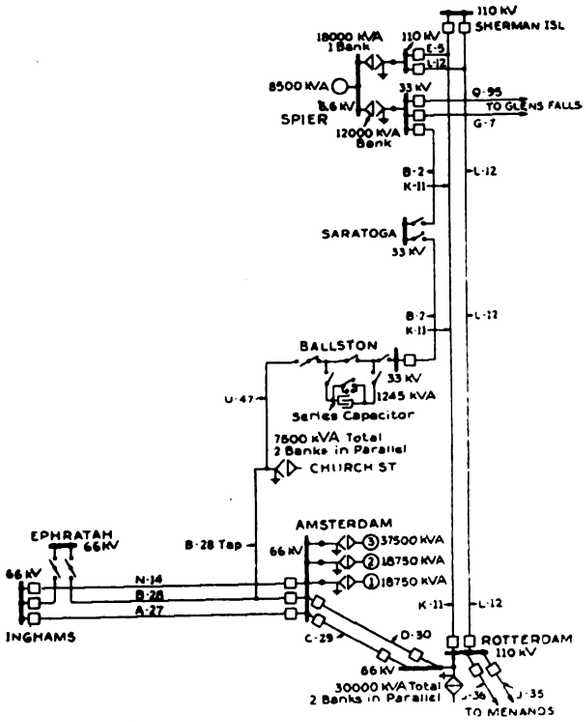


**Fig. 1.—A line diagram of the connections of the series capacitor installation on the system of the New York Power and Light Corporation.**

in commercial service on the lines of the New York Power and Light Corporation at Ballston (N.Y.) the first installation of its kind in the world; a series capacitor for the compensation of transmission-line reactance. With the closing of the control switches in the sub-station, three single-phase 415 kVA capacitors were cut into the 33 000 V three-phase circuit running from Ballston to Amsterdam. The immediate effect was an increase of the load current in this circuit from 33 to 67 A, and a very appreciable increase in the voltage on the distribution buses at Ballaston.

These actions illustrate one of the possibilities of the series capacitor: viz., the control of load distribution over loop circuits. The Ballston-Amsterdam 33 kV circuit forms a part of one side of a loop system between the Spier Falls generating station and Amsterdam. With the compensation of the inductive reactance in the Ballston-Amsterdam circuit, the total impedance in that side of the loop is reduced, and a corresponding increase made in the load-carrying capacity of that line.

The use of the series capacitor to compensate for transmission-line reactance is a new advance in electrical engineering, for the practical application of such a capacitor has presented problems that, until recently, had been unsolved. The solution, as represented by the Ballston installation, includes several interesting engineering achievements.

### The Fundamental Principle.

The fundamental principle involved is the compensation of the inductive-reactance effect of the line by the introduction of capacitive reactance in series. This eliminates the line inductive reactance as a factor in voltage regulation and load limitation, and leaves only the factor of line resistance. In other words, with 100 per cent. compensation of the inductive reactance of the line, the line as a unit is tuned to the fundamental 60-cycle frequency. Therefore, as far as the line alone is concerned, the current during a short-circuit period would be limited only by the ohmic resistance of the line. In actual operation, however, this excessive flow of current does not take place, for in a transmission system there is other inductive reactance (generators, transformers, connecting transmission lines, etc.), besides the line reactance, that is compensated for by the series capacitor. Thus, the short-circuit current is limited by the *system* reactance.

Short-circuit currents may, nevertheless, build up to ten or twenty times normal load value, and if permitted to pass through the series capacitor would cause ten to twenty times the normal voltage drop across the capacitor. Obviously, means must be provided for protecting this unit from such high voltage conditions.

### Compensation for Line Reactance.

In the Ballston installation the line reactance is 24 per cent. to neutral. To compensate for this reactance a capacitance of 110 μF per phase is required. Each single-phase capacitor unit is rated at 415 kVA, 3 170 V, 132 A at full load, 60 cycles; and is insulated from ground of the line potential of 33 kV. The location of this series-capacitor installation, and its connections to the adjacent system of the New York Power and Light Corporation, are indicated on the line diagram in Fig. 1.

The series-capacitor assembly of the required microfarad rating is built up of units similar in appearance and detail to the capacitors ordinarily used in shunt connection on industrial power circuits for power-factor correction. The same oil-treated paper dielectric is employed, and the unit assemblies are contained in hermetically-sealed cases. The group of units for the 415 kVA assembly is rigidly mounted on an angle-iron rack structure which is in turn, as shown in Fig. 2, mounted on an insulating rack to provide the insulation required to ground for the 33 kV line potential. The rack and capacitor cases are electrically connected to one terminal of the capacitor bank in order to maintain a definite

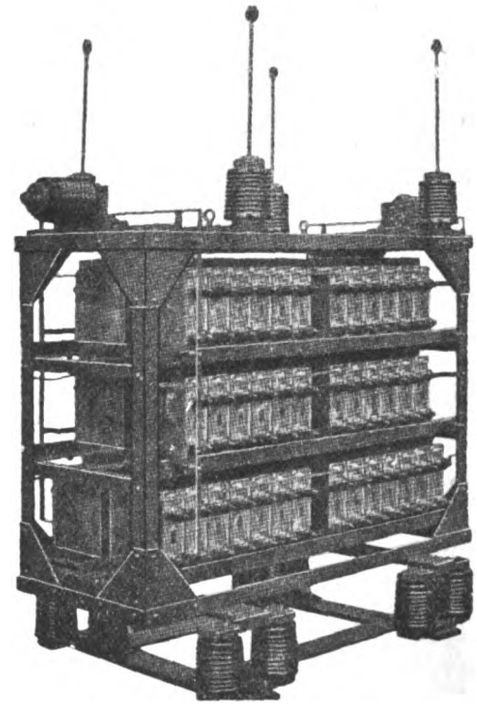

**Fig. 2.—Internal assembly of one of the 415 kVA, 3170 V single-phase series capacitors mounted on insulating rack for 33 kV line potential.**

potential on the structure. The whole assembly is immersed in oil in an elliptical steel tank. The oil is required only as insulating medium, because the loss in the capacitor is almost negligible (amounting to only 750 W at full load rating for each single-phase capacitor).

To visualise the capacitor in another way, each single-phase assembly represents an area of 6 200 sq. ft. of dielectric, or a bulk of approximately 800 lb. of paper, through which the power load on this circuit is transmitted.

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The protective equipment is designed to take care of two possible abnormal conditions: first, a short-circuit of the line on the load side, which would throw line voltage across the capacitors; and second, a dielectric failure in the capacitor itself, which would shunt the load current through the short-circuited section.

To provide this two-fold protection a combination of

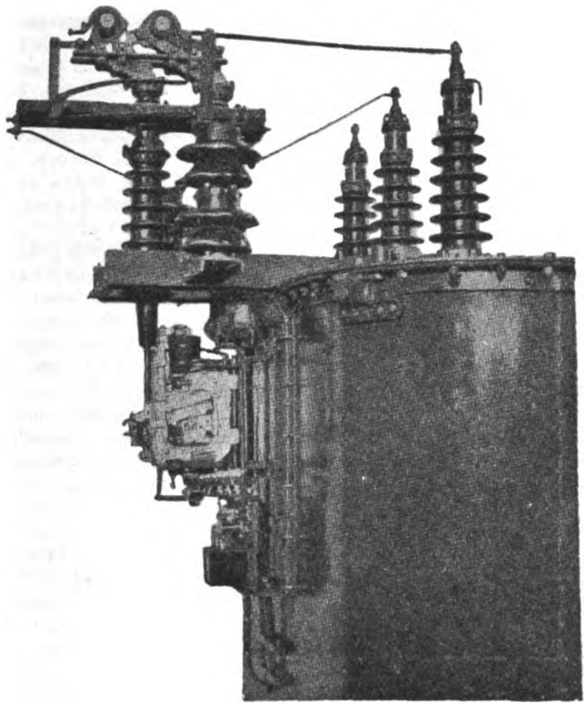

Fig. 3.—A view of the capacitor protective equipment.

a special spark-gap and a shunting contactor, actuated by a high-speed mechanism, has been developed and tested under conditions of short-circuit current many times that which can be obtained under actual service operation. Fig. 3 shows the protective equipment, with housings removed, mounted on the tank and cover of the capacitor assembly. The spark-gap is formed of tungsten-faced hemispherical electrodes, to give fast operation and to avoid pitting and burning of the gap, incident to the severe arcs caused by short-circuit currents. This sphere-gap, combined with a powerful magnetic blowout and with shunting contacts, is mounted on insulators on an extension of the tank cover. The high-speed mechanism with the control relays is supported on the side of the tank directly below. The mechanism operates the contacts by means of an insulated rod carried up through one of the gap-supporting insulators.

## Adjustable Sphere Gap.

The sphere-gap is adjustable, and for this installation is set to break down at 150 per cent. of normal full-load voltage drop across the capacitor. When, due to short-circuit or overload, the voltage across the capacitor rises to this value, the gap arcs over, forming a shunt path for the short-circuit line current, thus preventing further rise of voltage across the capacitor. Through control relays, operated from current transformers in the line and gap circuits, the overload current trips the high-speed mechanism which then closes the shunting contactor and extinguished the arc at the sphere-gap. The mechanism operates extremely fast. It completes its performance within 0·01 sec. In addition to its closing function, the high-speed mechanism is adjusted to open the shunting contactor and cut the capacitor back into service when the line current has decreased to approximately normal full-load value.

Thus the protective equipment automatically short-circuits the capacitor at a predetermined voltage, introducing the line reactance with its current limiting effect, and then cuts the capacitor into service again when circuit conditions become normal.

To protect against the possibility of a dielectric failure with the capacitor, the high-speed mechanism is designed to trip automatically and close the shunting contactor. This is accomplished by means of an impedance relay which has normally balanced current and potential windings energised for current and potential transformers connected across the capacitor.

Since current and voltage increase in direct proportion with respect to the capacitor, the balance is maintained at all loads. Should a failure of dielectric occur, the potential winding of the relay is de-energised and the relay closes its contacts, tripping the high-speed mechanism and short circuiting the capacitor. In this operation, all three units are short-circuited out of service and are locked out until a relay is reset by hand.

The current and potential transformers required for the operation of the control circuits are supported from the tank cover over the capacitor assembly. The third bushing on the cover is employed to bring out the gap circuit through a current transformer which is separate from that carrying the normal load.

## Wide Operating Range.

This protective equipment was thoroughly tested at the factory for the complete range of short-circuit-current values up to 10 000 A and operated with entire satisfaction at all values. The same protective scheme can be applied to series capacitors for either higher or lower circuit voltages.

Other possible methods of protection have been considered and tested, but they lack the effectiveness and reliability of the one which has been here described. The service results of this first installation have continued the satisfactory record made at the factory. With the elimination of line reactance, alternating-current transmission takes on the advantages of direct-current transmission. Where line reactance limits the load that can be carried over a given circuit, the application of a series capacitor may easily double the load capacity of the circuit.

Great interest in the development of the series capacitor has been evidenced by the larger utilities, and the operation of the Ballston installation is being closely observed by transmission engineers. This pioneer installation will be followed by others as soon as the usefulness of the series capacitor is fully appreciated.

# INTERNATIONAL ILLUMINATION CONGRESS.

## British Visitors to the U.S.A. Meetings.

LAST Saturday morning the British delegates to the first World Congress on Illumination to be held in connection with the plenary meeting of the International Commission on Illumination in the U.S.A. during September left Southampton on the "Tuscania." The party, which was photographed for THE ELECTRICIAN (see page 243) before entering the boat train, includes, in addition to Mr. C. C. Paterson and Dr. J. W. T. Walsh, President and Secretary respectively of the Commission, Mr. W. E. Bush (Electric Lamp Manufacturers' Association), Mr. J. F. Colquhoun (Corporation of Sheffield), Mr. P. Good (Institution of Electrical Engineers), Dr. W. M. Hampton (Messrs. Chance Bros.), Mr. L. B. W. Jolley (General Electric Co., Research Laboratories), Prof. J. T. Macgregor Morris (Institution of Electrical Engineers), Mr. J. W. Ryde (General Electric Co., Research Laboratories), Major G. H. Spittle (Railway Clearing House), Mr. E. J. Stewart (Corporation of Glasgow), Mr. J. M. Waldram (John Waldram and Son), and Mr. G. Wilson (General Electric Co., Research Laboratories).

Upon arrival at New York the delegates will take part in a tour, commencing about September 5th, including visits to Boston, Washington, Cleveland, Detroit, Chicago, Niagara Falls, Toronto, and possibly other cities.

At the conclusion of the tour the visitors will attend the twenty-second annual convention of the Illuminating Engineering Society in Toronto from September 17th to 20th, after which they will proceed to Saranac, N.Y., for the meetings of the International Commission on Illumination from September 22nd to 28th.

The various aspects of illumination which will be dealt with at the sectional meetings at Saranac include "Automobile Headlighting," "Daylight Illumination," "Factory and School Lighting," "Research on Glare," and "Street Lighting," while an International Symposium will deal with "Residence and Show Window Lighting Practice," "Lighting for Aviation," and "The Status of Lighting Education."

Countries represented on the International Commission include Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Japan, Switzerland, and the United States.

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# BOOK REVIEWS.

**History of Radio Telegraphy and Telephony.** By G. G. BLAKE. (London: Chapman and Hall.) Pp. xix +425. 25s. net.

The present volume is intended by its author to bring into prominence the many almost forgotten wireless schemes and devices in the hope that new ideas may spring therefrom. It is intended to be a history of principles and inventions rather than a record of commercial wireless. This is an excellent object, as one is continually hearing of old devices being "rediscovered," and hailed as epoch-making inventions.

The book covers a very wide field, and describes many inventions in telephony and other subjects which have no direct bearing on radio, but which constitute useful information for the experimenter. Indeed, it is for the experimenter that the book seems to be primarily suited.

One of the most useful features of the work is the very complete reference list or bibliography at the end containing over 1 100 references to sources of additional information.

The earlier chapters deal with the growth of electrical signal systems, and the first attempts at wireless communication by conduction and other systems.

The discovery of ether waves is next described, and the various wave detectors of coherer, magnetic, electrolytic and crystal types are enumerated and explained.

The subject of practical radio telegraphy is then dealt with, and the various spark, arc and other systems described.

Chapters on the thermionic valve, direction finding, and miscellaneous subjects conclude the volume.

In many cases the amount of space devoted to subjects seems to be in the inverse ratio to their importance, and we find what are usually regarded as trivial devices sometimes described at great length, while relatively important ones are sometimes ignored or dismissed in a few words.

There are a number of points in this book which seem to require amendment; for example, on page 310 it is stated that the length of a Beverage antenna is considerably greater than the wavelength of the received signals. In practice very little advantage arises in making such an aerial more than a wavelength long, and this is the usual limit for such aerials. The great advantage of such an aerial, and practically the sole reason for its use, is the directional property, and this is not appreciably increased with increase of length beyond one wavelength.

On page 331, under the heading of "The British Broadcasting Co.'s Wired Wireless Achievement" a description is given of a demonstration in which a conversation between London and Bristol, carried out by "wired wireless," was extended by ordinary telephone lines to Marconi House and broadcast by the B.B.C. It should be pointed out that the wired wireless transmission was carried out over the Post Office lines by apparatus designed and installed by the Post Office engineers. As this was the only outstanding feature of the demonstration these facts should surely be mentioned.

These points are nevertheless only minor faults, and the book can be recommended as one likely to be useful to the experimenter, either in a professional or amateur capacity.

E. H. S.

**Induction Motor Practice.** By A. M. DUDLEY. (London: McGraw-Hill Publishing Co.) Pp. xi+236. 12s. 6d.

This book is intended for operating men and students to help in the solution of practical problems involving induction motor characteristics. It would not be of much value to the designer except where it gives details of American manufacturing practice, which differ in some respects from English practice. The machines and parts illustrated are nearly all of Westinghouse Electric and Manufacturing Co., U.S.A., design, and it is probable that the methods of manufacture described are also those of the same company.

There is practically no mathematics used in the book, and no attempt is made to give exact proof of the various statements made regarding the characteristics of the induction motor and the calculation of the efficiency and power factor from no load and locked rotor tests. Some of the rules given are not mathematically correct, and only hold within certain limits.

The author describes in a popular way how torque is produced in a direct-current motor, and also, in a similar way, the fundamentals of alternating current such as frequency, phase, wattless current and power factor. An attempt is then made to explain the rotating field by vectors and diagrams of flux distribution.

The general mechanical construction of the induction motor, the windings and insulation are briefly dealt with. The illustrations showing the mechanical construction of small or medium-size induction motors are very good. Stator windings are also briefly dealt with, but those shown are all of the two coil per slot type used in America, and no reference is made to the single coil per slot windings which are so common in Europe. There is no doubt that the two coil per slot winding with diamond shaped coils, or, as it is generally called, the two layer lap winding, has many advantages. With the increasing demand for quiet motors and uniform smooth acceleration with no dips in the torque speed curve, this type of winding will become more generally used in Europe. For detailed information on windings the author refers to his more extended treatise, "Connecting Induction Motors."

The merits and demerits of the slipring and squirrel-cage rotors are considered from the point of view of the practical application of the motors. It is novel to find the well-known Boucherot or double squirrel-cage type of rotor referred to as the squirrel-cage rotor with double deck winding. The speed torque curves of motors with the following types of rotor are discussed:—(i) low resistance squirrel cage; (ii) double squirrel cage; (iii) high resistance squirrel cage; (iv) wound rotor with sliprings. This information should be of interest to engineers who have to consider various applications of induction motors without a knowledge of their fundamental principles and characteristics.

One is pleased to note that mention is made of the elementary, but important point, that it is essential to have an appreciable amount of resistance in the rotor of a squirrel-cage motor if it is to work in combination with a flywheel. If many of the people who draw up specifications for induction motors would study these speed torque curves we would not find requests, as we frequently do, for starting torques and currents that are perfectly impracticable. For example, we find statements in specifications to the effect that the squirrel-cage motors must be capable of starting against twice full load torque with a current not exceeding twice full load current.

The section of the book dealing with control is very scrappy, but like several other sections of the work it does attempt to include modern practice such as the use of thermal relays in place of fuses for the protection of motors. In considering the use of two-wound rotor motors operated by one controller, the rotor windings being in parallel, the author is obviously not acquainted with developments in this country. He states that this may only be attempted when the motors are rigidly coupled, and even then he considers it very difficult. Actually, cranes have been equipped with two slipring wound motors not mechanically coupled, but worked at the same speed, and whose rotors were controlled by one controller.

It is obvious from the book that the star delta starter is not used in America to anything like the same extent as it is in England, as one finds no reference to it in the section dealing with control.

A few useful constructional hints are given regarding the mechanical features which have to be specially considered relatively to the installation and service of motors. As a good motor is often spoiled by being installed in the wrong situation, or with the wrong type of drive, the brief notes given by the author on this important subject may be appreciated by the class of reader for whom the book is specially written.

The inclusion in the book of detailed instructions for the construction and use of the circle diagram is hardly to be commended. Modern theoretical and experimental investigations have shown that the original Heyland diagram is only approximately correct. The construction described by the author follows closely the method of Heyland, and is, therefore, likely to give the same errors. It is sometimes difficult to get operating and consulting engineers to understand that if the power factor, efficiency and maximum torque of a motor as obtained by the Heyland circle diagram do not agree with the results obtained by more exact measurements and tests, the error is in the Heyland diagram. This is particularly the case with small motors of very slow speed and high overload capacity.

The author of this book has for a number of years been answering questions on the induction motor in "The Electric Journal." Many of these questions and answers have been reproduced in the final chapter of this book, and this chapter actually forms more than one third of the whole book. To those who believe that the best equipment for solving

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detailed problems is a sound grip of the fundamentals, this section will make very little appeal. The value of the work would have been enhanced if, in place of this section, or in addition to it, there had been a more extended treatment of the general theory, with a few exact yet simple proofs. One fears that the operator or student will find that his problem is just one of the many that have been omitted from the question box, and that he has not found sufficient in the book to enable him to reason out a solution of his problem.

On the whole, the book is a useful addition to the literature of the induction motor. To the operating engineer trained chiefly on the maintenance side, and who desires to get some detailed information on the construction and characteristics of the induction motor, this book can be recommended.

H. JACK.

## I.E.E. STUDENTS' TOUR.

### Interesting Ten-Day Trip on the Continent.

HOLLAND and Western Germany were chosen for the annual summer meeting of the Students' Section of the Institution of Electrical Engineers. The party, numbering thirty-one, including members from the provincial centres, left Liverpool Street Station on Saturday evening, July 28th, for Harwich and the Hook of Holland. Landing early on the Sunday morning, the party immediately entrained for Rotterdam, where a couple of days were spent.

On the Sunday afternoon a visit was made to the Hague and Scheveningen, the popular Dutch seaside resort. The following morning the electrical manufacturing works of Messrs. Willem Smit, Slikkeveer, Rotterdam, were visited, and in the afternoon the party inspected, at the Delft works of the Nederlandsche Kabelfabriek, the manufacture of paper insulated cables.

The same evening the party left for Utrecht, where, on the Tuesday morning, the central power station was visited, and in the afternoon the Electrotechnische Mechanische Industrie, makers of electric fans.

In the power station, built in 1924, were noticed boilers of a well-known English make although all the other machinery was either Dutch or German.

Unfortunately, the weather changed on Wednesday, and the party left Utrecht for Eindhoven, in a downpour of rain. On arrival at Eindhoven the party was met by Mr. R. J. Castendijk, of Messrs. Philips Lamps, and was taken round the town in a char-à-bancs, then on to the works, passing through the "Philips' Village." After luncheon, at the invitation of Messrs. Philips Lamps, an interesting afternoon was spent watching the manufacture of lamps.

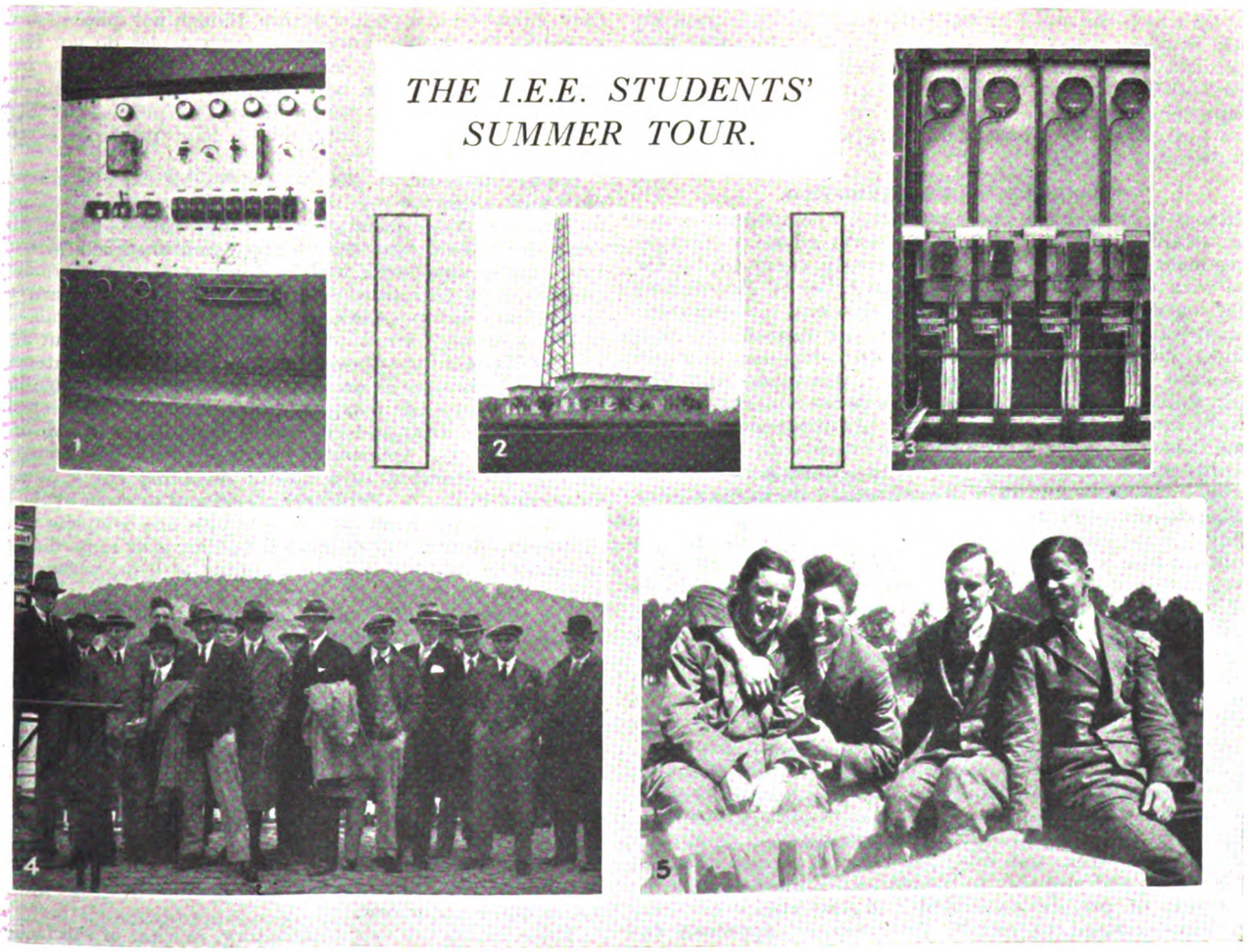
After leaving Eindhoven, Essen was the next stop, where a visit was made on Thursday to Messrs. Krupps' works, where at the present time agricultural machinery, locomotives, stainless steel and car chassis are being made.

Friday again saw the party on the move, Cologne being the destination, although the journey was broken at Düsseldorf to visit the Matthes Fisher works, one of the largest works in Europe manufacturing tin boxes. On Saturday morning the party had the opportunity of seeing the Cologne Broadcasting Station, both the studio and transmitting station being inspected.

On Sunday the majority of the party went by train to Coblence and back down the Rhine by steamer; but unfortunately the trip was spoiled by rain, which fell all day. At dinner on the Sunday evening a small presentation was made by members of the party to Mr. S. H. Hart, hon. secretary of the London Section, in appreciation of his work in connection with the tour.

On Monday the last visit of the tour was made to Messrs. Felten and Guilleaume's works, where the manufacture of the steel strands for a new suspension bridge over the Rhine was seen, in addition to wire drawing and rolling, the drawing of copper and brass tubes, and the manufacture of cables.

From Cologne the party returned direct to London, which was reached on Tuesday morning, August 7th. In all, about 1 100 miles were covered, and a very enjoyable and instructive ten days' holiday spent on the Continent.




*THESE pictures, taken during the Continental tour of the I.E.E. Students' Section, show :—(1) The control panel at the Cologne broadcasting station; (2) the Cologne radio station buildings with part of one of the aerial masts; (3) a rear view of a cable control panel at the central power station at Utrecht; (4) the party waiting for a train at Coblence; and (5) a happy group snapped in one of the intervals between works visits.*

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# AMERICAN LETTER.

## Further Consolidations Rumoured in the Electricity Supply Field.

By FRANK C. WELLS (News Editor of the "Electrical World.")

NEW YORK, AUGUST 11TH, 1928.

DESPITE the praiseworthy spread of the vacation habit in recent years in the American business world, midsummer does not become a period of complete dullness in industries so large and so active as the one concerned with the production of electricity. No matter how many of its captains may be absorbing culture at Oxford, amusement at Paris, art at Florence or medicinal waters at Bad Nauheim, others are left for whom ninety in the shade has no terrors. Age cannot wither, for illustrious instance, the infinite variety of Mr. Edison, who pauses in his investigation of indigenous rubber-yielding plants only long enough to bestow approval upon new Kodaks which may bring colour photography within the reach of all; nor can custom stale the financial re-alignments of light and power capital, on whose checkerboard black takes white, and white out-manœuvres black, in a race for the king rows where the biggest companies sit in dignity, save when they descend to chase other kings or ordinary pawns around the field.

In this popular sport of "corporation magnates," two kinds of play are apparent—that of the speculator or the forestaller, who buys here, there and everywhere in an effort to get richer quick by selling again, and that of the business logician, whose extensions and consolidations tend to compactness of territory, and hence to efficient and economical service. The speculator is a menace. The consolidator is simply following the trend of his time, and his operations deserve impartial observation and judgment on their individual merits.

The largest consolidation in the electric light and power world—for newspaper rumours of a great transaction by which the "Mellon interests" will take in all the chief light and power companies on the North Atlantic Coast may be discounted for the present—is the "billion-dollar" one embracing the Brooklyn Edison Co. and the Consolidated Gas Co., by which the stock of the former will be exchanged for stock of the latter.' The Consolidated Gas Co. has long controlled all the light and power companies in the Greater New York district save the Brooklyn Edison and one or two of comparative insignificance, and the "Brady interests" which have dominated the Consolidated Gas have also dominated the Brooklyn Edison.

### Obstacles to Amalgamation.

Now it is proposed to make the latter a component, rather than an allied member, of the great system, whose original gas investments are to-day—just as recently came to be the case with the United Gas Improvement Co. of Philadelphia—far outweighed by its electrical possessions. The amalgamation was not achieved without hurdling obstacles. Stockholders' consent was received by both companies, a *prima facie* case for economy and efficiency was made, the New York Public Service Commission (authorisation from which was, by law, essential) seemed favourably impressed, and then came the attorney for a citizens' committee with proclivities towards public ownership to demand a hearing before the Commission, and to be put off with permission only to file a brief.

The disappointed attorney appealed to Governor Smith, laying special emphasis on the contention that the merger might make more difficult the Governor's plan for the State development of hydro-electric sites on the St. Lawrence River and elsewhere; the Governor telegraphed the Commission requesting that it listen to any opponents of the plan desiring to be heard; the Commission by a partisan tie vote—two to two, the fifth member being ill—failed to accede to the Governor's request.

Coincident with these proceedings the City of New York registered written opposition, not to the transaction itself, but to the terms of the exchange of stock, in which Brooklyn Edison shares were valued at the high price to which they had soared in the market under the stimulus of the anticipated merger, and not at their book value. Finally, the Commission met again this week, and—over the vigorous protest of one of its members, and probably to the aid and comfort alike of the opponents of private ownership and the critics of State regulation—refused to reopen the case and approved the merger, though with a stipulation intended to prevent any possible inclusion of the surplus market value of Brooklyn Edison stock in a future rate base.

Such are the vicissitudes of electrical combination and centralised production—hailed by its enthusiasts as the twentieth century method of accomplishment and a vital factor in extending the triumphs of the Electrical Age, condemned by its critics as a surrender of the people's rights into the greedy hands of money grabbers and industrial tyrants. The ultimate criterion—though perhaps not the true one—that will be applied will be the price charged for energy, especially to the domestic consumer. The city authorities point to five cents a kilowatt-hour as the goal. It remains to be seen whether the metropolitan subsidiaries—for Brooklyn could not be allowed to undersell Manhattan—can and will make this substantial cut from the seven cents they now charge.

### Preserving Niagara.

An interim report made by the special International Niagara Board appointed by the Governments of the United States and Canada to determine how the scenic beauty of Niagara Falls and of the rapids above them can best be maintained, and by what means and to what extent the impairment thereof by erosion or otherwise can be overcome, has been published. This report maintains that the Falls are in no danger of "committing suicide" and that the more elaborate plans put forth to regulate their flow by means of extensive engineering structures in the stream are therefore uncalled for. It is held, however, that remedial works at Horseshoe Fall should be undertaken in order to rewater its flanks.

# CABLES FOR MINES.

## Interesting Tests with New Types of Trailing and Other Flexible Cables.

FLEXIBLE cables for use underground in coal mines fall into two classes:—(*a*) For use with fixed apparatus; (*b*) for use with portable apparatus.

In the former class are cables for use with coal conveyor plant, which are usually paid out from a drum or a pair of bollards, as the coal face advances, and it is necessary that they should be of a pliable nature, though not quite so flexible as cables for trailing purposes. Such cables do not require the separate earth core demanded by the regulations in the case of cables for use with portable apparatus, and some special cables recently supplied for this purpose by British Insulated Cables Ltd., are said to have produced excellent results.

Each conductor of the 3-core flexible cable is composed of tinned copper wires, insulated with pure and vulcanised indiarubber Association 660 V grade, cores coloured differently and cabled together, wormed and sheathed with cabtyre rubber, armoured with a layer of stranded armouring composed of galvanised steel wires, and either hard cord braided and compounded, or cabtyre sheathed overall.

The following particulars of experiments carried out at the Helsby Works of the above company may prove of interest.

The test consists of drawing a short length of cable backwards and forwards over two grooved pulleys, one of these pulleys being fixed and the other hanging on a loop of the cable under test. One end of the cable under test is fixed and the other connected to a slowly revolving crank, and the suspended pulley is alternately raised and lowered at the rate of 502 cycles per hour (one cycle equals one complete up and down movement). The suspended pulley is of 12 in. diameter, so that the cable is bent to a radius of 6 in. when passing round this pulley.

The length of cable under test consists of about 7 ft. and the specification of a particular length recently experimented on is as follows:—117/0·018 ins. 3-core, each core insulated with pure and v.i.r. Association 600 V grade, 3-cores wormed and sheathed with cab-tyre sheathing (having a radial thickness of 0·126 in.) armoured with 28 groups of galvanised steel wires, each group consisting of 19/23 s.w.g.

The cable was cab-tyre sheathed overall with a radial thickness of 0·150 in.

This cable was subjected to alternate raising and lowering at the rate of 502 cycles per hour, and during the whole period was kept under continuous observation, with daily tests. No fewer than 420 000 cycles were completed before one core broke down under test.

These results are very satisfactory, in view of the fact that two other cables of different build, but designed for the same service, gave trouble after 85 000 and 130 000 cycles, respectively.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## The "London Electrical Engineers."

[To the Editor.]

Sir,—I was amazed to learn from your interesting illustrated account of the work of the 26th Anti-Aircraft Battalion R.E. (T.A.) that while a gas undertaking has provided one complete company for this unit, none of the big London electricity supply authorities, either company or municipal, have seen fit to encourage their staffs to take up this very interesting and nationally important work.

This attitude is in striking contrast with that adopted at the outbreak of the South African War in 1899, when a detachment of about 300 men of the then recently formed Electrical Engineers Volunteers under Col. (then Major) R. E. Crompton were permitted by their employers—mainly supply undertakings—to volunteer for war service overseas.

As this important section of the Territorial Army was founded by two eminent past-presidents of the Institution of Electrical Engineers (Dr. John Hopkinson and Col. Crompton), it seems to me to be fitting that the Institution should again take a hand in the work of restoring the A.A. Battalions to their full effective strength. The I.E.E. Students' Section, particularly, might well provide a detachment.

I am, etc.,
"T. D."

London.
August 25th.

[We understand that the London Students' Section of the I.E.E. is now considering the possibility of forming a searchlight detachment to serve in the London Electrical Engineers.—Ed.]

## Pure Food.

[To the Editor.]

Sir,—Recent reports of illnesses and deaths arising from the consumption of contaminated food appear to have had the unfortunate effect of inspiring misguided advocacy against the greatest pure food reform ever adopted in this country.

The "Public Health (Preservative and Colouring Matter in Food) Regulations, 1925," were actually long overdue. Our regulations are certainly not more stringent than those which have been in successful operation in America for a long time. America keeps healthy without introducing chemical preservatives into food simply because she is more advanced in regard to refrigeration.

I submit that there is no logical reason for suggesting a return to dangerous chemical preservatives, but that ample provision should be made forthwith for refrigeration, which is the only certain means of ensuring pure food.

I am, etc.,
V. W. Dale,
Business Manager,
The British Electrical Development Association Inc.

London, W.C.2.
August 21st.

## "Looking Backward."

[To the Editor.]

Sir,—In reading your weekly series of "peeps into the past," one often finds interesting parallels with current events. The reference last week to the activities twenty-five years ago of the company which used to exploit the alleged therapeutic use of electricity in finger rings reminds one that the public is still being appealed to with a variety of appliances which are claimed to produce all sorts of marvellous effects by means of electricity.

In recent weeks I have seen large-space advertisements in national daily newspapers of electric combs which do not need recharging, and of what is, apparently, the old shocking coil under a new name, which is put forward as a cure for most of the ills to which the flesh is heir.

Careful inspection of the claims made for most of these devices shows that the statements are not sufficiently specific to warrant any imputation of misrepresentation. The implications, however, are not entirely helpful to the obviously beneficial effects of electricity when scientifically administered by means of approved apparatus.

I am, etc.,
"Electromedic."

London.
August 27th.

[Writers of letters to the Editor intended for publication are notified that the Postmaster-General, following representations by the "Newspaper World," has decided to admit such letters at the inland printed paper rate of postage. It is, however, essential, if risk of surcharge is to be avoided, that the words "Manuscript for Press" should appear in the top left-hand corner of the address side of the cover.—Ed.]

# LOOKING BACKWARD.

## Electro-culture Experiments Initiated Fifty Years Ago.

FIFTY years ago, as recorded in The Electrician dated August 31st, 1878:—

The telephone was about to be utilised in the German Army.

Inventors were invited to produce some economical substitute for wooden telegraph poles for use in India.

Prof. W. E. Ayrton, who had come over from Japan for the purpose, read his paper on "A New Determination of the Number of Electrostatic Units in the Electromagnetic Unit" before Section A of the British Association.

Experiments in the effect of electricity on plant growth were being conducted in France. Tests started in 1877 had demonstrated that plants completely protected from the action of atmospheric electricity were much inferior in size and weight to those not so treated. It was concluded "that the electricity of the atmosphere is equally necessary to vegetation as sunlight, air and water."

Shareholders of the Indo-European Telegraph Co. approved a proposed co-operative working agreement between the Indo-European Telegraph Department of Her Majesty's Indian Government, the Eastern Telegraph Co., and the Indo-European Telegraph Co., for the division between the three organisations of the revenue derived from the transmission of Indian and trans-Indian messages.

* * *

Twenty-five years ago, according to The Electrician of September 4th, 1903:—

According to prices given in tenders accepted 14s. 6d. per point was paid on London wiring contracts.

Brighton Lighting Committee decided that premises provided with a time switch should be supplied with electrical energy at 1d. per kWh after 8 p.m., instead of after 10 p.m.

Mr. E. A. Barker, then assistant electrical engineer, was appointed borough electrical engineer of Barnsley to succeed Mr. S. E. Bastow. The salary was then £225, rising to £250.

One of the chief topics of discussion at the preliminary Wireless Telegraph Conference in Berlin was whether steps should be taken to prevent a single company [Marconi's] from enjoying the monopoly of wireless telegraphic communication with ships at sea.

Some railways were already feeling the effects of competition from road transport, particularly electric tramways. The North Eastern Railway Company, as a counter-move, ran a service of motor cars carrying 16 passengers and 10 cwt. of luggage each, between Beverley and Beeford.

A Local Government Board inquiry was held at Hull to consider Hull Corporation's application for a loan of £47 350 to put down a telephone system to be run in competition with that of the National Telephone Co. It was pointed out that the company had already an excellent and up-to-date system in Hull, and the only reason that the Corporation could assign for taking this step was their hope—which few apparently shared—to provide a service at lower rates.

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Police control boxes have been established at Coventry. The boxes are spread over the greater part of the area and are connected by telephone with the central station. The public will have access to the telephone for emergency use. The scheme will, at the outset, afford communication with the principal police station and will afterwards be extended to three divisional stations.

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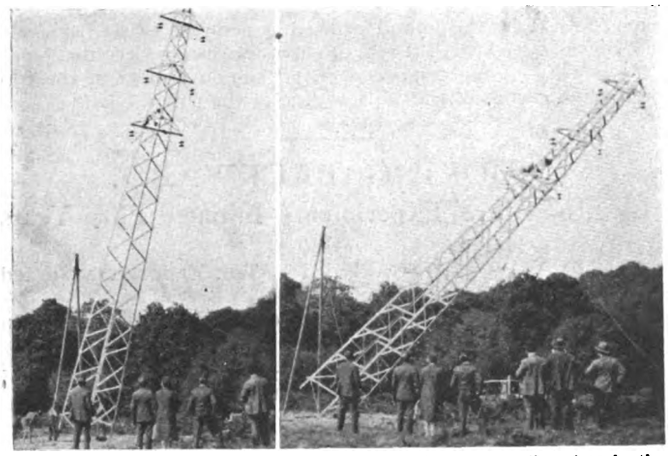
# POLE ERECTION.

## Demonstration of Rapid Erection of Steel Lattice Transmission Poles.

AN interesting demonstration in connection with the erection of new overhead transmission lines was given recently by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., at Alveley, near Kidderminster, a point



Raising the three-ton overhead line tower at the special demonstration given by the Shropshire, Worcestershire and Staffordshire E.P. Co. at Alveley.

on the company's new line from Stourport to Bridgnorth. It was attended by a number of people prominent in the electricity supply industry.

The masts for carrying the new line are of the steel lattice type, measuring 60 feet and weighing approximately three tons. Hitherto the method has been to erect these masts in sections, a necessarily tedious process. In the new method evolved by the company the completely equipped mast was raised from horizontal to vertical and finally bolted down into position, within one and a half minutes.

The visitors were much impressed by the efficacy of the new method. Those present included Mr. R. A. Chattock, city electrical engineer, Birmingham, Capt. Donaldson, chief engineer of the North Metropolitan Electric Power Supply Co., Mr. C. D. Taite, chief engineer and manager of the Lancashire Electric Power Co., Mr. C. Douglas Cloe, city electrical engineer of Hereford, Mr. E. Garcke and Mr. W. G. Bond, chairman and managing director respectively of the S.W.S. Co., and Mr. J. T. H. Legge, the company's chief engineer and manager.

The new method is being used throughout the company's new overhead transmission lines and will greatly speed up the work. It involves the use of shear legs and a six-wheeled commercial vehicle only.

Photographs taken at the demonstration are reproduced above.

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## "THE CONFESSIONS OF A CAPITALIST."

AFTER many delays, "The Confessions of a Capitalist" is now available to the public in a sixpenny edition. This good news will be welcome to hundreds of employers and others, who have long urged that Sir Ernest Benn's much-discussed book should be available for distribution to workers and students, and others of limited means. "The Confessions of a Capitalist" has had a very remarkable history. Published first at a guinea, many thousands were sold; a cheap edition at 3s. 6d. was issued last year, special editions have been published in America and in Australia, and there are no fewer than six foreign translations. No economic work has ever approached this outspoken statement of the case for capitalism, and its popularity, or the number of its impressions. The sixpenny edition is on sale at all Woolworth and similar stores.

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Under the Special Order for the supply of electricity to the southern parts of Lincolnshire, the Boston and District Electric Supply Co., Ltd., are taking steps to carry their lines from Boston to Sutton Bridge and over the River Welland at Fosdyke Bridge for the supply of power and light over that large rural area. The various local authorities are consenting to the overhead wires which the company propose to take across the fields.

# NEWS IN BRIEF.

A DIRECT telephone circuit has been provided between London and Vienna.

Electric fairy lamps decorate the shelters on the Llandudno Promenade.

A direct wireless telegraph service is available between this country and Kenya.

Experiments in the transmission of facsimile telegrams are being conducted by the Post Office.

A buried cable at the Croydon Aerodrome now assists aircraft in landing during hazy weather.

A scheme for rental wiring of power, heating and cooking points has been adopted by Hastings T.C.

The telephone service between Germany, Belgium, and Switzerland was opened to the public on August 25th.

Warrington Health Committee are obtaining reports as to the provision of a suitable automatic refrigerator for the sanatorium.

The Eastern Telegraph Co. have extended their regenerator system to their cables to India, with which country London is now in direct touch.

The annual dinner and smoking concert of the Tramways and Light Railways Association will be held at the Hotel Cecil on October 26th.

The Gotham Silk Hosiery Company of America has acquired the rights of an electrically-operated device for repairing "laddered" silk stockings.

The Australian Director of Posts and Telegraphs is anxious to introduce a regular service of wireless telephony between Great Britain and Australia.

A short list of candidates for the position of borough electrical engineer will be selected by the Hull Electricity Committee on September 3rd.

At the Reading Industries Exhibition, which opens at the Reading Town Hall in October, demonstrations of the various forms of refrigeration will be given.

Wakefield Education Committee are asking the electricity department to provide an electric cooker for demonstration purposes at the Newstead Road centre.

Glasgow Electricity Committee and Education Committee have now come to terms for the continuation of the experimental heating of schools by electricity.

Warrington Electricity Committee are obtaining further information regarding the appointment of a lady instructor and demonstrator of electric cookers, etc.

The autumn meeting of the Institute of Metals will be held at Liverpool from September 4th to 7th, inclusive, under the presidency of Dr. Walter Rosenhain, F.R.S.

The Post Office are arranging for a direct trunk telephone circuit between Fort William and Oban, which will facilitate communication with Glasgow and the South.

Wandsworth Board of Guardians have agreed to a recommendation for the provision of 16 electrically-heated hot water boilers for St. James's Infirmary at a cost of £420.

At a conference on Monday, a draft scheme for amalgamation of the Transport and General Workers' Union and the Workers' Union was agreed upon by the joint committee.

The protracted negotiations between the Plympton R.D.C. and Heath and Co. as to the terms for taking over the latter's electricity works at Plympton were concluded on August 11th.

The electrically-propelled P. and O. "Viceroy of India" is due to be launched on the Clyde next month. The electric ship "Brunswick" is now nearing completion at Greenock.

Lancaster Electricity Committee have been informed that the 5 000 kW turbo-generating plant, the transformer substation, and new showrooms and offices will be completed probably in September.

A contract has been signed giving the Postal Telegraph Co. rights, similar to those held by the Western Union Telegraph Co., to make use of the lines and other facilities of the American Telephone and Telegraph Co.

An automatic telephone exchange, with a hundred lines, has been installed by a Berlin firm in the Vatican for internal communication. The Vatican is connected by three lines with the central telephone exchange in Rome.

In a report to the Borough Council, Chelsea (London) Health Committee state that they have agreed to make the necessary arrangements with London County Council for taking action against the London Electric Railway Co. in regard to an alleged nuisance arising from smoke and grit from the chimney shafts of the company's Lot's Road power house. Summonses against the company in 1906 and 1907 on similar grounds were dismissed.

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# PERSONAL.

THE Prince of Wales visited the Rugby wireless station on Wednesday.

Mr. and Mrs. W. E. Warrilow celebrated their silver wedding on August 25th.

Mr. G. H. Peake has been appointed deputy chairman of the Yorkshire Electric Power Co.

Sir George Sutton, chairman of W. T. Henley's Telegraph Works Co., Ltd., has been elected chairman of the Royal Society of Arts.

Wolverhampton Corporation have increased the salary of the borough electrical engineer, Mr. E. Morgan, from £1 000 to £1 250 per annum, as from August 5th, 1928.

Col. Ionides and Sir Robert Dixon have joined the board of Babcock and Wilcox, Ltd. Sir John Dewrance remains chairman, and in the absence of a managing director, Mr. A. Spyer is continuing to act as general manager.

It is announced that the marriage arranged between Mr. Charles Malcolm, elder son of Lt.-Col. W. A. Vignoles, and Mrs. Vignoles, and Miss Frances Beatrice Macartney, will be solemnised at Streatley on September 11th.

Estate of the gross value of £5 709, with net personalty £4 254 was left by the late Mr. Joseph Armitage Crowther, who on his retirement seven years ago had been for twenty-five years borough electrical engineer and manager for Wallasey Corporation.

Mrs. Sanders, a member of the staff of the County of London Electric Supply Co., Ltd., is the authoress of a forthcoming book which, according to "County Pie," tells in a most interesting way the plots of the Gilbert and Sullivan operas. Mrs. Sanders is hiding her identity under the name of Lillian Bradstock.

Messrs. H. C. Saxby and E. G. K. Calder have joined the staff of Messrs. J. R. Morris as sales organisers in the south of England and Wales. Mr. Saxby was formerly with A. H. Hunt and Co., Ltd., while Mr. Calder was for many years supply manager of the A.E.G., and was also with the Lamp Department of the British-Thomson-Houston Co.

Successful Burnley students in examinations in connection with the Union of Lancashire and Cheshire Institutes include:—SENIOR ELECTRICAL ENGINEERING COURSE (1st year): G. R. Adcock; W. H. Bannister; F. Butler; G. Dixon, J. Duerden, H. Edmondson, J. Ellison, F. Gradwell, H. Horner, F. Johnston, H. Leaver, W. Mason, A. Riley, W. Smith, L. Taylor. (2nd year): C. Airey, W. Marshall, F. H. Richmond, F. A. Smith, W. Wilkinson. (3rd year): H. Hargreaves. ADVANCED ELECTRICAL ENGINEERING COURSE (1st year): E. C. Duxbury, D. Hargreaves, R. Lonsdale, R. Yeadon. (2nd year): R. Lonsdale.

## Leeds Tramway Manager.

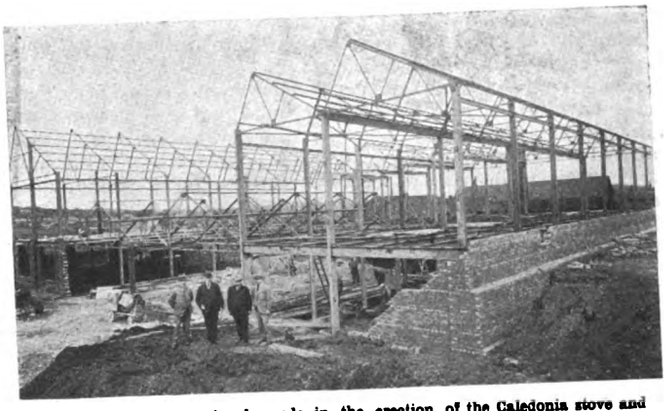
Leeds Tramways Committee have selected four from 40 applications for the post of general manager of the Tramways and Transport Department in succession to Mr. W. Chamberlain. The four selected are Mr. R. L. Horsfield, general manager of the Cardiff Corporation Tramways; Mr. Ben Hall, general manager and engineer of the Portsmouth Corporation Tramways; Mr. C. O. Silvers, general manager and engineer of the Wolverhampton Corporation Tramways; and Mr. G. F. Craven, late manager of the Reading Corporation Tramways and acting manager of the Southampton Tramways. The applicants are to be interviewed on September 11th.

Sir Hugo Hirst left England on Thursday last for Australia, as one of the four members of the Government Mission appointed to confer with the Commonwealth Government and the leaders of industry and commerce on the development of Australian resources and other matters which might tend to the promotion of trade between the two countries. He will journey overland to Marseilles in company with Sir Arthur Duckham, the leader of the Mission, and Mr. Dougal Malcolm, another of the members of the Mission, and at the French port will join the boat in which the fourth member of the Mission, Sir Ernest Clark, left Tilbury on August 24th. We are confident that the wide experience of Sir Hugo Hirst and the intimate knowledge he possesses of the Empire's commercial activities and industrial resources, will prove of inestimable worth in the investigations the Mission purposes to undertake. Sir Hugo was entertained at a farewell dinner by his fellow-directors of the G.E.C. at the Café Royal on Monday. Among those present were Sir William Noble, Sir J. P. Hewett, Mr. M. J. Railing, Dr. A. H. Railing, Mr. L. C. Gamage, and Mr. C. Wilson.

# BUSINESS ITEMS.

WE understand that as from to-morrow (Sept. 1st) the prices of certain classes of lamps controlled by members of the E.L.M.A. will be reduced.

Philips Lamps, Ltd. announce that new prices will come into force as and from September 1st, for their battery charger, Type No. 450, their dual battery charger, Type No. 1 009, their h.t. units, Type No. 3 002, and 3 003.



Showing the progress already made in the erection of the Caledonia stove and electrical works of Lane and Girvan, Ltd. The figures in the foreground are, from left to right, Mr. J. Ferguson, managing director; Mr. W. R. Lane, chairman; Mr. P. B. Wright, director; and Mr. A. R. Wood, manager of the electrical works.

Agricultural and General Engineers, Ltd. announce that in order to co-ordinate the Australian interests of their 14 associated companies, they have appointed Mr. A. Simpson, formerly H.M. Trade Commissioner in Sydney, to act as their resident chief representative in Australia. Mr. Simpson's appointment will in no way interfere with any existing agency.

With the opening on Saturday last of a new telephone exchange at Wilpshire, a parish some three miles to the north of Blackburn with a population at the last census of less than 2 000, has now been accorded the same privileges as its near neighbours in Blackburn proper. The Strowger Automatic Telephone Exchange installed at Blackburn in 1916 by Automatic Telephone Manufacturing Co., Ltd. has now grown to a capacity of 3 400 lines, serving a population of some 130 000, and the new Wilpshire exchange, installed by the same company, will work in conjunction with it. The initial capacity of the Wilpshire exchange is 275 subscribers and 25 coin box lines, and the ultimate capacity, 400 lines. Three line-switch units comprise the major portion of the equipment and upon them is mounted the whole of the apparatus with the exception of the repeaters, which are accommodated on a separate rack, and the meters, which are carried by a 1-bay meter rack. Only the incoming third and final selectors are located in the Wilpshire exchange, the 1st and 2nd group selectors, outgoing auto-to-auto repeaters and test offering relay group being accommodated in the main exchange at Blackburn.

Lane and Girvan, Ltd., of Bonnybridge, near Glasgow, have entered into the electrical field. This development was only decided on after the directors had given the matter serious consideration, but having once made up their minds they are going ahead very thoroughly. The accompanying illustration shows that good progress has already been made with the new works, which are designed and laid out on the most modern lines. They are of steel and concrete construction, two-storey fireproof buildings, and the section illustrated forms the first part of the new electrical shops. This main building will house the sheet metal, fitting and electrical assembly shops, also the stove enamelling department, where the latest spraying plant and oil-fired stoves are being installed. It will also include the test room, laboratory, stores for furnishings and also for finished Caledonia appliances, packing rooms and the warehouse, into which the railway enters, thus enabling all goods to be loaded up under cover. In addition to the buildings shown, another block comprising steel and concrete structure, is being built and equipped with up-to-date porcelain enamelling plant. This will enable all finishing processes to be carried on under the firm's own control. The offices have already been completed, a staff engaged, and several designs of electrical appliances have already been developed and are under test. It is expected that production will commence in these new works in the course of the next three or four months.

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# LAMP PUBLICITY.

## Mazda Lamp Advertising Campaign for 1928-29.

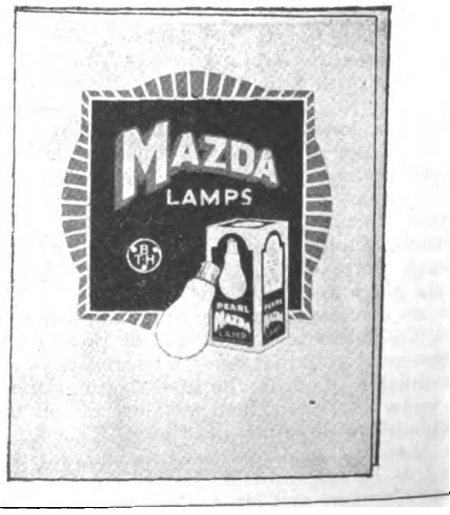
THE lamp advertising campaign launched by the British Thomson-Houston Co., Ltd., for the forthcoming lighting season, is expected to have a profound effect on electrical business in general, and Mazda lamp sales in particular. Appropriate advertising in the Press has been designed to drive home the outstanding characteristic of these lamps, and the claim that Mazda lamps maintain their brilliance without appreciable diminution to the end of their rated lives will be forcefully advertised to the general public in a series of advertisements in the leading London and Provincial newspapers and also in a number of magazines and periodicals. The same appeal will be employed in the various engineering, industrial, and retail trade papers. This insistence on a single vital characteristic will probably induce many people who have not hitherto used Mazda lamps to buy them and give them a trial.

Perhaps the most arresting item in the B.T.-H. 1928-9 lamp advertising scheme is an illuminated window display. This consists of three panels arranged in the form of a folding screen, the overall dimensions, when fully extended, being 47 in. wide by 40 in. high, with a depth from back to front of 5 in. A human note is struck by the picture on the middle panel which features the well-known Mazda Girl in the act of pulling the switch of a table lamp, to the delight of the small child she is carrying. The charm of the picture is enhanced by the soft light from the table lamp which is lighted by a suitable lamp fixed in a compartment at the back of the display and controlled by a thermal flasher. A second lamp, located in another compartment behind the display, illuminates the lettering on the lower portion of the centre panel. The display is provided with the thermal flasher, two lamp holders and an adapter ready wired to a length of flex for instant use in the trader's window. The two lamps are the only items which the trader has to supply. The display is printed in full colours, and since only a limited number is available, early application should be made for these fittings.

Another item in the publicity scheme is the Pearl Mazda showcard, reproduced from the painting of a well-known artist. It shows a dancing girl and is entitled "Beauty Enriched by Light." Full of colour and light, this showcard measures 22½ in. high by 16 in. wide, and is provided with a

### *LAMP ADVERTISING MATERIAL.*

*THE British Thomson-Houston Co., Ltd., have sent us particulars of their campaign for selling Mazda lamps during the coming season. Some of the booklets and the poster are shown below in miniature, together with the special window display fitting which has been prepared. The purposes served by the booklets, and the dimensions, colours, etc., of the poster and display will be found in the text.*

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hanger and strut at the back. A second showcard dealing with automobile lamps is also available. This is similar to that issued last year, but additional information has been embodied in the tabulation. On the front an attractive design forms a background for a panel in which full particulars, including prices and illustrations, are shown. On the back of the showcard are printed up-to-date particulars of the voltage and type of cap required for all motor cars, commercial vehicles and motor cycles used in the United Kingdom.

This season's complete catalogue is one of the most comprehensive and informative lamp catalogues ever published. It consists of twenty-four pages, is printed in two colours, and has a stiff cover. It contains complete particulars and prices of every type and size of lamp manufactured by the British Thomson-Houston Co. for all lighting purposes.

The following leaflets and folders produced in full colours are available for overprinting with re-sellers' names and addresses: Leaflet L437. Containing complete details, prices and other information about all regular Mazda lamps, including Pearl, colour-sprayed and white lamps, together with candle, tubular and Neon lamps. It is a complete compendium of lamps for domestic use. Leaflet L439. Dealing exclusively with the Pearl Mazda lamps, and pointing out that these lamps cost no more than ordinary clear lamps. Leaflet L438. Giving particulars and prices of gasfilled and vacuum lamps, etc. Details of train lighting, tramway, steamship, traction and sign lamps are also included. Leaflet L440 is a very useful folder, giving full details and prices of the complete range of Mazda automobile lamps. Finally we come to a very striking folder entitled "Selling Light," which gives a quantity of useful information concerning the 1928-29 advertising campaign as a whole. The folder also tells the trade how to obtain supplies of advertising material, and gives a number of hints concerning the selling of lamps.

## TRADE PUBLICATIONS.

THE current issue of the "Brown Budget" is a special catalogue number.

Book 385, describing electric runways, has been published by Herbert Morris, Ltd.

The August stock-list has been received from the Electrical Equipment and Carbon Co., Ltd.

Mavor and Coulson, Ltd., have published a special leaflet dealing with a new face-belt conveyor.

Lectro Linx, Ltd., have published in booklet form details of their electrical and radio specialities.

The Tungston Accumulator Co., Ltd., have published a special booklet relating to their batteries.

A special publication devoted to the portable electric "Skilsaw" has been issued by the Rothermel Corporation, Ltd.

British Insulated Cables, Ltd., have issued list P. 240, dealing with 20 000 to 25 000 V cables, to replace their list P. 237.

Catalogue No. 641, by Siemens Brothers and Co., Ltd., describes the company's batteries, including a high capacity h.t. type for portable sets.

A. H. Hunt, Ltd., have published leaflet No. 138B, dealing with their electrical measuring instruments, including a number with increased ranges and calibrations.

A new pamphlet dealing with C.T.S. flexibles with heald cord strengtheners has been published by Callender's Cable and Construction Co., Ltd. Reference No. 39.

The August issue of the "Mond Nickel Bulletin" has been received. This is the second number of the first volume and gives a summary of current information on nickel.

We have received from Ateliers de Constructions Electrique de Charleroi, brochure No. 501 E, which describes and illustrates their transformer works and transformers.

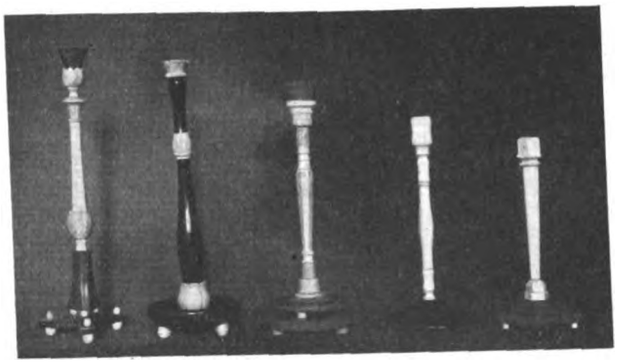
A description of the 8 350 kVA transformers recently supplied to the Coventry Corporation for installation in the new Longford station, has been published in book form by the British Thomson-Houston Co., Ltd.

The British Thomson-Houston Co., Ltd., have also sent us a newly published card listing the range of exhaust fans of their manufacture. The card gives data concerning the direction of air flow, etc., d.c. and a.c. models, regulators, automatic shutters, etc.

The Ransome and Marles Bearing Co., Ltd., have prepared a new edition of their abridged catalogue. This gives details of the most frequently used types and sizes of R. and M. bearings, together with brief instructions regarding mounting and maintenance.

## SELLING LINES.

THE Eagle Electric Co. have recently introduced a small lamp flasher unit, which consists of an ordinary bayonet lamp cap, with the sleeve and plunger unit of a b.c. lampholder and a flasher, all in one component. The flasher portion is made up of a bi-metal contact device and resistance coil,



Some of the novel table standards made by Goodworks, Ltd.

arranged in such a way that the expansion of the bi-metal contact, brought about by the heating of the resistance coil, completes the circuit. The coil is then short circuited, when the contact device automatically cools and breaks the circuit. The name given to the flasher is "The Eagle Blinker," and we understand that it may be used to directly control a single lamp or a cluster, advertising group or string. The loading of the device is up to 100 W, and it is claimed that atmospheric conditions have no influence upon its operation. The unit is suitable for use on all standard voltages, while its overall length is about 2½ in.

The success which has attended the "Wonlite" letter sign has prompted the General Electric Co., Ltd., to adopt the same principle for use on transport vehicles. The distinguishing feature of this sign is its economy. It requires only one lamp per letter for illumination purposes, which, owing to scientific conformation of the reflector, produces a sufficiently even intensity of illumination over the entire area of each letter. Each letter which forms the sign is recessed, and is of such a curvature that the maximum amount of light is collected and reflected. In use with transport vehicles these signs are made of cast iron instead of sheet steel. The standard size of the letters is 6 in., and the front of each letter is finished in white cellulose enamel with blue sides. A miniature Edison screw type lamp holder is fitted to each letter and is designed to accommodate an Osram 6 V 3 W lamp or a 12 V 2·4 W lamp. The bowls of these lamps are silvered to provide a reflecting surface and on this silvering is imposed a coat of either black or white paint according to the letter in which the lamp is to be used, thereby maintaining the shape of the letter when serving for day sign purposes. Current to operate the sign can be run off the existing lighting battery of the vehicle, although a separate accumulator can be used if preferred.

The Marconiphone Co., Ltd., have recently introduced a new short wave receiver, for which outstanding capabilities are claimed. A feature of the set is that it is possible for standard plug-in coils to be used with an adapter, thus extending the wavelength range to any desired limit. Marconiphone model "34" is, therefore, a universal receiver, equally suitable for broadcast and short wave purposes. Another new Marconiphone product is the "Popular" transformer (ratio 4 to 1). This instrument, while in the lower-priced category, is nevertheless capable of giving excellent quality.

Siemens Brothers and Co., Ltd., have introduced for portable and transportable sets a new high capacity h.t. battery which, at the expense of a slight increase in height (approximately 1 in.) over their standard small capacity battery, is able to provide nearly twice the output of current. Provided that this small increase in height can be allowed for in existing portable or transportable sets in which the ordinary small capacity battery is fitted, it will be possible to accommodate this new type. In order to keep the overall height at a minimum, Siemens Brothers are now supplying a special short wander plug which increases the overall height of a battery, including plugs, by less than ¼ in. Two sizes of these batteries have been standardised, 126 V and 108 V. Both types are fitted with plug sockets at every 6 V.

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# LEGAL INTELLIGENCE.

## Important Decision Regarding the Loewe Valve and Marconi Royalties.

A DECISION of importance to the British wireless industry has been given by Mr. W. S. Jarratt, Comptroller-General of the Patents Office, and Mr. H. C. Haycraft, Assistant-Comptroller, sitting as a special Tribunal under the Patents and Designs Acts.

In their report, issued on Friday of last week, they have granted to the Loewe Radio Company a licence to manufacture in this country multi-electrode valves for wireless reception on which the royalties to be paid to the Marconi Company should be 10s. and 7s. 6d. respectively. In other forms of multiple valve the royalty should be calculated on the basis of 5s. in respect of the first unitary valve and 2s. 6d. for each additional unitary valve. The respondents, the Marconi's Wireless Telegraph Co., Ltd., and the British Thomson-Houston Co., Ltd., when the application was heard, asked for a royalty of £1 17s. 6d. on each triple valve, £1 5s. on each double electrode valve and £3 2s. 6d. on the long-range sets. The applicants claimed that wireless receiving sets which were stated to be equal to three-valve sets could be made and sold in this country at about 30s. each, and later, by means of mass production, at 25s. each. The sets were sold in Germany at 25s. wholesale and 39s. 6d. retail, while £35 000 was paid in royalties to the Telefunken Co. in Germany last year. The manufacturers were prepared to pay royalties on an equivalent system to the Marconi Co., and were anxious to transfer the whole of the manufacturing part of their business to this country immediately.

Giving the reasons for their decision the Tribunal state :—

We are of opinion that the royalties of £1 17s. 6d. on the Loewe triple-valve and £3 2s. 6d. on the long-range set are too high. By insisting on these royalties the respondents are in our opinion substantially refusing to grant licences upon reasonable terms, and are thereby prejudicing the establishment of a new trade or industry in the United Kingdom. The respondent company (Marconi) have secured a dominant position by gathering together in their own hands a large series of patents which, taken collectively, cover almost all broadcasting receivers of an efficient character. It is to be remarked that not one of the five patents now in question is for an invention originating with the respondent company. Three of them are American, one is French, and one is German in origin. It is a kind of super-monopoly. The applicants cannot seek alternative terms from competing monopolists. They are absolutely in the hands of those who have gathered together this far-reaching aggregation of monopolies. Broadcasting has become a feature of our national life, and a commercial policy which excludes large sections of the public from its full enjoyment is not, we think, a justifiable policy. On the other hand, the respondents have played a large part in the development of this remarkable field of scientific activity, and have necessarily spent large sums of money in experiment and research. We think that a policy tending to large output at a lower scale of royalties will not be wholly adverse to their interests.

The Tribunal allowed twenty-one days for the submission of an agreed form of licence. If such a licence is not submitted, an Order will be made.

With regard to the above proceedings it should be remembered that the British Thomson-Houston Company were only respondents in a technical sense. Having sold the radio rights under their patents to the Marconi Company, they do not receive any part of the royalties.

### Marconi Patents and Brownie Wireless Co.

A reduction in the royalties paid to the Marconi's Wireless Telegraph Co., Ltd., per valve-holders in wireless sets has also been made in favour of the Brownie Wireless Co. (Gt. Britain), Ltd., by a Special Tribunal of the Patents Office. The latter company applied for compulsory licences under certain Marconi patents.

The Tribunal decided that the royalties obtained per valve-holder should be reduced from 12s. 6d. each to 10 per cent. on the wholesale selling price, subject to a minimum charge of 5s. on the first valve-holder and 2s. 6d. on each additional valve-holder. The applicants' chief objective, as pointed out in the Tribunal's report, is to put on the market a two-valve set selling at about £2 10s. retail price, not including valves, accessories or royalty. Of this retail selling price the manufacturers would receive, roughly speaking, 50 per cent., and their profits would be about 20 per cent. of what they receive.

"We have found" (says the report) "that it is in the public interest that a licence should be granted to the applicants and we have found that the terms on which the licence is offered are unreasonable terms, prejudicial to their trade." On the question as to whether the royalty should be assessed on the wholesale selling price or on the retailers' list price, the Tribunal says :—"The Radio Manufacturers' Association put forward the figure of 5 per cent. on the net retail selling price. We are of opinion that this is too low, and we think also that as these royalties are collected from the manufacturer, and the manufacturer cannot always effectively control the retail selling price, the royalty should preferably be calculated upon the net realised wholesale selling price of the article."

"Although the conclusion at which the Tribunal may arrive (the printed decision says finally) may logically involve the implication that the applicants have established the general case of prejudice to the trade of a class of persons, as well as prejudice to their own trade, we have, in fact, only one specific application to deal with, and this decision can go no further than to define the relief to which applicants themselves may be entitled."

# CANADIAN ELECTRICITY.

## Bureau of Statistics' Report on Capacity and Output of Works.

THE Canadian Dominion Bureau of Statistics have issued a report in reference to the production of electrical energy in Canada up to December 31st, 1927. At that date Canada's total hydraulic installation was 4777 921 H.P., of which over 82 per cent. was in central electric stations, and for several years past the output of these stations was in excess of 98 per cent. of the total electricity distributed in Canada for public use. Quebec showed the greatest increase for 1927, viz., 149 280 H.P., Manitoba, with 28 000 H.P., and Ontario, with 26 320 H.P., being second and third respectively. The available 24-hour horse power, at 80 per cent. efficiency, was 20 197 000 H.P. at ordinary minimum flow and 33 113 200 H.P. at ordinary six month flow, while the turbine installation horse power was 4 777 921. The ratio of actual plant installation to theoretical horse power available indicate that the water power resources of the Dominion as at present recorded will permit of a turbine installation of 42 000 000 H.P. With a water power development of 500 H.P. per 1 000 population, Canada stands well to the fore in respect to availability and, utilisation of hydro power resources. The census of industry 1926, shows that in that year 12 Canadian companies which generated 5 380 922 877 kWh produced for export to the United States 1 535 851 752 kWh.

### Increased Revenue and Output.

The increase in capital employed in the central electric station industry between 1922 and 1926 was 33 per cent., the revenue increased 43 per cent. and the output increased 79 per cent. The dynamo capacity also increased by 72·5, or only slightly under the rate of increase of the output. The ratio of the output to the maximum capacity of the stations was 42·1 per cent. in 1922; it rose to 47 per cent. in 1923 and to 48·5 per cent. in 1924 with some groups of stations having a ratio as high as 58·4 per cent. The completion of new plants in 1925, creating a temporary surplus of capacity, reduced the ratio to 42·2 per cent. in 1925, but in 1926 it rose to 45·5 per cent.

The increase during the four years 1922-1926 in the primary power equipment of 66·9 per cent. was almost entirely in water wheels and turbines, which increased by 1 497 096 H.P. Steam reciprocating engines decreased in capacity by 4 098 H.P., steam turbines increased by 14 302 H.P. and internal combustion engines by 3 625. The increase in the total capacity in 1925 of 25 per cent., which was exceptionally high, was not maintained in 1926, the increase being 5·5 per cent.

The hydro-electric plants generated almost 99 per cent. of the total output of all the plants. Of the 11 911 039 000 kWh generated by these stations, fourteen plants with capacities of 50 000 kVA and up, for which data could be segregated, generated over 70 per cent. of it. The ratio of their output to their maximum capacity was 51·4 per cent., which was considerably higher than for any other group except six plants constituting the group with capacities between 5 000 and 10 000 kVA, which sold practically all their output to a few large customers. The average revenue per kilowatt hour sold for these plants with capacities over 50 000 kVA was only 0·28 cent., and on account of the magnitude of the quantity sold, materially affected the average for the total.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BRADFORD CORPORATION.—Electric lighting installations in eight combined shops and houses on Swain House estate and eight combined shops and houses on Lower Grange estate. Tenders to the Town Clerk.

CARDIFF CORPORATION.—Electric lighting of Windsor Clive Council Schools. Specifications, etc., from the City Electrical Engineer, the Hayes, Cardiff.

CLACTON-ON-SEA URBAN DISTRICT COUNCIL.—Supply of 700 yards of 0·35 by 0·2 by 0·35 sq. in. three core, paper insulated, lead covered and armoured cable, to withstand working pressure of 660 V and conform to B.E. Standard [illegible] Tenders to the Clerk.

[illegible]ULEY SANATORIUM (TIMPERLEY), August 31st.—To [illegible]y, deliver, erect and connect up to main board in engine [illegible], and switchboards, three twin v.i.r. taped lead covered, steel tape armoured and jute served, 600 megohms, grade cable. Specification, etc., from the Sanatorium, by appointment.

MANCHESTER CORPORATION, August 31st.—Supply and [illegible]ing in position at various sub-stations, of eight 250 kVA [illegible]t 500 kVA, and two 125 kVA static transformers. Specification (No. 225), etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ROCHDALE CORPORATION, August 31st.—For supply of 500 [illegible]tric wash boilers, to be taken over a period of 12 months. [illegible]ecifications, etc., from the Engineer and Manager, Electricity Works, Dane Street, Rochdale.

SALFORD BOARD OF GUARDIANS, August 31st.—Lighting and power supply to garage and east end rooms of the Eccles New Road Institution. Specification, etc., from Mr. E. H Inchley, Poor Law Offices, Eccles New Road, Salford.

EDINBURGH PARISH COUNCIL, September 1st.—Electric [illegible]ght and power installation at Craigleath Hospital. Schedules [illegible]rom Mr. J. M. Johnston, 47, Charlotte Street, Leith; deposit £1 1s.

LEEDS GUARDIANS, September 1st.—Supply and fixing of three-phase winding gear, automatic control, new gates, etc., to four lifts at St. James' Hospital, Beckett Street, Leeds. Specifications, etc., from Mr. J. E. Storr, 14, Park Row, Leeds.

NORTHFIELD (BIRMINGHAM) PARISH CHURCH, September 1st.—Electric light wiring. Specification from the Rector.

STANDING JOINT COMMITTEE FOR DEVON, September 1st.—Supply of police accoutrements for three years, including electric lamps. Tender forms, etc., from the Chief Constable of Devon, Exeter.

LLANTARNAM URBAN DISTRICT COUNCIL, September 3rd.—(1)High and low-tension switchgear; (2) transformers; and (3) overhead and underground mains. Specifications from Messrs. Arthur Ellis and Partners, 9, Park Place, Cardiff; deposit £3 3s.

COMMISSIONERS OF H.M. WORKS, September 4th.—Supply of electrical and mechanical labour in daywork at Cardiff. Forms of tender, etc., from the Contracts Branch, H.M. Office of Works, King Charles Street, London, S.W.1.

LLANDUDNO URBAN DISTRICT COUNCIL, September 4th.—Supply, delivery, supervision of laying and complete jointing of e.h.t and l.t. cables, cubicles, transformers and unit type feeder pillars. Specifications, etc., from the Electrical Engineer, Electricity Works, Llandudno.

RHONDDA URBAN DISTRICT COUNCIL, September 4th.—Supply and delivery of one 150 kVA three-phase, static transformer, 3 500/414 V, 25 cycles; one 150 kVA three phase static transformer, 11 000/414 V., 25 cycles. Specifications and form of tender from Mr. J. M. Bowman, electrical engineer, Electricity Works, Porth, Glam.

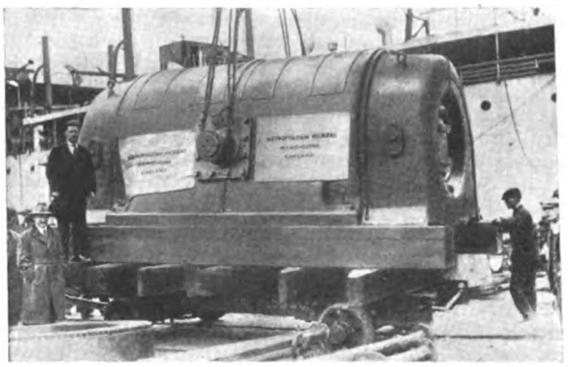
ST. PANCRAS (LONDON) BOROUGH COUNCIL, September 4th.—Supply and erection of 15 000 kW generator, condenser and auxiliaries, at King's Road generating station. Specification, etc., from Electricity Offices, 57, Pratt Street, London, N.W.1; deposit £1.

TORQUAY CORPORATION, September 4th.—Supply and erection of electric decorative strip lighting in the Town Hall ball room. Specification, etc., from Mr. Herbert A. Hield, Town Hall, Torquay.

CROYDON GUARDIANS, September 6th.—Supply of electrical fittings and appliances for six months. Tender forms from the clerk, Mr. Norman P. Walker, Mayday Road, Thornton Heath.

STEPNEY (LONDON) GUARDIANS, September 6th.—Six months' supply of electrical fittings. Forms of tender from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1. Stamped, addressed envelope to be sent.

EDINBURGH CORPORATION, September 7th.—Steel work for coal bunkers, in connection with extension of Portobello generating station. Schedule from the City Architect.



*A PHOTOGRAPH of the last 18 750 kW turbo-generator for the Belfast Corporation being landed. This stator, which weighs 54 tons, is the heaviest piece of machinery which has entered into Belfast for transport. It was lifted out of the boat by the Harbour Board's 120-ton electric crane, and hauled by traction engine to site, about three-quarters of a mile along the dock. The whole of the road had to be plated, and it took from 1 p.m. on the Friday until 5 p.m. on the following day to get it into the station. This generating unit brings the total quantity of Metro-Vick turbo sets supplied to Belfast Corporation, up to 50 000 kW.*

BOROUGH OF COLCHESTER MENTAL HOSPITALS, September 8th.—For the supply, delivery and erection of electric cables, conduits and contact gear at Brentwood Mental Hospital. Specifications, etc., from Mr. H. H. Gepp, Essex and Colchester Mental Hospital, Chelmsford; deposit £2 2s.

KEIGHLEY CORPORATION, September 10th.—Electrician's work in connection with the renovation of the registrar's house at the Cemetery. Specifications from the Borough Architect, Gas Offices, Cooke Lane, Keighley.

OLDHAM GUARDIANS, September 10th.—Electric lamps and fittings, for the Institution, Rochdale Road. Forms of tender, etc., from the Clerk, Union Offices, Oldham.

STOKE-ON-TRENT CORPORATION, September 10th.—Six months' supply of electric lamps. Specification and form of tender (No. 15) from the City Surveyor, Town Hall, Stoke-on-Trent.

DEWSBURY BOARD OF GUARDIANS, September 11th.—Electrical work at new casual wards at Staincliffe. Particulars from the architects, Messrs. W. Hanstock and Son, Branch Road, Batley.

MANCHESTER CORPORATION, September 11th.—Supply of (*a*) motors, and (*b*) controllers, for electric tramcars. Specifications, etc., from Mr. Henry Mattinson, Corporation Tramways Department, 55, Piccadilly, Manchester.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of two water tube boilers having normal evaporative capacity of 260 lb. per sq. in. Specifications, etc., from City Electrical Engineer; deposit £2.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of one secondary battery with storage capacity of 1 200 A, for a normal pressure of 100 V. Specifications, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £[illegible].

BATH, CLUTTON, MIDSOMER NORTON AND RADSTOCK JOINT HOSPITAL COMMITTEE, September 17th.—Installing electric light at a new isolation hospital at Paulton, near Bristol. Particulars from the architect, Mr. A. J. Pictor, 14, Queen's Square, Bath.

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BOOTLE CORPORATION, September 18th.—Electrician's work in connection with erection of 100 houses at Linacre Park. Specification, etc., from the Borough Engineer, Town Hall, Bootle; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 18th.—Renewal of battery plates at the National Physical Laboratory, Teddington. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

WEST RIDING EDUCATION COMMITTEE, September 18th.—Electric light installation at Rossington New Middle School. Specification, etc., from the Education Department, County Hall, Wakefield.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, September 28th.—Supply of electrical fittings. Forms of tender, etc., from the Clerk, 22, Lombard Street, West Bromwich.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2.; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

CAPE TOWN CITY COUNCIL, August 31st.—For supply and delivery of 29 300 yards of multi-core, paper insulated, lead covered cables. (Reference B.X. 4 633.)

JOHANNESBURG TOWN COUNCIL, September 1st.—Supply and delivery of electric cables. (Refrence B.X. 4 649.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cord for indoor installations. (Reference B.X. 4 590.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 3rd.—Supply of 155 000 metres of rubber insulated cable. Reference A.X. 6 538.)

VICTORIAN ELECTRICITY COMMISSION, September 3rd.—Manufacture and supply of (*a*) 120 000 V switchgear, for Richmond terminal station (specification No. 28/20), and (*b*) 135 000 V switchgear for Yallourn power station extension (specification No. 28/21). Specification, etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £1 1s. in each case.

CAPE TOWN MUNICIPALITY, September 4th.—Supply of 1 000 kW converter set (specification No. 427/1928). (Reference B.X. 4 604.)

## Electric Cranes.

LYTTELTON (N.Z.) HARBOUR BOARD, September 4th.—Supply of four 5-ton electrically-operated luffing cranes. (Reference A.X. 6 483.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 4th.—Supply of insulating tape. (Reference B.X. 4 572.)

ANTWERP PORT AUTHORITY, September 6th.—Supply of 35 steel masts for electric lamps. (Reference A.X. 6 704.)

ASSAM-BENGAL RAILWAY CO., LTD., September 6th.—Supply of overhead electric cranes. Specifications, etc. from the offices of the company, Bishopsgate House, 80, Bishopsgate, London, E.C.; deposit £1 1s.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 6th.—Motor-driven milling, pipe screwing, grinding and planing machines, etc. (Reference A.X. 6 592.)

SOUTH INDIAN RAILWAY CO., LTD., September 7th.—Supply of electrical materials and fittings. Specification (fee 5s.), etc., from the company's offices, 91, Petty France, Westminster, London, S.W.1.

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th.—Supply of 338 000 metres of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA), MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 12th.—Telephone cable (P. and T. 151/998). (Reference B.X. 4 672.)

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 14th.—Supply of a.c. meters. (Reference B.X. 4 648.)

WATERFORD CORPORATION, September 14th.—Supply of single-phase and three-phase house service and other meters.

*THE entries for the National Radio Exhibition Poster Competition, organised by the Radio Manufacturers' Association, were this year of a higher standard than last, with the result that selection was by no means easy. A photograph of the winning poster is reproduced on page 243, together with those which were accorded second and third places. The posters reproduced above were placed fourth, fifth and sixth respectively, looking left to right.*

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Specification, etc., from Messrs. Macentee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 17th.—Supply and delivery of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, together with junction and terminal boxes. (Reference B.X. 4 608.)

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 19th.—Supply and delivery of 250 V lead covered conductors. (Reference B.X. 4 607.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 20th.—Supply and delivery of one electrically-driven heavy duty double face-plate wheel lathe for Germiston wagon repair shops. (Reference A.X. 6 660.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

ANTWERP PORT AUTHORITY.—September 27th.—Supply and erection of 32 electric travelling cranes. (Reference A.X. 6 712.)

## Electric Switchgear.

JOHANNESBURG TOWN COUNCIL, September 27th.—Supply and delivery of 6 600 V switchgear. (Reference B.X. 4 668.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 27th.—Supply and delivery of arc welding sets. (Reference B.X. 4 647.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th.—Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

IRISH FREE STATE ELECTRICITY BOARD, October 1st.—Supply and erection of complete electrical equipment, including switchgear and three transformers, each 12 000 kVA (38 000/5 000 V), for Shannon transformer station at Fleet Street, Dublin. Specification, etc., from the Secretary to the Board, 60-62, Upper Mount Street, Dublin; deposit £5, returnable.

SALISBURY (RHODESIA) MUNICIPALITY, October 1st.—Supply and erection of h.t. transmission lines and transformers. (Reference B.X. 4 669.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st.—Supply of porcelain insulators. (Reference B.X. 4 643.)

TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—For the supply and delivery of 250 ornamental electric lamp standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date.)—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexander. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

SOUTH AFRICAN DEPARTMENT OF PORTS AND TELEGRAPHS, October 4th.—Supply of telegraph line material. (Reference B.X. 4 655.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, October 4th.—Supply of copper wire and lead covered cable. (Reference B.X. 4 657.)

ARGENTINE DEPARTMENT OF NAVIGATION AND PORTS, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 604.*)

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, October 5th.—Supply of lead fuse wire, silver fuse wire, copper wire for bell installation, insulating tape, porcelain counterweights, quick-break lever switches (single pole, double pole and triple pole), tumbler switches (single pole), switches (single pole and double pole), rotary combination switches for staircases (3-way and 4-way), rotary switches for indoor use (single pole and double pole), switches (double pole) for flush mounting, rotary combination switches (3-way) for flush mounting, rotary switches (single pole) for flush mounting, normal Edison screw lampholders, without key switch, enamelled lampshades, porcelains for sockets and plugs for double pole fittings, insulating compound, transformers for bell installations, hard vulcanised rubber tubing, cast-iron cable boxes, glass globes for arc lamps, etc.

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 11th.—Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639).

RANGOON MUNICIPALITY, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on closed circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-stations. (Reference B.X. 4 622.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories for Yallourn power station (Specification No. 28/48). Copies of tender (£1 1s.), etc., from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

## Tenders Accepted.

WAKEFIELD EDUCATION COMMITTEE.—Crompton Parkinson, Ltd., switchboard, for Technical College extension.

VICTORIAN ELECTRICITY COMMISSION.—English Electric Co., Ltd., supply of two 10 000 kW generators, £51 600.

MARKET DRAYTON URBAN DISTRICT COUNCIL.—Market Drayton Electric Light Co., public lighting during ensuing season, £3 10s. per lamp.

GLASGOW CORPORATION.—Darroch and Espie, electric light installation at 852 houses to be erected at Knightswood, £3 883 10s. 8d. (recommended.)

SYDNEY MUNICIPALITY.—Yorkshire Copper Works Co., Ltd., supply of cupro-nickel condenser tubes, in connection with extension of plant at Bunnerong power station.

BLACKBURN GUARDIANS.—T. Blackshaw, electric lighting of footpaths to Union Sanatorium, nurses' home and mortuary, £49 4s. 6d., and supply of electric power plugs at Chaplain's house.

CLACTON URBAN DISTRICT COUNCIL.—Crompton Parkinson, Ltd.; e.h.t. and l.t. switchgear, £640 15s.; Fuller Electrical Manufacturing Co., transformers, £180 1s., for St. Osyth Road sub-station.

BOMBAY CORPORATION.—Bombay Electric Supply and Tramways Co., Ltd., electric lighting of Sir Pherozshah Mehta Road by means of thirteen 200 W Holophane lamps, Rs. 4 335, plus Rs. 2 340 for maintenance.

GREAT WESTERN RAILWAY.—Ransomes and Rapier, supply and erection of four electric capstans at the Mole, King's Dock, Swansea, S. H. Heywood and Co., supply of 50-ton overhead electric travelling crane for Old Oak Common.

GLASGOW CORPORATION.—Johnston, Park and Co., electric lighting work in workmen's houses at Bellefield Sanatorium; A. Reyrolle and Co., Ltd., ironclad switchgear for sub-stations, £8 694; Felten and Guilleaume and T. Bolton and Sons, Ltd., trolley wire for tramways department; J. Brooks and Co., electric blowing gear, etc., for St. Andrew's Hall grand organ, £250.

BOMBAY CORPORATION.—Turner, Hoare and Co., Ltd., supply of two Broom and Wade electrically-driven air compressors coupled with Crompton Parkinson motors, Rs. 16 584·12 per set (recommended.) Also tendered: Duncan Stratton and Co., John Fleming and Co., Ingersoll Rand (India), Ltd., Consolidated Pneumatic Tool Co., Ltd., Jessop and Co., Ltd., British Thomson-Houston Co. (India), Ltd.

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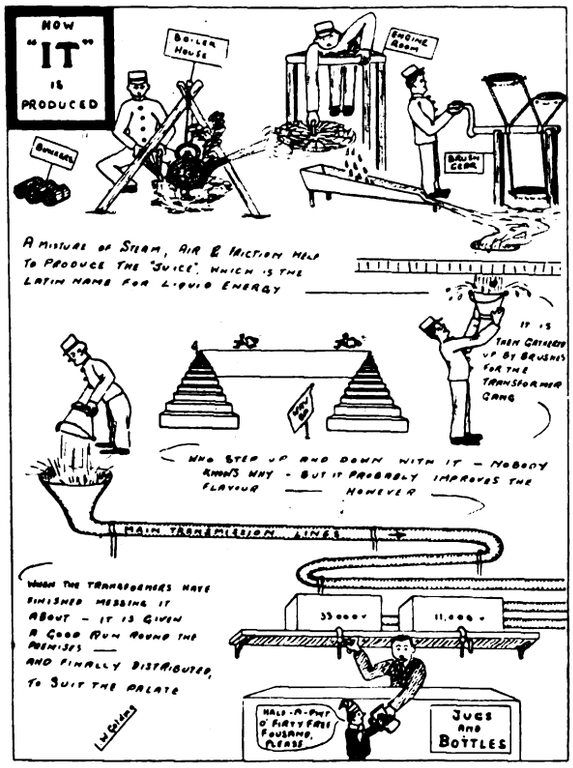
# ELECTRICITY SUPPLY.

## Harrogate and Frequency Change—Norwich and Overhead Lines—Proposed Extensions at Chester—Coleraine and Its Supply—Dundee and the Central Board—Glasgow Finance —Bulk Supply for Southend.

RADCLIFFE U.D.C. have applied for a loan of £21 927 for electricity purposes for a period of three years.

Stirling T.C. have applied for a loan of £2 000 for the installation of a duplicate set in the sub-station at Forth Street.

Harrogate T.C. have applied for a loan of £49 400 in connection with the changing of the electricity system from single to three-phase.




*THE above illustration, "re-juiced" from a drawing in the current issue of "County Pie," tells its own story, and is of special interest to electricity supply engineers.*

Hungerford P.C. have entered into an agreement with the Wessex Electricity Co. for public lighting, the cost being £170 for lighting and maintaining 46 lamps.

Norfolk County Council have consented to the Norwich Corporation placing overhead lines across or along county main roads in connection with proposed extensions.

East Suffolk County Council have granted applications from the East Suffolk Electricity Distribution Co., Ltd., for consent to place underground and overhead cables at Leiston, Melton and Saxmundham.

Clacton-on-Sea T.C. are applying to the Electricity Commissioners for sanction to the following loans:—Clacton, mains and services, £2 300; meters, £2 000; Holland-on-Sea, mains and services, £3 500; meters, £750.

Chester Electricity Committee are to apply for sanction to borrow £20 000 for extensions in the area defined in the Chester Electricity (Extension) Special Order, 1927, such loan to include £250 to be applied as special remuneration to the electrical engineer.

At a parish meeting at Ashford, Derbyshire, it has been decided to adopt the Lighting and Watching Act for the whole parish. The Derbyshire and Nottinghamshire Electric Power Co. are to provide eight 200 c.p. lamps, and the cost of erection is estimated at £100.

It has been announced at a meeting of Coleraine U.D.C. that the Council, who were recently refused a Government loan of £19 000 for an electricity supply scheme, have received a private offer of the required sum on much better terms than the Government generally concedes.

Beaconsfield U.D.C. have considered a letter from Uxbridge Council regarding joint action by various councils in reference to a supply of electricity for the district, and, subject to a favourable reply to the question as to the probable cost to each council, have decided to fall in with the views expressed by Uxbridge.

Dundee Corporation have rescinded a previous decision to allow the Central Electricity Board to erect latticed towers along Kingsway for carrying high-power cables in connection with the Government's electricity scheme. It will now be necessary for the Board to reopen negotiations.

The gross revenue of Glasgow electricity department for the year ended May 31st was £1 440 679, the gross profit was £830 543, and after provision for interest, sinking fund, depreciation, etc., the net surplus was £28 533, to which is added the amount at credit of reserve fund appropriated, £70 058, making £98 591.

Following upon correspondence with the Aldeburgh Electric Supply Co., Ltd., and Christy Bros. and Co., Ltd., concerning extensions of lighting mains along Leiston Road, Aldeburgh, and the erection of the poles, the East Suffolk County Council have decided to raise no objection so long as the poles are placed in positions approved by the county surveyor.

Nottingham County Council have granted permission for the laying of an electric cable under the Ollerton, Tuxford and Darlton main road for the Butterley Colliery Company at Ollerton. The Council have also granted permission for the laying of a cable for the Air Ministry under the Watnall-Hucknall Road, in connection with the Hucknall Aerodrome.

Southend T.C. has accepted the offer of the County of London Electric Supply Co., Ltd., for a bulk supply of electricity delivered into the station at Leigh, at a standing charge of £5 10s. per annum per kW of maximum demand, with a running charge of 0·3d. per kWh. The plant for receiving the bulk supply is to be obtained at an estimated cost of £1 200. A loan of £12 000 for services has been applied for.

Glasgow Electricity Committee have authorised extensions of distributing mains at a cost of £4 800.—The Corporation have agreed to the application of the Central Electricity Board for permission to carry a high-pressure transmission line across the Clyde.—Terms have now been arranged with regard to carrying through the city the main transmission lines from Dalmarnock power station to Port Dundas and Yoker power stations, which are to be constructed under the Central Scotland scheme.

A scheme for the provision of electricity for lighting and heating at the Hefferston Grange Sanatorium has been agreed upon by Warrington Corporation. Authority has been given to consult an expert with a view to retaining his services in connection with any inquiry held in the matter in connection with the N.W. England Electricity Scheme. Objection has already been lodged. Accounts of the Electricity Department for the year show a net profit of £18 964, compared with a profit of £7 293 the previous year.

The future of the electricity undertaking was discussed at Padiham U.D.C. last week. Coun. Howarth, chairman of the Electricity Committee, said if the undertaking was to be profitable it would be necessary to spend money on mains extensions. Few people had taken advantage of the assisted wiring scheme, but benefit was being obtained indirectly, because contractors had now to compete with the Council's close-cut price. Coun. J. W. Coe said the Council advocated electricity and its benefits and yet could not supply it. Instead of hoarding up profits it was better to spend them upon laying cables where there was a possibility of development.

Referring to a proposal to reduce the number of mukadams employed in the supervision of public lighting in the City of Bombay, the municipal commissioner states that the kerosene oil lamps have been gradually replaced by gas and electric lamps during recent years and will be entirely eliminated in about a year. There are 8 136 street lamps in the city, of which 6 708 are gas, 1 155 electric, 231 incandescent oil, and 42 ordinary kerosene, and these lamps are inspected by 18 mukadams on alternate days. The commissioner does not think it advisable to relax the present supervision, as it might result in the deterioration of the existing standard of efficiency.

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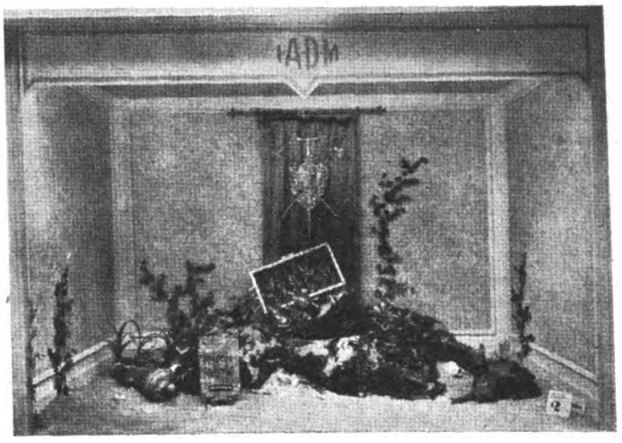
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

An ELECTRICIAN photograph of the British delegates to the International Commission on Illumination before leaving Waterloo on Saturday last, for Southampton. They sailed for the United States the same day on the Cunard s.s. "Tuscania." P. 229.

A novel electric vehicle seen at Deauville. It is called the "Red Bug," and belongs to Lord Michelham.

An exclusive photograph of a new electric compressed air hammer, intended for rock drilling and similar purposes, which has been invented by Prof. W. Weibull of the Technical College of Stockholm. It is said to be revolutionary in design and destined to become an important item in Swedish export trade.



An attractive window display of Westinghouse domestic electric appliances. It represents a treasure chest filled with a variety of to-day's essentials cast up on the sands of Comfort Island. The floor is of real sand and the chest contains real treasures. Photo: "Electrical News."

The three designs for the National Radio Exhibition Poster Competition, which, from left to right, were placed first, second and third respectively. It will be remembered that details of the competition were given in THE ELECTRICIAN of April 27th, and that mention has since been made that the entries were even heavier this year than last. This year's poster, therefore, has been chosen from a large number of designs of outstanding merit and its story is better told than was the case last year. Other pictures will be found on page 240.

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# FACTORY LIGHTING.

## Co-operative Effort and the E.D.A. Campaign.

NEXT month will see the launching of a Factory and Workshop Lighting campaign, planned by the E.L.M.A., conducted by the E.D.A. and backed by the co-operation of all sections of the British electrical industry. That proper lighting of factories is of vital importance to the industry has been conclusively proved, and recent research into existing conditions has shown that in the majority of workshops lighting arrangements are inadequate and inefficient.

A Government Committee specially appointed to investigate the relation between illumination and the speed of operations for fine work recently made a report to the effect that at 20 f.c. the output reached that obtained in daylight, but when the illumination was lowered to 7 f.c. the output was reduced by 10 per cent., while at 2 f.c. the output was reduced by no less than 25 per cent. From the Government Report it also appeared that an increase in illumination from 2 f.c. to 20 f.c. for fine work increased the output by fully 33 per cent.

### Expert Advice.

Appreciating that each workshop and factory must be considered individually and lighted according to its special requirements, the General Electric Co., Ltd., are, in a special campaign, drawing the attention of works and workshops managers to the fact that their illuminating engineers are at the disposal of those who have illumination problems to tackle. With this assistance, works managers may be certain that the height and spacing of the lighting units, the selection of fittings, and—an important point—the selection of the right lamps to be used in those fittings, will be arranged with a view to obtaining the maximum of light on the working plane, with a minimum of glare and shadow, at a cost which will be saved many times over by the all-round improvement in work which will result.

Concurrently with the E.D.A. activity a campaign is also to be conducted by the G.E.C. This will be launched next month and is intended to assist contractors. It will be concerned with extolling the advantages attaching to improved lighting of docks, railways, wharves, mines, factories, workshops, warehouses and offices, and will tell how home establishments can compete successfully with the outside world, with the aid of scientifically designed illumination. The special propaganda which has been prepared will tell of the losses of output due to bad lighting, and show how such losses can be made good at no extra running cost by adopting properly designed artificial illumination. The campaign will be directed towards explaining the value in pounds, shillings and pence of good lighting in terms plotted against the cost of personnel, equipment, output and turnover of many industries. These will include, amongst others, constructional engineering, iron, coal and steel trades, shipping, railways, chemical, textile, motor, printing and paper-making, tobacco, and shoe and leather trades.

It will show, for example, that coal can be screened under correct artificial lighting with even greater accuracy than in daylight, and that dyeing and cleaning, tobacco grading, paper-making, type-setting, the handling of freight, etc., and other kinds of industrial work can be accomplished under correct forms of artificial illumination with far greater exactitude, and in certain circumstances with much greater speed, than under varying conditions of actual daylight.

### THE BOYS' BALLOT.

In the height of the holiday season it is to be hoped that readers will not lose sight of the John Benn Hostel Ballot, which is now drawing near to the close. It will soon be too late to enter for this Sports and Pastimes Competition, in which it is possible to win a saloon motor car, a trip abroad (which can be taken next year if desired), or one of the 350 other prizes in the list, which totals in value over £1 500. There is yet time for tickets to be purchased before the closing date is advertised in the "Daily Telegraph" on September 26th, and it is earnestly hoped that all friends of the John Benn Hostel for East End working boys at Stepney will make the most of the remaining few weeks to swell the total of tickets sold.

The tickets, which are 1s. each, 10s. for a book of 11, together with complete prize lists, may be obtained from the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

# POST OFFICE CONTRACT.

## Explanation Why Order for All-Bronze Telephone Wire Went Abroad.

WITH reference to the placing with the Trefileries Co. by the Postmaster-General a contract for the supply of all bronze wire to be used in the British telephone service during the current year, an official statement was made on Friday of last week which reads to the effect that, "The Select Committee on Estimates of the House of Commons recommended, after consideration of the effects of a 'ring' on prices quoted to the Post Office, that the Post Office should have a free hand to accept tenders from abroad in cases where it is unable to obtain satisfactory evidence that the prices quoted by British manufacturers are not excessive, and in the present case there was no satisfactory evidence to that effect, and considerable evidence to the contrary."

"The prices quoted on behalf of the associated British makers for the manufacture of the bronze wire (apart from the cost of the principal raw material, copper, which would necessarily be imported whether the order for wire went to a British firm or not)," the statement continued, "compared very unfavourably, not only with the foreign prices for bronze wire, but with the British prices for the manufacture of copper wire, in which there is effective competition, from British firms outside the association.

"Nevertheless, the Post Office did not place the order abroad until it had made every effort to induce the British firms to quote a reasonable price, and had even suggested to them a price (allowing a substantial margin over the foreign price) at which it was ready to place a large order at once."

It was added that it was the settled policy of the Government not to disclose contract prices, and therefore the value of the order could not be published.

# WIRELESS NOTES.

## Proposed League of Nations Wireless Station and the Swiss Government.

THE Secretariat of the League of Nations has communicated to the States members the supplementary report relating to the establishment of a League wireless station to be used by the Secretariat in times of crisis. The Swiss Political Department in a covering Note deals with the questions that it considers would be raised by the operation under the League of a wireless station in Swiss territory in time of crisis. It recalls the particular obligations of Switzerland as a result of its neutrality, and declares that the Federal Government is nevertheless ready to consider an arrangement that will allow the League to fulfil its mission. It nevertheless considers it indispensable that it should possess the power in times of crisis to delegate an observer at Geneva whose duty it should be to inform the Federal Government regarding the activity of the station. Furthermore, it expresses the desire that the Assembly by formal resolution should recognise that the international responsibilities of Switzerland could not be affected by the use which the League might put the wireless station to in time of trouble.

**There are at present over 30 000 radio licence holders in Japan.**

**The first horizontal directional aerial was** patented by **Marconi in 1905.**

The Berlin wireless exhibition opens to-day (Friday) and continues until September 9th.

Mr. Bruce, Prime Minister of the Federal Government of Australia, has announced that the Government does not intend constructing a high-power wireless station at Canberra.

H.M. Stationery Office has published the text of the International Radiotelegraph Convention of Washington, 1927, and the general and supplementary regulations (price 2s. 6d.).

A model of the wireless transmitting station at Rugby, where a power of 1 000 kW is controlled by a tuning fork; a mechanical representation of the operation of a valve; and a model of the Bodmin beam station are now exhibited in the Radio Section of the Science Museum, South Kensington, London.

According to the Irish Free State Department of Industry and Commerce, shipping statistics show that wireless sets and components valued at £27 848 were imported by the Free State during the period January to March last. Of this Great Britain contributed goods to the value of £27 004 and Northern Ireland £536.

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# COMPANY NEWS.

## Appreciation of General Electric Shares—Supply Companies' Dividends—Expansion of German Companies' Holdings—Electricity in Japanese Mines—West Wilts Electric Light and Power Co.'s Meeting—New Companies.

THE electrical share market remains quiet, with changes in price quotations comparatively few and unimportant. In the supply group, Shropshire B's have risen a shilling to 33s., Chelseas are also 1s. to the good, and the two Kensington companies' shares each 6d. up. General Electric shares have been bought, and have jumped up 3s. 6d. to 42s. Marconi's Wireless are 1s. 3d. higher than a week ago, and one or two cable shares shows small improvement, but Eastern stock is unchanged. District Railway ordinary stock is 2 points up.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927 Highest. | 1912 to 1927 Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/– | 26/6 | 45/– | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 97 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/– | 27/– | 60/– | 10/– |
| 4½ | " " " 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/– |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 20/6 | 39/6 | 10/– |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | " " 6% C.P. .. .. | 23/6 | 23/6 | 40/– | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 39/– | 38/6 | 68/6 | 14/6 |
| 6 | " " 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/– |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/6 | 27/6 | 38/3 | 5/– |
| 9 | Metro. Elec. Sup. Ord .. .. | 48/9 | 48/9 | 43/– | 8/– |
| 4½ | " " " 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | " Elec. Sup. Ord. .. | 25/7½ | 25/7½ | 26/– | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/– | 23/9 | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10¾ | 10¾ | 10¾ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/– | 22/– |
| 1/4½ | Shrops, Worcs & Staffs Power B Ord. | 33/– | 32/– | 23/– | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/– | 27/– | 52/– | 18/– |
| 4½ | " " 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/– |
| 8 | Yorks. Elec. Power Ord. .. .. | 36/– | 36/– | 32/9 | 12/6 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/6 | 25/– | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk .. | 125 | 125 | 152½ | 24 |
| 6 | " " " 6% Pf. Stk... | 126 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72½ | 73 | 89½ | 40½ |
| 4 | " " 4% Deb... .. | 80 | 80 | 103 | 50½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102¾ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73¼ | 10 |
| 4 | " " " 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | " " " 4% Deb. .. .. | 80 | 80 | 98¾ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 85 | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101¼ | 49 |
| 5 | " " " 5% Deb. .. | 66½ | 66½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 60½* | 66½ | 84½ | 19 |
| 3½ | " " 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | " " 3½% Deb. .. | 71 | 71 | 92¾ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79½ | 77¾ | 66¾ | 12¾ |
| 4½ | " " 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | " " 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73¾ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/– | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/– | 5/– | 27/– | 1/– |
| 4½ | " " " 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord .. | 85/– | 85/– | 86/3 | 26/6 |
| 6 | " " 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | " " 7% Deb. | 106 | 106 | 109¾ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/1½ | 28/1½ | 29/9 | 10/– |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/– | 22/– |
| 6½ | " " 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/– |
| 7½ | " " 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/– | 8/– |
| 7 | " " 8% Cum. Pf. | 26/3 | 26/3 | 25/– | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/–) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | " " 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/– | 5/– |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | " " 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/– |
| — | English Elec. Ord... .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | " " 6% C.P. .. .. | 10/– | 10/– | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/– | 20/– | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/9 | 27/– | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/– | 19/– | 19/4½ | 16/9 |
| 7 | " 7% 2nd Pref. .. .. | 19/– | 19/– | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 42/– | 38/6 | 59/– | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 110/– | 110/– | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/– | 40/– | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref... | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 33/1½ | 32/6 | 37/– | 13/1 |
| 8 | " " 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/– |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/9 | 28/1½ | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 62½ | 60½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 79½ | 79½ | 77¾ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 245 | 245 | 213½ | 113/2/6 |
| 3½ | " " 3½% Pref. Stk. .. | 69½ | 67½ | 84/17/6 | 49 |
| 4 | " " 4% Deb. .. | 80½ | 79¼ | 103¼ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24¾ | 24¾ | 21¼ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 46½ | 45½ | 56¾ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 66/3 | 65/– | 9/16/3 | 20/9 |
| 12½ | " Int. Mar. .. .. | 51/– | 51/– | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24¾ | 24¾ | 23 | 11/3/6 |

(*a*) 1s. 7.5d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share. (*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d. ‡Including 1s. bonus. * Ex dividend

DAVIS AND TIMMINS, LTD.—Int. div. on ord. shs. at rate of 6 p.c. p.a. tax free (same).

PENNSYLVANIA WATER AND POWER CO.—Div. on common shs. $\frac{5}{8}$ p. sh. for qrtr. endg. September 30th, payable October 1st.

NEWCASTLE-UPON TYNE ELECTRIC SUPPLY CO., LTD.—Intm. div. of 2½ p.c. (same rate as last year) will be payable on Sept. 29 on ord. shs.

HURST, NELSON AND CO., LTD.—A div. on ord. shs. at the rate of 2s. p. sh., with bonus of 6d. p. sh., both less tax (same as last year) is announced.

ILLINOIS POWER CO., LTD.—Quarterly div. 11½ p.c. and 13¼ p.c. respect. on 6 p.c. and 7 p.c. pref. shrs., both payable Oct. 1 to holders of record Sept. 15.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Intm. div. at rate of 10 p.c. p.a. (same rate as last year) on ord. shs. for half year, will be payable on Sept. 29.

COLUMBIA GAS AND ELECTRIC SUPPLY CO., LTD.—Quarterly div. $1.50 per sh. on cum. 6 p.c. pref. stk. and $1.25 per sh. on no par value com. stk. paid Aug. 15.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION, LTD.—Est. net earngs., after deducting exs. for July, $18 600, agst. $14 700. Total est. net earngs. from Jan. 1, $140 200, agst. $34 500.

CIA CHILENA DE ELECTRICIDAD LIMITADA.—Int. due on bonds of 8 p.c. 1st mtge. loan will be paid on and after Sept. 1 on presentation of Coupon No. 14 to Anglo-South American Bank, 117, Old Broad Street, London, E.C.2.

PINCHIN, JOHNSON AND CO., LTD.—Pft. for half-year ended June 30th, 1928, show substantial increase over corresponding period of last year. Intm. div. of 10 p.c. actual, less tax, on ord. shs. will be payable on September 8th.

WELLMAN SMITH OWEN ENGINEERING CORPORATION, LTD.—Trdg. loss for 1927, £13 159, agst. £5 983 loss for 1926, plus taxation, £525. After transferring remainder rev. to pft. and loss acc., cr. blce. of £1 835 bt. fwd. is converted to def. of £10 877.

WEST WILTS ELECTRIC LIGHT AND POWER CO., LTD.—Rept. for year ended Dec. 31 shows pft. of £1 606 10s. 7d., after charging £3 500 for depcn. res. £359 15s. 2d. carried fwd. from last year, makg. pft. £1 968 14s. 9d. Divs. recommend. 5 p.c. div. on ord. shs., £1 130; 6 p.c. on pref. shs., £518, carrying fwd. £510 to next account.

BOGNOR GAS AND ELECTRICITY CO., LTD.—Divs. are announced at rate of 8 p.c. p.a. on original and additional ord. con. stk. "A," 9½ p.c. p.a. on original ord. con. stk. "B," and 7 p.c. p.a. on new con. stk., all payable, less tax, on Sept. 3, accts. being now made up annually to Dec. 31. Last year divs. were at same rates for half-year to June 30.

PEARSON AND KNOWLES, LTD.—The deb. stkhldrs' cmttee., in response to circular of 13th, have received considerable support from hldrs. of 1st mort. deb. stk., and have accordingly instructed lead. counsel to represent dissentients for purpose of opposing reconstructn. scheme, so far as it concerns the 1st deb. stkhlders, when the petitn. for confirmatn. comes before the Court.

GERMAN INTERESTS IN SWEDEN.—The Osram Ges. m.b.H., of Berlin, have acquired the majority of the shs. of the Elektra Works Co., of Stockholm, at 400 kr. p. sh., and the remaining shhldrs. have been invited to sell at the same price. The cap. of the Elektra Works Co. was reduced early in the present year from 5 000 000 to 2 500 000 kroner. Amongst the partners in the Osram Ges. m.b.H. are the German General Electric Co. and Siemens and Halske A.G.

ASSOCIATED GAS AND ELECTRIC CO.—Gross earngs. for 1927, $35 296 741, increase 21 p.c.; net earngs., after provisn. for operatg. exes., maintenance and taxes, $17 032 086, increase 24 p.c. Blce. available for Class "A" stk., other divs., etc., $2 805 145, increase 11 p.c. Of the rev., 75 p.c. was derived from sale of electricity. Gross income for 12 months ended May 31st, 1928, was $42 006 909, increase 32 p.c., and net earngs. were $18 167 902, increase 24 p.c.

CHOSEN MINING SYNDICATE.—The board state that an arrangement for an adequate supply of all electrical power to the properties has been concluded with the Shimada Syndicate under the guarantee of the Chosen Denki Kabushiki Kaisha, owning one of the most up-to-date electric generating stations

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in Japan, situate about 98 miles from the property. Preliminary construction work on the transmission line has already started, and power is expected to be available about April next.

INTERNATIONAL PAPER CO.—Consolidated earngs. statemt. for qtr. ended June 30, shows total rev. $4 385 686, agst. $3 896 971 for correspondg. qtr. of 1927. Net rev. available for divs. was $1 415 571 agst. $1 413 030. Divs. on Canadian Hydro-Electric Corpn. 1st pfd. stk. absorbed $187 500, agst. nil, divs. on International Paper pfd. $1 661 300, agst. $873 987, and common stk., $600 000, agst. $523 467, leaving deficit $1 033 229, compared with surplus $15 576. The earngs. shown do not include undistributed portn. of earngs. accruing on common shs. of New England Power Assocn.

BUELL COMBUSTION (FOREIGN), LTD., announce the formation of a company to operate the Buell patents in France, Belgium, and their colonies. The new company, the "Compagnie Française Buell Combustion Société Anonyme," incorporated under the laws of France with a capital of 12 000 000 fr., acquires the patents and goodwill from the Anciens Etablissements Loy et Aube of Paris, in connection with pulverised coal, and will complete the existing contracts of this company. Messrs. Loy et Aube have of late years successfully developed this industry, and have been responsible for many large installations in France, including power stations and industrial works. The company also acquire from the Buell Combustion (Foreign), Ltd., the whole of the Buell patents for France and Belgium on terms.

COMMONWEALTH POWER CORPORATION.—Gross earnings of Corporation and subsidiaries for year ended July 31, 1928, $56 060 477, agst. $51 818 617 for previous year, gross income, after deductg. operatg. exes., taxes and maintenance, $26 706 083, agst. $24 086 025, net amt. available, after provision for fixed charges, including int., amortisation of debt disct. and exes. and earngs. accruing on stk. of subsidiary cos. not owned by Corporation, $14 510 386, agst. $11 724 718. This sum is equal to $29·02 p. sh. on the 500 000 shs. of 6 p.c. pfd. stk. and $7·74 on the 1 495 503 shs. of common stk. oustanding at July 31, 1928. After provisn. for depreciatn. res., earnings were equal to $21·89 p. sh. on the pfd. and $5·18 p. sh. on the common stk., compared with $16·57 and $4·07 last year. After paymt. of div. on pfd. stk. and providg. $3 815 385, agst. $3 437 599, for depreciatn. res., blce. is $7 754 386, agst. $6 080 546. Sales of Corporation subsidiaries for July amtd. to 146 400 452 kWh, increase 17·89 p.c. compared with July, 1927. For year ended July 31, 1928, sales were 1 699 289 779 kWh agst. 1 507 077 704 kWh, increase 12·75 p.c.

## Company Meeting.

WEST WILTS ELECTRIC LIGHT AND POWER CO., LTD.—At the annual meeting on Wednesday of last week, the chairman, Mr. A. A. Douglas, stated that the result of the year's working, after charging £3 500 for depreciation reserve was a profit of £1 608 19s. 7d., which, together with the sum of £359 15s. 2d. carried forward from last year, gave an amount of £1 968 14s. 9d. to be dealt with. The policy of extending the company's mains into the villages was being continued, and the service which electricity offered in the home was beginning to be realised. Mr. George Lansdown seconded the motion, and said it seemed to him that the most satisfactory part of the report was the increase in the number of kWh sold. In 1926 the report showed that the company sold 226 187 kWh for lighting, and 37 939 for power, making a total of 464 126 kWh, while the report under review for 1927 showed 431 714 kWh sold for lighting, and 986 332 for power, making a total of 1 418 046, giving an increase on the year of 953 926 kWh. He was glad to say that requisitions for current were still coming in satisfactorily.

Mr. Edwards, the managing director, said he was satisfied with the progress of the company, it had even exceeded their expectations. One of the most cheering features was the amount of current sold for power, which compared very favourably with any other part of the country. Further extensions were under consideration, including the line from Westbury to Devizes which would give Devizes and that part of the county a duplicate supply, and Hilperton, and places beyond Westbury would receive consideration in the next few months. Also, he added, the service during the last nine months had given every satisfaction in the matter of freedom from stoppages.

The chairman then proposed a resolution, which was adopted, to the effect that the authorised share capital of the company be increased to £100 000 by the creation of 8 000 cumulative preference shares of £5 each, and 25 000 ordinary shares of £1 each, to rank equally with existing shares. Col. Blake questioned the wisdom of issuing £5 shares, as in his opinion £1 shares would be a greater inducement to the small investor. This, it was understood, will receive consideration.

The report was adopted, and the dividends set out approved.

## New Companies.

PARKSIDE SUPPLY CO., LTD.—Cap., £500. Lighting and electrical engineers, etc. Reg. office: 13, Hall Lane, Northowram, Halifax.

JOHN HECKIE, SON AND CO., LTD.—Cap., £5 000. Mechanical and electrical engineers, etc. Reg. office: 108, Douglas Street, Glasgow, C.2.

CEDARS, LTD.—Cap., £6 000. Manufacturers, importers and exporters of and dealers in electrical appliances, etc. Reg. Office: 44, High Street, Watford.

BLACKBURN SUN-RAY CLINIC, LTD.—Cap., £250. Sun-ray and ultra violet-ray clinic or institute, etc. Reg. office: 27, Granville Road, Blackburn.

RÜTHVEN TRADING CO., LTD.—Cap., £1 000. Manufacturers of and dealers in wireless sets and accessories, etc. Reg. office: 146, Wimborne Road, Bournemouth.

WOODGATE AND ELSWORTH, LTD.—Cap., £500. To carry on the business of dealers in all kinds of electrical stores, apparatus and plant, etc. Reg. Office: Summerhill, High Halden, Kent.

EVERLITE, LTD.—Cap., £1. To carry on the business of electricians, mechanical engineers, suppliers of electricity, etc. Solicitors: Ashurst Morris, Crisp and Co., 17, Throgmorton Avenue, E.C.

REFLEX ADVERTISING CO., LTD.—Cap., £4 000. Advertising agents, manufacturers and factors of electrical goods and advertising signs, etc. Solicitors: Barclay, Morgan, Griffiths and Co., 124/7, Minories, London, E.C.3.

UNBREAKABLE LAMPS, LTD.—Cap., £100. To acquire the business of factors of electric accessories, signs, fittings and lamps carried on by V. A. Walker as the "Unbreakable Lamp Co." Reg. Office: 67-8, Stafford Street, Birmingham.

ELECTRIC ART SHADES (1928), LTD.—Cap., £500. To acquire the business of lamp shade manufacturers and designers hitherto carried on by H. A. Chard and Laura G. Chard. Reg. Office: Freebourne's Garage, Newland Street, Witham, Essex.

C. H. C. ENGINEERING CO., LTD.—Cap., £1 500. To acquire business of consulting, electrical and mechanical engineers carried on by H. Crossen and V. Hogg in partnership as the "C. H. C. Engineering Co." at Riverside Works, 126, Wallis Road, Hackney Wick, London, E.9.

INSTRUMENT WIRES AND CABLES, LTD.—Cap., £2 000. Electrical, mechanical, wireless and general engineers, manufacturers of and dealers in electrical and mechanical apparatus, appliances, cables and wires, insulated and otherwise, etc. Reg. Office: 218, Homeside Road, Bickley, Kent.

TRUPHONIC, LTD.—Cap., £1 000. To acquire business of merchant of and dealer in wireless, electrical apparatus and appliances, etc., carried on by G. E. Spero at 121/3, Rosebery Avenue, London, E.C., as the "Truphonic Wireless Co." Reg. office: 121/3, Rosebery Avenue, London, E.C.

ELECTRIC FURNACE CO., LTD.—Cap., £200 000. To acquire business carried on by Electric Furnace Co., Ltd. (in liq.), with undertaking and all or any of the assets and liabilities of that company, to carry on the business of contractors, electrical, electrochemical, and general engineers, etc. Directors: D. F. Campbell and W. S. Gifford. Reg. office: 17, Victoria Street, Westminster, S.W.1. (Public Co.)

MEARS EAR PHONE CO. (LONDON), LTD.—Cap., £100. Manufacturers, importers, exporters and letters to hire of, agents for and dealers in ear phones, microphones, electrosages and instruments of all kinds for aiding the deaf to hear or for improving the hearing or for enlaying, intensifying, reproducing or transmitting sound, manufacturers and repairers of aural instruments, apparatus and devices, electricians, etc. Registered office: New Courts Chambers, 57-58, Chancery Lane, London, W.C.

ELECTROLUMINATION (ABADIE PROCES), LTD.—Cap., £5 000. To adopt an agreement with J. B. J. M. Abadie and L. Zinai, trading as L'Electro-Luminescence at 20, Rue Martin Bernard, Paris, and to carry on the business of electricians, engineers and manufacturers of and dealers in electrical condensers, luminous electric discharge tubes, electric discharge tubes with rarefied or varified atmospheres, wireless apparatus, high tension protective apparatus, etc. Solicitors: A. Veasey and Co., Aldwych House, London, W.C.2.

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## LEAD MARKET REPORT.

With reference to the lead market last week, James Forster and Co. state that Monday's market was flat, August shipment selling down to £21 12s. 6d. and November to £21 11s. 3d., a loss of 5s. on the day, followed next day by a similar market at same figures. The last three days the tone was decidedly better, and a considerable covering business was done up to the above figures. America has advanced the official price 10 points to 6·30.

Closing prices on August 3rd were at £22 for August, and £21 17s. 6d. for November, or 1s. 3d. per ton up on the week.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ATKINSON, Douglas Walter, 8, Grand Parade, West Bournemouth, engineer. £57 13s. 8d. July 14th.

AUTO-ELECTRICAL SERVICE, Garrick Place, Wellington Road South, Stockport, electrical specialists. £16 7s. July 11th.

BUCKINGHAM, Mr. C. W., 31, Bath Road, Margate, electrical engineer and contractor. £15 14s. 10d. July 19th.

BURCHELL, Mr. J. L., 17, Riches Road, Harringay, wireless battery maker. £10 19s. 6d. June 27th.

GRANT, Stewart (trading as GORDON JOHNSON), 12½, East Street, Leicester, electrical accessories dealer. £31 17s. 11d. June 20th.

JACOBS, Mr. E. V., 3, Ashfield Court, The Grove, Ealing, wireless dealer. £12 1s. 4d. March 13th.

KAYS ACCUMULATOR SERVICE, 38, Whalley Range, Blackburn, battery specialists. £17 14s. 4d. July 10th.

KERR, Sydney Croft, Radio Stores, St. Nicholas Street, Leicester, wireless dealer. £13 10s. 5d. June 28th.

LYNCH, J. and T., Harwood Lane, Great Harwood, wireless engineers. £16 9s. 10d. June 8th.

NICHOLAS, Mr. D. G., Victoria Square, Aberdare, radio dealer. £17 17s. 4d. July 10th.

SOUTHERN ELECTRICAL EQUIPMENT CO., 74, Shepherds Bush Road, W., wireless dealers. £11 0s. 5d. July 10th.

WOOLLDRIDGE RADIO CO., LTD., 17, Lisle Street, W.C., wireless dealers. £25 10s. July 13th.

## Receiverships.

BASTIAN METER CO., LTD.—J. C. Helme, 11, Queen Victoria Street, E.C.4, was appointed receiver and manager on August 9th, 1928, under powers contained in first mortgage debentures dated October 27th, 1926, and March 21st, 1928.

WOOLLDRIDGE RADIO CO., LTD.—S. J. Evans, F.A.I., 31, Brook Street, W., was appointed receiver by Order of Court dated August 10th, 1928.

## Private Meetings.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position, when he may not be insolvent.*]

UNEEDA SUPPLIES CO., LTD., 37, Tothill Street, London, S.W., wireless and electrical dealers. This company went into voluntary liquidation on July 31st, and the statutory meeting of the creditors was held on August 20th at the offices of Haynes and Baker, accountants and auditors, 93, Mortimer Street, W.1. The liquidator, Mr. W. F. Baker, presented a statement of affairs which disclosed liabilities of £6 752, of which £5 039 was due to trade creditors, while there were cash creditors for £624 and a bank overdraft for £489. In addition there were debentures and preferential claims amounting to £1 200. The assets consisted of stock in trade £1 178, stock returned and damaged £400, stock of which ownership was in dispute £200, stock at dock £14, stock of printing and stationery, etc., £250, three motor cars valued at £125, registered name of "Lustron" £100, furniture, fittings and fixtures £108, and book debts £2 896, a total of £5 271. The liquidator reported that the assets were at book valve, and if it came to a forced realisation they would not fetch anything like that amount. The registered name of "Lustron" was in connection with a crystal which cost the company £100, for the purpose of a statement of affairs it had been put down at that amount. The company was formed on June 23rd, 1926, with a nominal capital of £1 000, and had offices at Bank Chambers, High Holborn. In December, 1926, the business was removed to Petty France, and subsequently two months ago to their present premises. The issued capital of the company was £950, and the shares were held as follows:—Mr. E. Batty, £490; Mr. J. Bolton, £10; T. F. Shearer, £250, and Mr. L. C. Green, £200.

Replying to a creditor, the liquidator said that a debenture for £1 000 was created on April 25th, 1927, for cash advanced, and one for a similar amount in May of this year in favour of Mr. Batty in consideration of his guaranteeing payment of certain sums for goods supplied by Continental manufacturers, but Mr. Baker stated that the debentures would not rank. The cash creditors were Mr. Batty for £250, and Mr. Shearer for £300, representing the balance of unpaid salaries, and in addition Mr. Batty had guaranteed certain creditors' claims, including the bank. Replying to further questions, the liquidator said that the trading loss for the fifteen months to the date of liquidation was £1 428. Mr. Baker added that in addition to being appointed liquidator he was also receiver on behalf of the debenture holders. He was making efforts to sell the business as a going concern, but had so far been unsuccessful.

After some discussion it was decided that the voluntary liquidation of the company should be continued with Mr. Baker as liquidator and a committee of inspection.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

BURNDEPT WIRELESS, LTD. By special resolutions, July 25th, confirmed August 21st. R. A. Hamlyn, chartered accountant, 80, Bishopsgate, London, E.C., appointed as liquidator for the purposes of reconstruction. Meeting of the creditors at the office of the liquidator, on Friday, September 7th, at 12 noon.

MANCHESTER MAGNETO CO., LTD. By reason of its liabilities, August 16th. A. Linley Price, 8, Exchange Street, Manchester, chartered accountant, appointed as liquidator.

RUDOLPH, CHARLES AND GOFF, LTD. By reason of its liabilities, August 10th. F. Hyde, 34, London Wall, London, chartered accountant, appointed as liquidator.

### Bankruptcy Information.

DAWSON, Joseph Edward, High Street, Boston, Lincoln, wireless engineer. Receiving order, August 23rd. Creditor's petition.

ELLIOTT, William, and ELAND, Percy, 13, Cow Lane, Burnley, trading as BURNLEY ARMATURE REPAIRS, electrical engineers. Receiving order, August 25th. Debtor's petition.

GATESHILL, Harry, 113, Witham, Kingston-upon-Hull, wireless engineer. First meeting, September 4th, 11.30 a.m., Official Receiver's office, 37, Scale Lane, Hull. Public examination, October 15th, 2 p.m., Guildhall, Alfred Gelder Street, Hull.

LAWSON, Ralph Burton, lately The Avenue, Bare, Morecambe, Lancs., electrical engineer. Receiving order, August 23rd. Creditor's petition. First meeting, September 7th, 11 a.m., Official Receiver's Office, 9, Cannon Street, Preston. Public examination September 28th, 10.30 a.m., Sessions Hall, Lancaster Road, Preston.

### Notice of Dividend.

JONES, Sidney Ernest, and SHORT, George, Elsecar, near Barnsley, trading as S. E. JONES AND CO., dry battery manufacturers. First and final dividend, 1s. 6d. per £, payable August 29th, Official Receiver's Office, County Chambers, King Street, Wakefield.

### Notices of Intended Dividends.

BANKS, George Baldwin, 16, Market Place, Redditch, Worcester, trading as THE REDDITCH RADIO CO., radio engineer. Last day for receiving proofs, September 3rd. Trustee, C. Hoult, 191, Corporation Street, Official Receiver.

BRITTAIN, Percival Frederick, trading as BRITTAIN'S ELECTRIC MOTOR CO., East Down Works, Dermody Road, Lewisham, S.E.13, and at 110, Cannon Street, London E.C., electrical engineer. Last day for receiving proofs, August 30th. Trustees, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2.; J. H Hodson, 69, Basinghall Street, E.C.2.

COOPER, Arthur Coath, 1A, Sherwood Street, Scarborough, electrical engineer. Last day for receiving proofs, September 5th. Trustee, D. S. Mackay, 48, Westborough, Scarborough, official receiver.

HARTIGAN, James Aloysius, and HARTIGAN, George Joseph Dominick, trading as LONDON FAN AND MOTOR CO., 81, Charlotte Street, Tottenham Court Road, London, W.1, electrical engineers. Last day for receiving proofs, August 29th. Trustee, E. H. Hawkins, 4, Charterhouse Square, London, E.C.1.

HILTON, Reginald, 81, Blackburn Street, Radcliffe, electrical engineer. Last day for receiving proofs, August 10th. Trustee, S. A. Mayers, 16, Silverwell Street, Bolton.

HODGE, Wilfred Percy, 92, Cannon Street, London, E.C., wirelesse, salesman. Last day for receiving proofs, September 12th. Trustee, A. H. Hadden, 24, Old Square, Lincoln's Inn, London, W.C.

OSBORN, Herbert, 3, High Street, Normanton, Yorks, wireless dealer. Last day for receiving proofs, September 8th. Trustee, B. S. Briggs, County Chambers, King Street, Wakefield, official receiver.

SHORROCK, Harold Northrop, Holling's Yard, Heysham Road, Morecambe, electrical engineer. Last day for receiving proofs, September 14th. Trustee, H. Parker, official receiver, 9, Cannon Street, Preston.

### Partnership Dissolved.

HAYES, H. J., AND CO. (Herbert John HAYES and John VOADEN), electrical engineers, 78, North End, Croydon, as from July 20th, 1928. Debts received and paid by H. J. Hayes, who will continue the business.

## Bankruptcy Proceedings.

KELLY, Stanley Sherzell, 59, North Road, Durham, electrical contractor. The public examination of the bankrupt was held on August 21st, at the County Court Offices, Old Elvet, Durham, when the case was adjourned. The debtor, who returned a statement of affairs showing a deficiency of £1 410, stated that a year ago his liabilities exceeded his assets by £1 256, and that he had borrowed from two money lenders, agreeing to pay 50 per cent interest.

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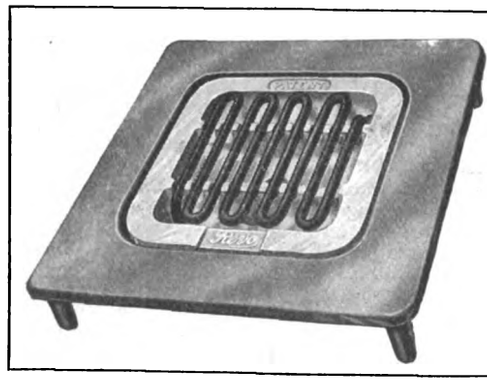
# ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by*** **GEE AND CO.,** ***Patents and Trade Mark Agents, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained.***

*Opposition to the registration of the following trade marks can be lodged up to September 22nd.*

GRAWOR. 491 888. Photographic apparatus, cinematograph apparatus and parts thereof, and cinematograph films (being transparencies for exhibition) and apparatus for use in wireless telegraphy and telephony. Walter Vollmann, trading as Grass and Worff, Markgrafenstrasse, 18, Berlin, S.W. 68, Germany; manufacturer. May 29th, 1928. Address for service in the United Kingdom is c/o Herbert Haddan and Co., 31-32, Bedford Street, Strand, London, W.C.2.



*THE new hot-plate by the Revo Electric Co., Ltd. A description of the apparatus has already appeared in* THE ELECTRICIAN.

PANAMPLUS. 492 396. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Universal and General Radio Co., Ltd., 1 to 42A, Bravington Road, London, W.9; manufacturers.—June 14th, 1928.

RADCROIX. 492 583. Class 8. Sound amplifying apparatus for use in connection with wireless telephonic apparatus. Lionel Sidney Alexander, trading as The Wholesale Wireless Co., 103, Farringdon Road, London, E.C.1; manufacturers.—June 21st, 1928. (To be Associated. Sect. 24.)

VEETA. 492 151. Class 13. Electric switches made of ordinary metal. The General Accessories Co., Ltd., Genex House, 18 to 22, Euston Buildings, Euston Square, London, N.W.1; manufacturers. —June 6th, 1928. (By Consent.)

# METAL AND CHEMICAL PRICES.

**TUESDAY,** August 28th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| ***Copper*—** | | | | |
| Best Selected .. | per ton | £65 0 0 | — | — |
| Electro Wirebars .. | ,, | £69 5 0 | — | — |
| H.C. Wires, basis .. | per lb. | 9 15/16d. | — | — |
| Sheet .. .. .. | ,, | 10¼d. | — | — |
| ***Phosphor Bronze*—** | | | | |
| Wire (Telephone) basis .. .. | per lb. | 1s. 0 15/16d. | — | — |
| ***Brass* 60/40—** | | | | |
| Rod, basis .. .. | per lb. | 8¼d. | — | — |
| Sheet ,, .. .. | ,, | 9⅛d. | — | — |
| Wire ,, .. .. | ,, | 9⅛d. | — | — |
| ***Pig Iron*—** | | | | |
| Cleveland Warrants.. | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. | ,, | £14 15 0 | — | |
| ***Lead Pig*—** | | | | |
| English .. .. | per ton | £23 5 0 | — | — |
| Foreign or Colonial .. | ,, | £22 0 0 | 7s. 0d. | — |
| ***Tin*—** | | | | |
| Ingot .. .. .. | per ton | £209 0 0 | — | £3 15 0 |
| Wire, basis .. .. | per lb. | 2s. 9d. | — | ¼d. |
| ***Aluminium Ingots*** .. | per ton | £95 0 0 | — | — |
| ***Spelter*** .. .. .. | ,, | £24 10 0 | 5 0 | — |
| ***Mercury*** .. .. | per bottle | £23 5 0 | 5 0 | — |

***Sulphur*—Flowers, Ton £12 0 0** ***Sodium Chlorate*—Per lb. 2¼d.**
,, Roll, ,, £10 15 0

***Sulphuric Acid*** (Pyrites, 168°) per ton £6 15 0

***Copper Sulphate*—Ton £25 to £25 10 0**

***Boric Acid*** (Crystals) ,, £30 ***Sodium Bichromate*—Per lb. 3¼d.**

***Rubber*—Para fine, 11¼d.; plantation 1st latex, 9 7/16d.**

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

## COMING EVENTS.

**Wednesday, September 5th-12th.**

BRITISH ASSOCIATION.—Annual meeting, Glasgow.

**Wednesday, September 5th-22nd.**

MACHINE TOOL AND ENGINEERING EXHIBITION.—Olympia, London.

# PATENT RECORD.

***The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.***

## Applications for Patents.

### August 11th.

23 213 BRITISH THOMSON-HOUSTON CO., LTD., and L. J. DAVIES. Thermionic discharge tubes.
23 177 A. E. COLATO. Loud-speaker cabinets.
23 191 H. EWING, J. ROBERTS. Dynamometers.
23 194 GENERAL CABLE CORPORATION. Heat application to covering of conductive cores. (26/8/27, U.S.)
23 224 H. G. LAUDIS. Electric heaters.
23 239 E. A. TUBBS. Eliminating electrical interference.
22 813 AKT.-GES. BROWN, BOVERI ET CIE. Selection relays. (15/8/27, Germany.)

### August 13th.

23 311 AKT.-GES. BROWN, BOVERI ET CIE. Generators and turbines. (17/8/27, Germany.)
23 312 AKT.-GES. BROWN, BOVERI ET CIE. Valves. (22/8/27, Germany.)
23 307 E. ASCH and IDEAL WERKE AKT.-GES. FUR DRAHTLOSE TELEPHONIE. Electric sound boxes for talking machines.
23 278 BRITISH THOMSON-HOUSTON CO., LTD. Speed control systems. (20/3/28, U.S.).
23 309 E. DUTT and A. HELBRONNER. Electric batteries. (11/8/27, France.)
23 276 ELECTRIC FIRES, LTD., and F. L. LEWHOUSE. Electric kettles.
23 338 ETABLISSEMENTS INDUSTRIELS DE E.C. ET DE A. GRAMMONT. Electric discharge tubes. (11/8/27, France.)
23 314 FELTON AND GUILLEAUME CARLSWERK AKT.-GES. Avoidance of cross talk in telephone cables. (11/8/27, Germany.)
23 315 FELTON AND GUILLEAUME CARLSWERK AKT.-GES. High tension cables. (20/8/27, Germany.)
23 265 W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., and H. C. HOBAN. Electric circuit testing device.
23 323 P. LANCIER. Apparatus for withdrawing underground cables.
23 285 S. LOEWE. Electric discharge tubes. (17/8/27, Germany.)
23 286 S. LOEWE. Heated filament for thermionic valves. (15/8/27, Germany.)
23 634 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Picture transmission. (13/8/27 U.S.)
23 297 MASCHINENFABRIK ESSLINGEN.—Electro-magnetic transmission gearing. (3/10/27, Germany.)
23 244 F. G. PEACOCK. Wireless testing apparatus.
23 242 J. H. REGNER. Electric mains supply devices.
23 321 D. S. S. STEUART. Apparatus for production and transmission of sound. (12/12/27.)
23 319 WICO ELECTRIC CO. Magnetos. (9/5/28, U.S.)

### August 14th.

23 455 AKT.-GES. BROWN, BOVERI ET CIE. Valves. (19/8/27, Germany.)
23 416 T. A. BIDDINGTON and R. FIELD. Wireless receiving apparatus.
23 432 BRITISH THOMSON-HOUSTON CO., LTD. Machines for forming rings of segmental pieces. (19/8/27, U.S.)
23 436 D. H. JOHNSON. Thermionic amplifiers.
23 405 M. AND A. LEVY and ELECTRO-TECHNIQUE APPLIQUEE. Means for recharging storage batteries.
23 409 H. R. G. MOORE and T. P. RIGBY. Diaphragms for signalling and recording apparatus.
23 395 J. V. PUGH. Light reflecting devices.
23 410 D. N. SHARMA. Television system.
23 445 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electric rectifier. (3/9/27, Germany.)
23 465 L. SZENYOVSKY. Television apparatus. (16/8/27, Austria.)
23 407 A. ZAJDLER. Electrical advertising apparatus.

### August 15th

23 488 D. D. G. ANDERSON. Electric condensers.
23 571 A. BAKER. Moving coil loud speakers.
23 522 BRITISH THOMSON-HOUSTON CO., LTD. Control of dynamo electric machines. (16/8/27, U.S.)
23 523 BRITISH THOMSON-HOUSTON CO., LTD. Amplifying apparatus. (22/8/27, U.S.)
23 542 CALLENDER'S CABLE AND CONSTRUCTION CO., LTD., and J. URMSTON. Transmission for electric currents.
23 501 J. R. LAIRD and G. PATE. Electric kettles.
23 477 J. W. LEATHER. Sparking plug adjuster.
23 558 C. L. LIPMAN and NALDER BROS. AND THOMPSON, LTD. Electric time-selective relays.
23 505 A. H. REEVES and STANDARD TELEPHONES AND CABLES, LTD. Electric signalling systems.
23 473 A. F. ROBINSON. Electrically welding metallic studs to steel plating.
23 532 SIEMENS-SCHUCKERTWERKE AKT.-GES. Domestic electric appliances. (25/8/27, Germany.)
23 540 SIEMENS-SCHUCKERTWERKE AKT.-GES. Induction motors. (3/11/27, Germany.)
23 543 SIEMENS SCHUCKERTWERKE AKT.-GES. Contact rectifier electrode. (1/1/27, Germany.)
23 547 SIEMENS-SCHUCKERTWERKE AKT.-GES. Electric rectifier. (12/7/27, Germany.)
23 531 L. TSCHORNER. Television apparatus.
23 503 S. C. WHAITE. Accumulators.

### August 16th.

23 594 H. AUTRANIKIAN. Radio direction indicator.
23 633 L. B. AULT and BRITISH THOMSON-HOUSTON CO., LTD. Sound reproducing devices.
23 617 T. K. BARNARD. Electrical reproduction of sound.
23 600 W. E. BEATTY. Submarine cables.
23 606 J. BECKMANN. Electric lamps.
23 640 W. R. BULLIMORE. Manufacture of electrical transformers.
23 614 N. R. CAMPBELL and the GENERAL ELECTRIC CO., LTD. Photo-electric cells.
23 623 E. N. ELFORD and GRAHAM AMPLION, LTD. Variable electric condensers.
23 615 GENERAL ELECTRIC CO., LTD., N. M. HILL and W. WILSON. Electric plant for running in fluid pressure engines.
23 616 GENERAL ELECTRIC CO., LTD., and W. H. PETERS. Inductance coils for radio purposes.
23 652 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Wireless signalling. (17/8/27, U.S.)
23 622 L. H. MASKELL. Photo-telegraphy.
23 582 F. J. PEARCE and G. H. SCHOLES AND CO., LTD. Electrical plug and socket couplings.
23 586 L. C. RUDKIN. Sound recording apparatus.
23 630 A. RUPPS. Electric cigar lighters. (1/10/27, Germany.)

### August 17th.

23 669 W. AITKEN. Automatic telephone switching systems.
23 725 BRITISH THOMSON-HOUSTON CO., LTD. Insulated cable joints. (18/8/27, U.S.)
23 726 BRITISH THOMSON-HOUSTON CO., LTD. Electric distribution systems. (23/8/27, U.S.)

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## The New Lamp Prices.

A CURIOUS situation has arisen regarding the announcement of the further reductions in E.L.M.A. lamps which became effective last Saturday. On that day the news appeared in certain daily papers, but, although the trade might have expected to receive the information at least as early as the general public, it has not been able to receive any official intimation until nearly a week later, though, unofficially, the information seems to have been fairly common knowledge in the trade towards the end of last week. It is obvious that there could have been no sinister reason for withholding the news from the trade, because after August 31st the cuts were actually operative and no financial considerations could be involved. It must then have been due to failure on somebody's part to realise that the publication dates of the technical weekly journals fell, on this occasion, one or two days before the appointed day, and that, in any case, the retail trade should have official warning preparatory to receiving visits from customers requiring lamps at the new prices. It may perhaps seem a small matter, but those who look at it in this light should try to put themselves in the position of the retailer who last Saturday may have sold and charged up lamps at the old prices and have been taken to task by the purchaser, either for not knowing his own business or for trying to take advantage of the fancied ignorance of the customer by seeking to obtain an unauthorised profit. Apart from this inexplicable reticence in imparting a piece of welcome news to the trade, the present price reductions, which are, by the way, the fifth since the war, will exercise a stimulating effect on trade during the lighting season, and even if the extent of the cuts does not meet with universal approbation, it will at least be recognised as a further step in the desired direction. We cannot help thinking that there is something in the suggestion that the requirements of the poorer working-class home could be provided for with lower-priced E.L.M.A. lamps in some such way as the Cable Makers' Association, with its various grades of "Nonazo" cables, has been able to sell a cheap product alongside a better. The marketing of a special lamp priced around a shilling would, we think, rob the inferior imported article sold at half that figure of much of its present attraction to a certain class of user.

## Advertising the National Register.

A WRITER in our correspondence columns this week puts forward the suggestion that the National Register of Electrical Installation Contractors "should undertake propaganda to educate the public to the need for reliable installations, and how they can differentiate between reliable contractors and the shoddy wiring contractor." With this suggestion we agree, but only up to a point. Obviously with the small sum which is available for publicity work, the Register cannot contemplate any sort of campaign directed to the general public, and, even if it had the necessary funds, the procedure would prove to be a very costly way of obtaining orders for installations in penny numbers. The people who give orders for the complete wiring of housing estates, public buildings, and so on, obviously present the most promising field, and it is, therefore, fortunate that they can be reached and interested for the veriest fraction of the expenditure that would be necessary to secure similar results on a more general appeal. Through the professional and trade papers of interest to architects, consulting engineers, builders, and municipal officials, the chief sources of installation work can be appealed to, and, once the support of these classes has been secured for the large orders, it will follow that a similar regard for safety and general good workmanship will characterise their dealings with individual clients. Apart altogether from questions of cost, it is not, in our view, reasonable to consider it the duty of the National Register to bring customers to the registered contractor. Taking the broad view, enrolment on the Register confers a definite status on an installation contractor, and its value largely depends upon the use which the individual makes of that status. An electrical engineer who qualifies for corporate membership of the Institution of Electrical Engineers does not demand that the Institution should advertise to employers the advantages of employing only those who are members of the I.E.E., and in a similar way we ought to look upon the National Register more as a qualifying professional body than as a mere unpaid canvasser for installation jobs. If registered contractors will regard registration as an addi-



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tional qualification, and as an extra sales-argument in their businesses—as they have every right to do—there is no reason why the discerning members of the public should not in a few years be as unwilling to patronise the non-registered contractor as they are to enter the surgery of the unqualified dentist or medical practitioner.

## The British Association.

On Wednesday, the British Association, for the fifth time in its history, opened its annual meeting at Glasgow, with accommodation which permits the holding of all the sectional meetings within the University buildings. As many of the sectional discussions will interest members of other sections, the ability to flit from one meeting to another will doubtless be appreciated. Electrical interests are fairly well catered for in the programmes of Sections A and G, and various aspects of ultra-violet light radiation are to be considered in the proceedings of the Sections devoted to Physiology and Botany. Sir William Bragg's Presidential address, extracts from which are reproduced on a later page of this issue, furnishes additional evidence that our men of science are not the hermits they are commonly believed to be, but are paying serious attention to the material industrial problems of the moment. Those who deplore the decline of craftsmanship in an age of mass production, should pay special attention to that portion of Sir William's Address in which he shows that the two are by no means incompatible, and how the men now engaged in research associations and industrial research laboratories are actually inaugurating a new era of craftsmanship by means of the scientific knowledge which, he rightly claims, is one of its essentials. By his fearless destruction of the imaginary, but at times very obstructive, line between pure and applied science, and by his clear exposition of their essential interdependence, Sir William Bragg has set the right keynote for a meeting which promises to be more than unusually in touch with the practical needs of the moment.

## Why Not?

In a note headed "Why not the 60 Ampere Service?" that bright young Henley organ, "Distribution of Electricity," cites the case of a consumer who, quite naturally we think, fails to understand—as gas and water services as first installed are adequate for any normal requirements—why he cannot have an electric fire or cooker without having to pay for a heavier service, etc. As our contemporary points out, he can perhaps appreciate the necessity for a lead to the cooker or fire, but thinks, and with some reason, that if the supply department wanted him to use electricity for cooking and heating his demand should have been anticipated, and even though the undertaking may bear the cost of the new service the consumer still has to put up with the inconvenience incidental to the replacement of a service cable and cut-outs installed perhaps only a few months before. We heartily agree that attractive tariffs alone will not win the heating and cooking load if the consumer finds that in addition to paying for the appliances and his own wiring, he has to pay a sort of entrance fee for the privilege of using more electricity, and that if, in the future, electricity is to become as popular for heating as it is now for lighting, 60 A services must be regarded as the minimum for all new installations. The extra cost to the supplier is small in relation to the ultimate gain. Why not?

## Supply Authorities and Radio Apparatus.

More than once of late certain electricity supply authorities have been taken to task by a wireless periodical for their reluctance to compensate the user of d.c. wireless apparatus when the system of public supply is changed over to a.c. So strongly, indeed, does our contemporary feel on this point that it does not hesitate to characterise the suppliers' attitude as a "ramp." If there is a "ramp" we think it is being operated by the consumer who blithely expects the supply authority to replace equipment of the existence of which it is not even aware, and of which it would probably disapprove if it were brought to its notice. The publication of the I.E.E.'s recommendations regarding wireless receiving apparatus operated from the supply mains is put forward by our contemporary as a reason why supply undertakings should recognise the existence of such apparatus, but it seems to be overlooked that had the majority of the devices in question been less open to criticism from the electrical point of view there would have been little need for the issue of recommendations which are of such recent date that they have had no influence on the design of the bulk of the apparatus now in use. In any event, it is common knowledge that the national electricity supply policy is to change the d.c. supplies to a.c., and if, having this knowledge, manufacturers make and sell, and consumers buy, d.c. mains units, they are hardly in a position to feel aggrieved if, when a supplier decides to make the inevitable change, it seems reluctant to replace an unknown quantity of d.c. apparatus. As an energy consuming device the mains unit cannot have much to recommend it until it is almost universally adopted, but though we do not think its use should be discouraged on that account, we do think that those desiring compensation should try to discuss the question in a reasonable way before talking about "ramps."

## Annihilating Space.

It has been observed that the world is a small place and some application of electricity is continually making it smaller. Pitcairn Island, which has hitherto held the somewhat equivocal distinction of being the loneliest island settlement in the world, is now, thanks to a 0·25 kW ship's transmitter, provided with the means of communicating with passing ships in mid-Pacific, and if need be, to have messages relayed to New Zealand or America. Armed with this apparatus and a wireless receiver, the islanders can now maintain two-way communication with the outside world. Whether this new facility will make them dissatisfied with their lonely abode and embue them with a keen desire to emigrate, or whether their aural experiences will lead to a voluntary resumption of their pre-radio seclusion, time alone will show. The incident is, however, of interest as a reminder to the public that radio is something more than a source of amusement.

## The Machine Tools Exhibition.

Though perhaps not of direct interest to the electrical engineer, the Machine Tools and Engineering Exhibition, organised by the Machine Tool Trades' Association, which was opened at Olympia on Wednesday, is at least worth a visit, as indicating the rapid strides which have been made in mass production methods. In the first place the housing of the exhibits themselves was no small feat of engineering, for it is estimated that no less than 5 000 tons of machinery have been installed, work which was greatly facilitated by electric trucks used in conjunction with mobile electric cranes. The last exhibition was held in 1924, and even in that year, as at the beginning of mass production, a certain amount of thoroughness was sacrificed for speed. This year's exhibits, however, lay claim to doing their work with a greater degree of accuracy and speed, with less wastage of materials, and fewer men to attend them. One machine, for instance, will tongue and groove boards at the rate of 23 miles in a normal working day—representing an increase of 150 ft. a minute since the 1924 exhibition—and at the same time plane the boards to a depth of a three-thousandth of an inch. As may be expected at an exhibition of this sort, there are a number of electrical exhibits to be seen, ranging from electrically operated tools to motor generator sets, and though to an engineer engineering in all its aspects is a fascinating subject, the fact that well over fifty per cent. of the machines on view are driven electrically renders the Olympia show particularly attractive to electrical men.

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# TRANSMISSION SYSTEM AND CONDUCTOR COMPARISONS.

## How to Make Proper Use of the Line—Comparison of Conductor Efficiencies of Single and Three-Phase Systems—Copper *v.* Aluminium.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

PRACTICALLY every country has adopted almost exclusively the use of three-phase transmission; just why, need not be discussed, but it is quite evident that, when judged from every viewpoint, there is no better system available at the present time for the requirements of the service, etc., demanded. On the other hand, in so far as the transmission line in particular is concerned, the writer firmly believes that proper use is not made of it., i.e., all possible insulation should be retained and the neutral should be made use of for increasing the protective value of the system from all kinds of external pressure rises, etc., for increasing the kVA capacity of transmission in terms of equal voltage stress to earth, for increasing the operating value, and for permitting a more reliable line should a line conductor or/and a transformer phase unit fail; which also means a better earning line. Independent of the system used, the writer is quite convinced that we are not using, or designing, overhead electric power lines in the right manner.

A transmission line and system requires, and should provide for, equal transmission distance and equal stress on insulation, the highest possible kVA capacity, greatest inherent protective value, and maximum reliability for normal as well as abnormal conditions—the abnormal conditions for proper design and use being different from and much safer than those for present-day design, construction and operation.

What applies to transmission lines generally applies to distribution lines, but the latter are differently insulated, have many taps and branches, are more liable to earths, are worked-on the most, carry heavier currents, require greater care for copper economy, have smaller allowable voltage drop, and so on.

For the distribution, single-phase three-wire and three-phase four-wire (with neutral earthed in each case) should be the general rule. For equal voltage to earth, i.e., equal maximum stress on the insulation, there arise many advantages for the earthed neutral systems. For normal operation the merits of the various systems are well known; sometimes the *delta* connection is compared with the *star*, and at other times the isolated neutral system compared with the earthed neutral system, and so forth, showing in each case certain viewpoints as to economy or operating advantages. No doubt the best comparison is to assume normal operating conditions in the one case, and then compare abnormal operation for equivalent requirements.

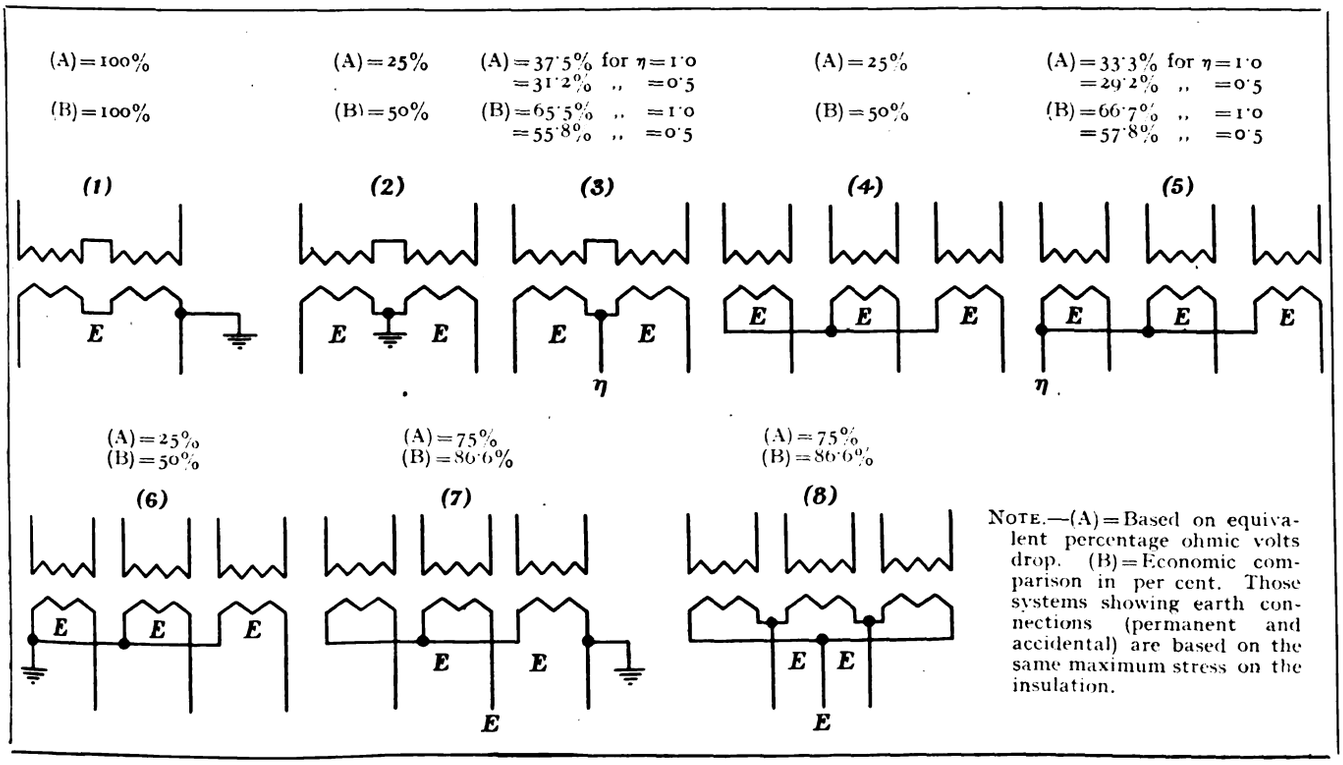
For normal operation and equal maximum stress on the insulation, the merits of the earthed neutral symmetrical systems, for distribution lines in general, are decidedly favourable to relative economy or total conductor proportion for equal distance of transmission and power delivered, etc.

For abnormal operating conditions of the isolated neutral systems (assuming an accidental earth on any one phase conductor), the factor of safety is reduced 50 per cent., the unbalanced current is more likely to cause very noticeable inductive interference, the resulting arcing earth may quickly endanger insulation on other parts of the system, and, when compared with normal operation of the earthed neutral systems, relative total conductor costs and their annual expense factor are greatly increased; furthermore the hazards may be greatly increased and operation similarly impaired.

An earth on the latter systems may result in a short-circuit on the earthed phase and a shut-down unless provision is made to supply polyphase current and operate over the remaining phase conductors and neutral conductor; this latter practice is sometimes followed. It is certainly better than the open-delta with an earth on one phase, but is not quite so good from the operating viewpoint as the closed delta with an earth on one phase. It is, however, necessary to bear in mind that for equal voltage to earth the *star* has a kVA capacity of transmission nearly three times that of the *delta*.

Distribution systems will most likely be connected as shown in (2) and (6), or (3) and (5) below, where the neutral is earthed. If connected as shown under (1) and (7), and there is an accidental earth on any one line phase-conductor then for equal maximum stress to earth as compared with (2) and (6), the total amount of copper required is *four* times more for (1) and *three* times more for (7); the earths shown in (1) and (7) in each case represent earth faults on one phase conductor.

For secondary low-tension mains in particular, we also have a choice of (3) and (5) when neutral is earthed; where $E$ is the voltage from neutral to line phase-conductor. The values given show the relative amount of copper required to




NOTE.—(A) = Based on equivalent percentage ohmic volts drop. (B) = Economic comparison in per cent. Those systems showing earth connections (permanent and accidental) are based on the same maximum stress on the insulation.

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deliver the same kVA the same distance for the same delivered voltage $E$.

For equal effective voltage the relative current per phase-conductor, relative voltage between phase-conductors, relative loss per phase-conductor, and total relative weight of phase-conductors for the single-phase and the three-phase systems, *are the same*. And, for the same effective voltage to neutral, all systems have the same conductor (copper) efficiency. The

TABLE I.

| System. | Relative area factor of *each conductor* (factors of $k$ and $k^1$) | | | |
|---|---|---|---|---|
| | Copper. | | Aluminium and steel cored aluminium. | |
| | ($k$) | ($k^1$) | ($k$) | ($k^1$) |
| Single-phase 2-wire .. | 5·00 | 8 800 | 8·33 | 14 660 |
| ,, ,, 3-wire .. | 1·29 | 2 270 | 2·12 | 3 731 |
| Two-phase 4-wire .. .. | 2·50 | 4 400 | 4·16 | 7 330 |
| ,, ,, 5-wire .. .. | 0·66 | 1 160 | 1·10 | 1 936 |
| Three-phase 3-wire .. | 2·50 | 4 400 | 4·16 | 7 330 |
| ,, ,, 4-wire .. | 0·833 | 1 466 | 1·40 | 2 443 |

conductor (copper) efficiency of the single-phase and the three-phase systems, based on effective values, is given in the following table :—

| | Single-phase per cent. | Three-phase per cent. |
|---|---|---|
| Voltage between phase-conductors | 100 | 100 |
| Current per phase conductor .. | 100 | 57·7 |
| Loss per phase conductor | 100 | 66·7 |
| Relative total conductor weight .. | 100 | 75·0 |

If we combine two single-phase two-wire circuits into a three-phase *star* four-wire circuit, the kVA capacity of the latter is increased approximately *three* times that of the former. If we connect a three-phase three-wire *delta* circuit to a three-phase three-wire *star* circuit, the kVA capacity of the latter is also increased approximately *three* times that of the former. For the same amount of copper conductor required for a single-phase two-wire circuit, a three-phase three-wire *star* circuit (equal to a three-phase four-wire with zero copper in the fourth wire) will transmit approximately *six* times more energy for the same percentage loss.

For a given percentage voltage drop, or percentage line loss, the sectional area of the conductors varies directly with the amount of power, directly with the distance of transmission and inversely as the square of the voltage. The relative *effective* sectional area for copper, aluminium, and steel-cored aluminium, varies according to the *constants* given in the following table, to satisfy formulæ :—

$$A = \frac{kW \times L \times k}{E^2 \times \theta\% \times \cos\phi} \text{ sq. in.}$$

where :

$E$ = voltage between phase conductors at supply end ;

$L$ = transmission distance—where $L$ = 1 000 yd. use $k$, and where $L$ = miles use $k^1$ ;

$kW$ = load in kilowatts supplied ;

$\theta\%$ = voltage drop at receiving end, expressed as a percentage ;

for *overhead* lines $\theta = 21 (R \cos\phi + X \sin\phi)$ for single-phase ;

,, ,, ,, $\theta = \sqrt{3}\,1 (R \cos\phi + X \sin\phi)$ for three-phase ;

for underground lines $\theta = 21Z$ for single-phase ;

,, ,, ,, $\theta = \sqrt{3}\,1Z$ for three-phase ;

where : $\theta\% = (\theta E)\ 100$

$k$ = *constant* for the 1 000 yd. length of transmission ;

$k^1$ = ,, ,, mile ,, ,, ,,

$\cos\phi$ = power factor of load expressed as a decimal.

If the percentage loss in transmission is not fixed, but if the sectional area of the conductors is proportioned to give maximum economy, the weight of conductor metal required (not including composite metal) varies directly with the amount of power, inversely as the first power of the line voltage, and directly as the first power of the length of the line. But, with the conductors proportioned for maximum economy, their sectional area will vary directly with the amount of power and inversely as the voltage, and, for a given line voltage, *is* independent of the transmission distance. For lines where *corona* is absent, the percentage line loss is independent of the transmission distance ; not so for the longer and higher voltage lines (*see last paragraph*).

Further allowance of sectional area must be made for the steel-cored aluminium, since the current carrying capacity of the steel can always be neglected.

For the lower voltage systems the relative values given in Table I. for constants $k$ and $k^1$ can be used with formulæ for $A$, but not so for the higher voltage systems, such as the 132 000 V "grid" which is about to be constructed in this country. For such lines, which are usually of relatively great length, the impedance of the line is no longer $Z$, and $\theta$ cannot be calculated by the above method. Taking the 132 kV "grid"* for purposes of illustration, and the anticipated range of distances and kW capacities, the most economical relative conditions work out approximately as given below for the two most-used transmission line conductor metals :—

COPPER LINE.

| Line voltage. | kW.† | Length in miles. | Sectional area in sq. in. | Diam. in in. |
|---|---|---|---|---|
| 132 000 | 50 000 | 35 | 0·23 | 0·63 |
| 132 000 | 40 000 | 75 | 0·23 | 0·63 |
| 132 000 | 34 000 | 200 | 0·23 | 0·63 |
| (equal transmission load and distance conditions, for most economical voltage.) | | | | |
| 132 000 | 50 000 | 35 | 0·23 | 0·63 |
| 132 000 | 40 000 | 75 | 0·23 | 0·63 |
| 132 000 | 34 000 | 200 | 0·23 | 0·63 |

STEEL-CORED ALUMINIUM LINE.

| Line voltage. | kW.† | Length in miles. | Sectional area‡ in sq. in. | Diam. in in. |
|---|---|---|---|---|
| 132 000 | 29 000 | 40 | 0·24 | 0·7 |
| 132 000 | 25 000 | 90 | 0·24 | 0·7 |
| 132 000 | 22 000 | 150 | 0·24 | 0·7 |
| (equal transmission load and distance conditions, for most economical voltage.) | | | | |
| 165 000 | 50 000 | 35 | 0·35 | 0·87 |
| 154 000 | 40 000 | 75 | 0·31 | 0·81 |
| 154 000 | 34 000 | 200 | 0·32 | 0·82 |

We thus see that the copper line results in the use of a lower voltage line than the aluminium line (steel-cored aluminium) for equal transmission distance and equal transmitted load. Calculations also show that a copper line gives less charging current, a less rise in voltage at the end of the line on open circuit, a better line regulation, a system of no greater cost, and, for equal method of protection against induced potentials from external sources, the copper line is a better protected line, hence, is a safer and a better operating line, and system of greater carrying capacity, etc.

For equal protection from induced potentials, equal line regulation, equal charging current, equal safety, equal line voltage, equal transmission distance and equal kW transmitted, the steel-cored aluminium line and system is more expensive and less reliable than the copper line and system. The higher conductivity line material, the lower height of conductors above ground, the more normal conditions of vibrations and stresses on insulators, etc., the higher fusing and annealing point, the closer separation of line conductors, the more efficient the line and system, the lower the product of modulus and expansion of the conductors, along with many other factors, all tend to favour the copper line.

For such lines (which come within the 132 000 V type), the percentage line loss *is not* independent of the length of the line, i.e., for maximum economy and for lines over a certain length, the line loss will increase with the transmission distance, and the loss will increase faster for the steel-cored aluminium line than for the copper line. Furthermore, differing from the lower voltage lines, the line voltage *is not* relatively a dependent measure of the transmission distance ; in fact, the most economical line voltage, also the sectional area of conductor, and kW transmitted, are almost a fixed value over a very wide range of transmission distances above certain lengths, the best all-round conditions again favouring the copper line.

* Steel-cored aluminium 37/110, 0·77 in. diameter.

† Root mean-square *kilowatts* = r.m.s. of average load in kW.

‡ Area of aluminium only. If steel forms part of the conductor, the resistance becomes a function of the frequency, and the effective resistance a function of the current density.

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# CRAFTSMANSHIP AND SCIENCE.*

## Their Importance in National Welfare—Electrical Engineering Built on Faraday's Discovery—Enlightened Electrical Research Policy—A New Class of Worker.

By PROF. SIR WILLIAM BRAGG, K.B.E., F.R.S.

THE craftsmanship of a nation is its very life. Even if we consider it only in relation to the production of material things, the state of a nation's craftsmanship is an index of its health.

As a people departs from its primitive condition so also does its craftsmanship. I would ask you to consider the nature of the change. The elements of craftsmanship in its original form centre round the individual. In his brain is the knowledge and imagination, in his hands is the skill, and round about him lie the materials and the tools of his craft. It is a long step from the simple workshop of the old single-handed craftsman to the vast complex factory of modern industry.

We are continually discovering instances of the marvellous skill of the craftsman of thousands of years ago. There is here, however, no disheartening implication, as has sometimes been asserted, that men can no longer do what was once in their power. To those who look into what goes on in a factory or a mine, in the field or on the sea, there are innumerable instances of beautiful craft work, beautiful because of their fitness for their purpose, their balance of design, their ingenuity, their history, their growth under human perseverance and thought. Every one of us can bring to mind instances of technical skill demanding imagination and intelligence as well as manipulative power which could be set alongside any instance in history.

Now we come to the point at which I would ask you to consider the relation of science to the craftsmanship which I have been trying to define. I would draw your attention to the manner in which, under the urgent drive of self-preservation, the craftsman has called scientific knowledge to his aid. In 1831 Faraday, in the course of certain systematic searchings, found out the way in which one electric current could bring another into being, the so-called electromagnetic induction. With that single day's work began the whole development of electrical engineering in its innumerable forms.

If you hinder the growth of science in any way you hinder the growth of craftsmanship. You cannot prevent the growth of knowledge, you cannot even make a selection of those points of advance which will lead to certain select classes of results. No one knows what is over the hill. The vanguard moves on without any thought of what is before it. That is why, if the march of science is to be conducted in an effective and orderly way, were it only for the purposes of industry, there must always be a certain number of laboratories or parts of laboratories where scientific research has no immediate thought of possible applications.

If I read modern industrial conditions rightly the closeness of the connection between craftsmanship and science may be illustrated in yet another way. It is, I think, a fact, and a remarkable fact, that the most active of our modern industries are those which are founded on recent scientific research. The most notable is, of course, that of electrical engineering.

### Faraday's Basic Work.

The year that sees the celebration of our Association's centenary will witness also the ceremonies that commemorate the basic experiment of Faraday. It is difficult to sketch in a few words the great edifices that have been built upon the discovery of electromagnetic induction. We might look upon it financially, and picture, as some of my hearers can do, the amount of capital involved in electrical undertakings throughout the world, electric lighting, electric transmission of power, cables, and now wireless, not to mention all the minor uses to which electricity is put. The transference of matter, of intelligence, of thought, of sound, even of vision, is largely dependent on electromagnetic action. If we are not familiar with financial quantities, let us just think for a moment of the change in our lives if every electric current ceased to run; and let us realise that the whole mechanism of modern intercourse would fail and that populations born to use it would be brought to dire distress.

Though the electrical engineering industry with all its branches may be said to have its source in a single laboratory experiment, yet it has grown by the continuous adaptation of fresh streams of knowledge. The huge American corporations maintain research laboratories costing millions of pounds annually, and find that the financial return justifies their policy. The General Electric Co. found that a costly research into the structure of the electric lamp repaid itself over and over again. The very important technical discoveries of Langmuir and Coolidge were consequent upon an attempt to find out what happened on the surfaces of the glass bulb and of the glowing filament. The point is that the electrical industry was not merely launched by a single discovery; it is continually guided, strengthened and extended by unremitting research.

### Science and Mass Production.

It must always be the aim of an industrial organisation to devise and set going one of those systems of manufacture on a large scale with which we have become familiar in recent years. With the aid of suitably designed machinery and methods, great numbers of quantities of some article in general demand can be produced at a comparatively small running cost. But every such phase of production comes to a natural end. An improved process is devised, and the new displaces the old. Mass production is, in its way, splendid, ministering to the necessities and conveniences of many who must otherwise have gone without. But, if it is brought to such a pitch that its processes call for little intelligence in their working, then cheap people of little intelligence will be found, in the end, to be in charge.

The relation of science to mass production is therefore both that of builder and that of destroyer. Mass productions are temporary lulls in the movement of imagination and knowledge. Much skill and thought and care may be required to arrange for one of those quiet and profitable times; the machine is set going and for a while goes by itself. But new applications of scientific knowledge, new ideas, new processes, new machines must always be in preparation.

If craftsmanship, to fulfil its task of providing for the people, must be continually improving its processes, then the nation that is to be successful must possess the means and the will to improve, and here we come, I think, to a notable point. May it not be said that in this country the means exist even to a remarkable degree? Our craftsmen as a whole, including all grades, are possessed of qualities, intelligence, skill, accuracy and so on, which make improvement possible. How could our enterprises in the past have been so often successful if this had not been so? How can we be succeeding so well in respect to the new industries of the present if the capacity is not there?

Should it not, therefore, be our policy to take advantage of our country's qualities by continually seeking for fresh industries or fresh adaptations of the old? We should not, surely, cling unduly to older activities when they have reached the stage in which many others have learnt to do them with equal efficiency, and when we can go on to something new and, it may be, more difficult. We can, of course, bolster up old industries by political methods, and I have no wish to decry such methods as always incorrect. But, clearly, the best protection of all is the knowledge and skill which can enable us to produce what others must ask us for because they cannot so well make it themselves.

These considerations lead naturally to a second aspect of the relations between craftsmanship and science. The improvement of craftsmanship depends in large part on the absorption and adaptation of scientific discovery. How is the process to be encouraged?

We here come to a point which must be emphasised with all possible vigour, because its importance is not always realised. Scientific knowledge and experience if it is to be of full service must be in direct practical contact with the problem that is to be solved. This must be clear to every one of us from actual experience. If you have expert knowledge on any subject and your advice is asked, your first instinct is, as you all know, to ask to be allowed to see for yourself. It is only

* Extracts from the Presidential Address delivered at the Glasgow meeting of the British Association on Wednesday.

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when all the circumstances are clear to you in their relation to the difficulty that the solution is likely to suggest itself. And it may take much watching and patient observation before you are successful. It is the combination of actual experience with scientific knowledge that is essential.

Are we, then, in this country, putting our scientific knowledge into the position where it is really effective? I would draw your attention to a most interesting and important movement which is attaining a notable magnitude.

A new class of worker is growing up among us, consisting of the men engaged in research associations and industrial research laboratories throughout the country. We must place a high value on their services, for they are actually and personally bringing back with them into craftsmanship the scientific knowledge which is one of its essentials. They bring the interest and the outlook of scientific inquiry into touch with both employer and employed, and I cannot but think that they may be to some extent the flux that will make them run together. For they can speak with the employer as men also trained in University and College, exchanging thought with ease and accuracy. And, at the same time, they are fellow workers with those in the shops, and can bring back there some of the interest and enthusiasm which springs from the understanding of purposes and methods. It is to be remembered always that personal contact has, on the whole, thanks to the better qualities in human nature, a marvellous effect in smoothing out differences.

I do not think it is unduly optimistic to welcome the growth of this new type of industrial worker, because it can, being in personal intercourse with both capital and labour, supply to each a new outlook on their whole enterprise, especially as that outlook is naturally illuminating and suggestive. For, after all, this is but going back to first conditions. The primitive craftsman has been replaced by separate persons or groups of persons who have slipped away from each other almost without our realising the fact. In the most recent times the separation has become more obvious and more dangerous, and that is why in so many directions efforts are being made to stem it.

Can it be good that the workman has a part demanding little intelligence, merely the capacity to repeat? Can it be expedient that mere manipulation should be left in the shop, while design and imagination have gone into the drawing office and shut the door behind them? Can it be right that the factory directorate should not be in immediate contact with the vast body of scientific knowledge?

The present number of industrial research workers is relatively small; it seems likely to increase, however, in proportion to the extent to which the province of science is better understood. The better understanding I think of as manifesting, in the first place, in industry itself. I am sure that here it is happily on the increase. There is also a broader view to be taken. There is a public estimation of the value of any calling which affects the numbers and the quality of those who respond.

## Inadequate Industrial Rewards.

I doubt if there is, in the first place, sufficient appreciation of the interests and rewards in the life of a student of industrial research. The pioneers have suffered unnecessary restrictions and discouragements, but their followers will be in better case. Surely it does not need much imagination to realise the splendid side of such work? The succession of fresh difficulties to be overcome, and of new and interesting views into the nature of things and ways of the world; the unforeseen value of results, sometimes an immediate prize, sometimes the clearing of an obstacle in a manufacturing process, never less than the discovery of facts which may some day be of use; the personal association with a living enterprise and with the human spirit behind it. And when it is realised that this kind of work is wanted badly, that it is really serviceable to the community, that there is opportunity for devotion, that it is in touch at once with human needs and with the furthest stretches of thought and imagination, it surely takes on to us the final touch of nobility.

We must remember also that the road of the student of science is still none too clear. The very methods of teaching science are a constant subject of discussion. I will say no more now than this: that the best methods must take time to elaborate and cannot be expected to have arrived at their final form. Education by scientific instruction is still apt to lack the comprehension of the human side, without which the classroom is a dull place. There are even some who think that science is inhuman. They speak or write as if students of modern science would destroy reverence and faith. I do not know how that can be said of the student who stands daily in the presence of what seems to him to be infinite.

Nothing in the progress of science, and more particularly of modern science, is so impressive as the growing appreciation of the immensity of what awaits discovery, and the contrasted feebleness of our ability to put into words even so much as we already dimly apprehend. Let me take an example from the world of the physical sciences. There is a problem of which the minds of physicists have been full in recent years. The nineteenth-century theory of radiation asks us to look on light as a series of waves in an all-pervading ether. The theory has been marvellously successful, and the great advances of nineteenth-century physics were largely based upon it. It can satisfy the fundamental test of all theories, for it can predict the occurrence of effects which can be tested by experiment and found to be correct. There is no question of its truth in the ordinary sense.

## Reconciling Opposing Views.

In the last twenty or thirty years a vast new field of optical research has been opened up, and among the curious things we have found is the fact that light has the properties of a stream of very minute particles. Only on that hypothesis can many experimental facts be explained. A wave theory is of no use in the newer field. How are the two views to be reconciled? How can anything be at once a wave and a particle? I do not believe I am unjust to any existing thinker if I say that no one yet has bridged the gap. Some of you who were present at the Liverpool meeting may remember that Bohr—one of the leading physicists of the world—doubted if the human mind was yet sufficiently developed to the stage in which it would be able to grasp the whole explanation. It may be a step forward to say, as we have been saying vaguely for some years, that both theories are true, that there are corpuscles and there are waves, and that the former are actually responsible for the transference of energy in light and heat, and for making us see; while the latter guide the former on their way. This is going back to Newton, who expressed ideas of this kind in his "Opticks."

Some, perhaps, may say that in considering science in relation to craftsmanship I am pressing the less noble view; that I am not considering knowledge as its own end. It is said that uselessness in science is a virtue. The accusation is a little obscure, because knowledge is never useless.

And no clear line can be drawn between pure science and applied science: they are but two stages of development, two phases which melt into one another, and either loses virtue if dissociated from the other.

## BOOK REVIEW.

**Elektrizitatszahler-technic.** By Dr. F. Bertold. (Stuttgart: Ferdinand Enke.) Pp. viii + 250. 17·80 marks.

This book, although described as a handbook, may be said to be a complete treatise on electricity meters. It is written in twelve sections. The first sections deal very thoroughly with the principles of operation; the production of rotating fields is illustrated, it is shown that this is the resultant of two fields from inductive and non-inductive circuits. The essentials of accurate rotation are dealt with, and compensating devices are described by means of which the 90 deg. phase difference (in single-phase meters) is obtained. Numerous diagrams and vectors illustrate methods of compensation.

Many types of meters are illustrated, and their circuit diagrams are given; the performance of the meters on various kinds of load is fully discussed. One of the sections deals with mercury meters operating on a differential thermometer principle; this section would be more valuable if it contained a calibration curve. In the later sections auto transformers and potential transformers are illustrated, and in the last section the apparatus for measuring torque is illustrated and described. The appendix is used merely as a means of illustrating various types of meters and their components. In view of the excellent books we have in this country on the same subject, I cannot say that it would be of any great advantage in the meter test room.—C. S.

### BOOK RECEIVED.

"Alternating Current Motors and Starting Gear." By L. E. Wood. (London: Electrical Review, Ltd.) Pp. xiv+158. 4s. net.

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# ELECTRICAL PLANT FAILURES.

## Causes of Trouble in Turbo-Generators—Need for Care in Making Joints—A Difficult Re-wind—Shaft Failures in Motors—Nero Watching the Condenser Burn—Research on Autogenous Welding.

CONSIDERABLE interest always attaches to the reports on electrical and other plant failures which are issued annually by the British Engine, Boiler and Electrical Insurance Co., Ltd. The "Technical Report for 1927," which has just been issued (price 7s. 6d.) is particularly interesting, as, in addition to the usual data, the book includes no fewer than three practical articles written by the company's engineers. The inclusion of such articles has more than once been suggested in these columns, and we are glad to see the extension of a practice which increases the usefulness of their publication. The first article, by Mr. N. J. Hockley, is a "Note on the Principle of the Leakage Indicator for two-wire Insulated D.C. Systems, and Some Points Considered in Connection with its Application to Feeder Protection." Mr. L. W. Schuster is responsible for the other two articles, which are entitled "Stresses in Curved Beams with a Vertical Load Uniformly Distributed Along the Span, with special reference to the Stress at the Edge of a Hole in a Plate," and "Some Notes Indicating the Influence of the Grain Flow in Steel on its Resistance to Deformation, with special reference to Crankshaft Webs." It had also been hoped, in the fiftieth year of the company's existence, to include a further article from the pen of Mr Michael Longridge, its original chief engineer, but his death last January made this impossible.

The portion of the report dealing with failures of turbo-generators mentions only eight cases, in four of which vibration gave warning of trouble; the largest unit affected was a 5 000 kW turbine. In one case hammering in the coupling had led to considerable damage of the blades. In another case failure of a 5 per cent. heat treated nickel steel bucket on a velocity wheel of a 3 000 kW impulse-type steam turbine progressed gradually from the concave side, where it had started at the sharp junction of the root with the body. The metal was clean, and had a fine structure.

### Failure of Metal.

Another failure of metal was found in a 5 000 kW set in which the paddle wheel at the high-pressure end had burst. The metal had split along the full radial depth at a point opposite the keyway, resulting in a radial crack 1¼ in. long being formed at the key way, and the wheel being opened out 2 in. at the outer end of the original split. The opened-out

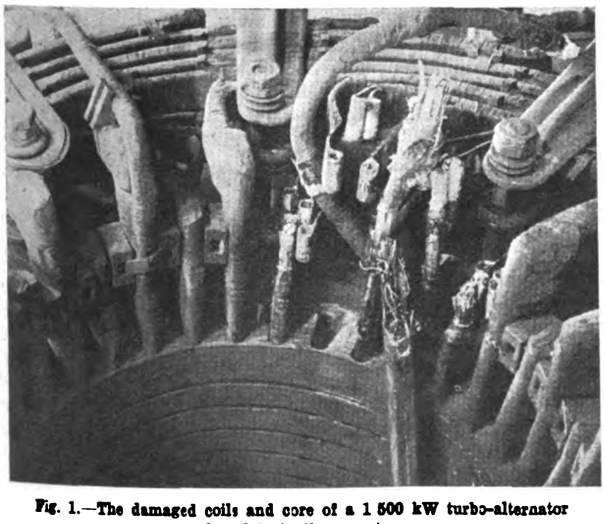

**Fig. 1.—The damaged coils and core of a 1 500 kW turbo-alternator referred to in the report.**

wheel jammed in the race, the crown of which was torn away, while as a result the shaft fouled the labyrinth packing rings of the diaphragms and the high pressure gland, damaging them.

The shutting down of a 1 500 kW three-phase 2 850 V 50 cycle turbo-alternator, following the detection of smoke emission disclosed that arcing had taken place at the end of the stator core, between two of the conductors in one of the slots, resulting in their being fused completely through, and in the third conductor being considerably burnt, as were also the core laminations. The damaged coils and core are shown in Fig. 1. The damage was attributed primarily to the development of a local defect in the insulation between the conductors, but disturbances on the line evidently aggravated the situation.

The first indication of anything being amiss with a 1 000 kW turbo-alternator, 500 V, three-phase, 50 cycles, was given by a smell of burning insulation in the engine room. When the end covers were removed, a fault was found in a soldered joint between two neighbouring coils of the stator windings, the surrounding insulation being damaged by arcing. The coils were wound with two 0·2 sq. in. conductors in parallel; each jointing sleeve, therefore, contained four conductors. The

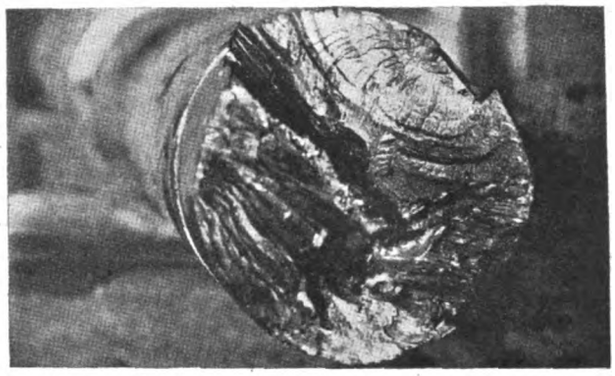

**Fig. 2.—The surface of a fractured shaft of a 500 H.P. motor.**

winder who had used soldering irons in making the joints had not been over successful, and appears to have lacked the degree of skill essential to ensure a satisfactory result by this means, with a joint of this description. As a result of the poor workmanship several of the other joints were found to be unsound, and the insulation to be damaged locally.

In order to make a satisfactory repair and prevent a repetition of the failure, it was decided to re-wind the stator completely with new coils. The new winding was disposed in the same manner as before, but the joints were made by pouring solder into the sleeves containing the conductors. It is pointed out that too much care cannot be exercised in the matter of making joints, which are a particularly vulnerable part of a machine, and a design which allows of the number of joints being a minimum is likely to give the best service.

### A Vibration Problem.

Excessive vibration was noticed on a nineteen years-old 1 000 kW turbo-generator, and inspection showed that vibration became greatest when full speed and excitation were attained, but ceased when the excitation current was cut off. The vibration was felt most at the exciter end, and was so marked at this part that an oil pipe supplying the exciter end bearing was fractured.

The turbine casing was opened up and nothing found amiss. The rotor of the alternator was therefore withdrawn for examination and test. The set screws securing the wedges for the coils were found to be loose, and it appeared that movement of the wedges had been taking place. This was rectified, but when the rotor, after being statically balanced, was tested in the bearings, the vibration was found as marked as before.

Owing to the low ohmic resistance of the windings, difficulty was experienced in determining by test whether the vibration was caused by one or more short circuits between the turns of the coils. It was considered however that the results of the tests justified all the coils being stripped and re-wound.

The paper insulation had deteriorated with age and from excessive temperature caused by insufficient ventilation. The winding and insulating material of all the pole pieces were renewed, leatheroid being used to replace the paper. To effect the re-wind was by no means an easy matter: as the conductor had to be wound in tension directly on the pole pieces, it was necessary to make use of a special machine whereby the whole rotor could be rotated round opposite poles with its long shaft swinging in a vertical plane. When the set was put back to work it was found that the vibration had been stopped completely.

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In the chapter devoted to "Other Electrical Machinery," the causes of trouble with motors are apportioned as follows :— Two to weakness of studs and bolts, two to faulty keying of rotors, five to shaft failures, two to commutator failures, two to machines catching fire, two to carelessness in aligning running parts, and two to faulty material.

## Shaft Failures.

One of the shaft failures described took place in a 500 B.H.P. synchronous motor driving a grinder in a cement works. The shaft was found to have broken spirally, the fracture lying just clear of the hub of the coupling and extending a short distance into the journal. The surface of fracture is shown in Fig. 2. It is evident, the report states, that the point of origin of fracture lay at the inner end of the key way, at the left hand or non-driving side, and that the fracture had been gradually developing. This had not been discovered, as it had not been convenient to stop the motor for inspection for several months before the accident. Sulphur prints made from parts near the fracture showed an entire absence of segregation, and microscopic examination showed an absence of excessive non-metallic matter, the structure being good for a commercial forging of this size with a carbon content of about 0.3 per cent. Bend strips with a radius equal to the thickness of the strip could be bent double without showing any sign of fracture. Judged by the position of failure, it is to be inferred that the shaft had broken through having to carry an abnormal stress. Although it could not be traced that there had been a lack of alignment, it would appear that the clutch had not always engaged concentrically.

In another shaft failure, on a 12 B.H.P. series-wound d.c. motor used in a steel works, an examination of the shaft showed that it was made of a very low-grade wrought iron. The section of fracture lay 4¾ in. from the end where the coupling was fixed, and the shaft had split longitudinally along this length. The material had been made up of a large number of strips of scrap that had not been previously piled, and the strips had opened up along a length of 2 in. measured from the section of fracture towards the coupling. Fig. 3 shows one side of the surface of break, and from this may be seen the manner in which the shaft opened up.

The shaft appears to have been a replacement installed by the owners six or seven years before the accident, and the company had repeatedly, since the motor came under its supervision, drawn attention to the severity of the working conditions. The motor and the extension shafts had not been in alignment. The bush in the pedestal at the outer end of the extension shaft had been loose in its housing, a brake drum on the extension shaft between the coupling and the neighbouring bearing had not been in balance, the coupling bolts had been loose, and the key had been hammering on the coupling. It is hardly surprising that the shaft failed.

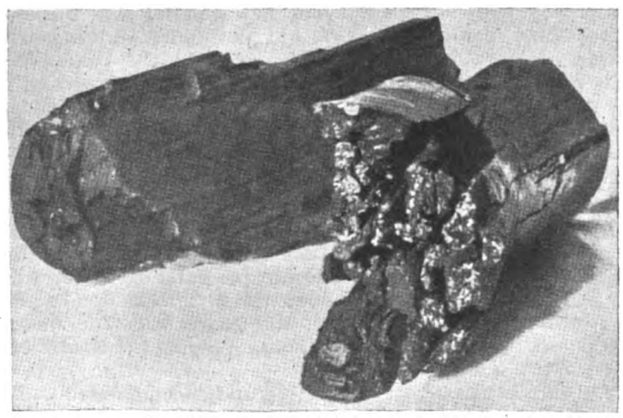

**Fig. 3.—Illustrating the opening up of a shaft on a 12 H.P. motor which split longitudinally.**

Examination of another shaft failure showed that metal had been added autogenously to form a seat for the coupling. The deposited metal was of good quality and, contrary to the company's usual experience, no sign was found of the original metal being damaged by the welding process. The trouble was due to malalignment, and to prevent a recurrence it was recommended that a flexible coupling and an extra bearing should be fitted while the shaft was being replaced.

In commenting on fires, the report points out that there is no doubt that fire extinguishers can quickly extinguish a fire in an electric machine, thus preventing the fire from spreading and the insulation from being completely burnt out. As the liquid in some of these extinguishers is non-conducting, there is no danger of the operator being subjected to shock when using them, but, as precautionary measures, it should be verified by test at the time of purchase whether this is so or not, and the electric supply should be cut off before an extinguisher is used on any portion of a live installation. After the use of certain types of extinguishers, the windings can readily be cleaned and the insulation is found, afterwards, free from any sign of damage from the injection of the liquid.

Emphasis is laid on the dangers from allowing dust to accumulate in windings. Arcing attended by injury to insulation, as a direct result or from a consequential fire, is a not uncommon result, many examples of these types of failure having been cited in previous issues of the report. They indicate that the periodical blowing-out of machines is essential when they work in a dusty atmosphere, or are situated close to a room where a dusty process is being carried out.

A remarkable case of negligence caused trouble in a 220 kVA static condenser, used for reducing the wattless current in the windings of an alternator, and controlled by a circuit breaker of 230 A capacity, fitted with a no-volt trip and three trips set to operate at 50 per cent. overload. It was built up of 2 229 units connected in parallel, and mounted in fifteen wooden frames immersed in oil. The circuit breaker opened, and smoke was seen coming from the condenser oil-tank.

The condenser was dismantled and examined, when an average of three in each frame of 149 units was found to be destroyed completely and a large number of the other units damaged to a lesser degree, the damage being fairly evenly distributed over the whole of the frames. A considerable quantity of carbonised paper was found in suspension in the oil.

The condenser had to be stripped completely, 365 units to be renewed, and the remainder given a thorough cleaning.

The events leading to the breakdown are described as somewhat reminiscent of Nero watching Rome burning. The attendant had noticed the temperature of the oil increasing day by day until it had shown a rise of 55 deg. F. above the surrounding air, against a normal rise of 22 deg. F. At the same time the charging current had fallen gradually by 10 or 15 A. The units had clearly been breaking down by slow degrees. At the first sign of an undue temperature or of an alteration to the charging current a condenser should forthwith be opened out and overhauled, the oil in particular requiring examination.

In view of the increasing number of accidents with cranes, the chapter on this subject is of special interest, though space does not permit detailed reference to the reports on particular failures. Commenting on a breakdown of an electrically-driven Goliath crane, the report points out that although it is difficult to provide a satisfactory method of electrically driving this type of crane, there is a minimum of risk of trouble when the arrangement takes the form of a single overhead motor driving on to a cross shaft connected to both sets of wheels by down shafts.

## Inspection of Boilers.

With regard to the inspection of boilers, it is stated that, in view of the extending use of other forms of power, it is gratifying to record that during 1927 the company insured and inspected more steam boilers and similar vessels than in any previous year, the percentage of increase exceeding the figures for 1925 and 1926. This result is somewhat surprising, seeing that the coal and steel industries have not participated in the revival of business which has benefited other branches of trade and that the Factories (No. 2) Bill had not been proceeded with. The latter consideration may appear immaterial, but if periodical inspection of steam process vessels and of air receivers were enforced by law, a larger number of owners would entrust the examination of their plant to the insurance companies who specialised in this class of business.

Dealing with the year's work, the application of autogenous welding both as regards new construction and repairs has again provided one of the principal features of difficulty. So much so has this been the case that the company is at present spending a considerable sum of money in research work on the subject. That the decisions evolved as a result of this work will be conclusive is perhaps too much to hope for, but if it only helps to diminish some of the complexities of such a contentious problem the time will have been well spent.

Further cases have arisen in which fractures have developed in the lap-jointed seams of boiler shells, and two of these, one relating to the barrel of a motor wagon boiler and the other to the water drum of a water-tube boiler, are fully dealt with in the report.

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# THE FUEL CONFERENCE, 1928.

## Preparatory Survey of the Ground to be Covered in Programme of 170 Papers—Some Electrical Topics—Tests on Loadings of Hotplates.

By D. WINTON THORPE, A.M.I.E.E.

As the descendant of the First World Power Conference of 1924 and the Basle Sectional Conference of 1926, the Fuel Conference of 1928 gave sufficient promise of success. Now that it is possible to analyse, not only the subjects to be dealt with, but the actual method of dealing with them, this promise is covered by ample security, and we can confidently look for some most valuable contributions at South Kensington at the end of this month.

Space will not permit of any detailed study of the 170 papers to be presented, but a glance into one or two of them will indicate the useful scope of the Conference. Although it is called "The Fuel Conference" the title gives little clue to the very many aspects of the subject which are dealt with.

### Electricity Costs.

In the Section devoted to "Utilisation of Fuels, including Electricity for Domestic Purposes," a section which will appeal to the electrical industry, perhaps, more than any other, Dr. Margaret Fishenden produces a mass of telling statistics and calculations couched in the most readable terms, and proving, among other things, that, assuming electricity to be 16 times as costly as coal, heat unit for heat unit, it is yet more economical to use for domestic purposes. Her argument, moreover, is not that of the clever barrister defending a hopeless case by rhetorical jugglery, but is rather the quiet, relentless logic of the detective who will not allow the obvious but equally important details of the case.

Every electrical trader is sensible of the room for improvement in design and construction of the electric hot-plate, which at present is, perhaps, the weakest link in the chain of domestic appliances. This subject receives careful consideration by Messrs. O. Staelhane and Nils Ekwall of Sweden in a paper in which they record the results of experiments carried out on hot-plates by the Royal Swedish Institute of Scientific Industrial Research. Among the conclusions resulting from their tests, one in particular stands out: that the present loading of hot-plates is insufficient, and that the demands of efficiency, quite apart from the demands of speed of cooking, favour a substantially higher loading than those in common use at the present time.

Viscount Shimpei Goto of Japan introduces us to a special appliance sold in Japan for the cooking of rice. It is called the "Bannokamado," and enjoys great popularity in that country, where, we are told, the number of consumers connected to the electricity mains is ten times what it was five years ago. This author also tells of the work of education which is being carried out by the Japanese equivalent of B.E.D.A., the Society to Promote Home Electrification. It is evident that they have the same conservatism to contend with in Japan as we have in this country.

In the section devoted to Industrial Furnace Work, Sir Robert Hadfield contributes a paper which consists of a very exhaustive treatment of the subject. Among the conclusions which he advances are: (1) That the value of the adaptability factor which is a function of the technical developments in furnaces, is higher in the case of gaseous and liquid fuel, and discounts, in a degree varying with the specific conditions of an operation, the lower therm cost of the solid fuel; and (2) that there is considerable scope for the direct application of solid fuel by further development of the mechanical stoker and other means of burning solid fuel, such as pulverising, combined with the preheating of air.

During the First World Power Conference at Wembley, Sir Alexander Kennedy made a very powerful plea for greater consideration to be given to the question of power alcohol and its production within the Empire. At the Fuel Conference, Sir Frederic Nathan takes up the case where Sir Alexander left it, and goes into considerable detail to show that the cultivation within the Empire of alcohol yielding plants is possible and desirable, and that the market for alcohol so produced is a good one. The possibilities of making synthetic alcohol are explored, but the prospect of being able to manufacture in such quantities that the cost of alcohol can compete with that of petrol seems to be remote.

Low-temperature carbonisation, which is usually such a lively topic of discussion, is productive of only three papers, two from Germany and one from Great Britain. However, the poverty in numbers on this subject is compensated by the wealth of informative detail contained in each of them. Dr. Lander, in co-operation with Dr. Sinnatt, makes it appear definite that low-temperature carbonisation will shortly come into its own. Dr. R. Heinze of Germany, in voicing the same opinion as to the ultimate success of low-temperature carbonisation, shows how the War, with its shortage of oil for Germany, forced them into research on the preparation of fuels, and resulted in the survival of the fittest. For the treatment of brown coal, low-temperature carbonisation is an old-established process, the original Rolle type of externally-heated retort still holding first place. One particularly interesting reference is made to a system of chain grate stokers, where the fuel in its progress to the grate is distilled by means of ascending gases to recover the tar. For the treatment of true coal various types of equipment are described, while space is also given to consideration of the low-temperature carbonisation of oil shale, and even of chalk, peat and wood.

Between the distiller and the user fuels have to pass through many hands, and on the methods employed in the storage and handling of liquid fuels depends in large degree the ultimate cost. Mr. I. Lubbock presents a paper on this subject in a section which numbers no fewer than 13 contributors. Mr. Lubbock disposes of the popular idea that fuel oil is a dangerous commodity to handle and store from the point of view of the fire hazard, since most of the fuels handled have a flash point as high as 170 deg. F.

### A New System of Control.

It is obviously impossible in this article to do more than pass in quick survey an array of papers which are to occupy some 4 500 pages in the final transactions. This year's Conference sees the inauguration of a new system of editorial control on contributions, which can only be submitted with the sanction of, and under the auspices of, some responsible technical body in each country. Such bodies first had to exercise their own discretion in making sure that there was no overlapping or redundancy in the papers presented from their country. When the papers reached London they were further edited and sub-edited, with a view to reducing their contents to the most essential points and cutting out wordiness or irrelevancy. So when, on September 24th, the Conference opens at South Kensington, it will be difficult to find any cause for complaint on the grounds of top-heaviness, a criticism which was with some justice levelled at the organisers after the Wembley Conference. On the other hand, it is only fair to remember that at the inauguration in 1924 it was necessary to start the ball rolling with a really big heave; the speed of the ball can easily be checked if it is getting out of hand.

Finally, if anything is wanted to "make assurance doubly sure," it is to be found in the presence of Lord Melchett as President. There is probably no man who combines a knowledge of the chemical industry—and the subject of fuels is largely a chemical one—with a shrewd business mind as does this year's President.

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## ELECTRIFICATION IN MANCHESTER.

### Work on Suburban Railway to be Commenced this Month.

The work of electrifying the railway between London Road (Manchester) terminus and Altrincham is expected to be commenced during the present month. This branch, eight and a half miles long, is a joint undertaking of the Cheshire Lines Committee and the former Great Central and London and North Western Railways. The London Midland and Scottish Co. and the London and North Eastern Co. are therefore concerned in the present undertaking, and are understood to have authorised the necessary expenditure. It is estimated that the cost of electrification of this length of track and the provision of the necessary vehicles for use on it will be about £500 000. The line serves the southern suburbs of Manchester, and has stations at Oxford Road and Knott Mill within the city and at Old Trafford, Stretford, Sale, Brooklands, and Timperley. The present steam service is between 140 and 150 trains in each direction on weekdays.

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# THE LEIPZIG FAIR.

## Review of the Electrical Exhibits.

[From Our Own Correspondent.]

THE outstanding feature of the Electrical Section at this year's Leipzig Autumn Fair was the progress made in apparatus used for domestic and shop purposes as opposed to industrial applications. Among the exhibits noticed was a new electric haircutting machine ("Forfex") which, its makers claim, avoids all the faults hitherto made in the construction of such machines. The new machine is light, handy, and the motor is incorporated in the handle. The machine runs noiselessly and the cutter-heads are interchangeable. The device, which is priced at £3 15s., is produced for 110, 150, and 220 V, for d.c. or a.c., and in various sizes.

A new electrical gas-lighter, for plugging into a wall socket, is shown by an Oldenburg firm. The manufacturers claim that this lighter (wholesale price 4s.) represents an improvement on previous electrical lighters. By holding the lighter in a certain position near the stove the gas will light up, and as soon as the "Gas Devil," as the makers call it, is removed from this position, it is automatically switched off. The "Gas Devil" sold well to British and South American buyers.

Electrically heated cushions seem to find increasing applications. A Falkenstein firm exhibited not only a cushion which can be used as a bed, body, or foot-warmer, but also for compresses for the eye or ear, for neck bandages, for bandages to the knees and shoulders. The firm also showed carpets which can be electrically heated by connecting them with a wall plug, in the same way as the cushions and bandages. All these devices are fitted with three-heat regulation and 6 ft. 6 in. flexible cords. It is thought that electrically-warmed carpets will have a great future in the motor car industry as they can be easily heated from a car battery.

New vacuum cleaners shown were noticeable for noiselessness, extreme simplicity of construction and use, and durability. Prices ranged from £4 to £6 10s., but there was one cleaner, the "Ilka," the price of which was £3 5s., including all accessories!

A laundry drying machine, the "Sonne," aroused great interest. It was shown in motion, and visitors could convince themselves of the fact that the machine can dry all washing, the finest curtains as well as the roughest wool rugs, within four minutes. It is priced at £15.

Many domestic refrigerators were shown, and the newer models were noticeable for the use of methyl-chloride, in place of ammonia and sulphur-dioxide.

### Electric Tools.

A new boring device for the timber industries as well as for the individual carpenter deserves mention. It is readily connected to a direct or alternating current supply, and has a boring spindle turning between 1 000 and 1 200 times per minute. Its weight is about 4 lb. Electrical planing tools were also seen. There was also a machine for the uniform and quick filling of cushions, mattresses, easy-chairs, etc. The "Julap" machine, as it is called, is electrically driven, and it orders and arranges any filling material and presses it, in such quantities and at such speed as the regulating controls will dictate, into the upholstery. Current consumption is very small.

Another novelty is the "Thermator," a small and compact device fitting immediately behind the water tap, with a regulating switch on top of it. It gives immediate supplies of water at temperatures up to 85 deg. C. The apparatus, as well as the water tube, are protected against overheating or against an explosion. The model, with a loading of 300 W, sells at £1 13s. Higher loadings, 400, 600 and 900 W, are also being sold.

Agriculturists were catered for by a new model of the "Dia" pump, which enables farmers, contractors, builders, etc., to raise water and also sewage, mud, pebbles, sand, and other foreign bodies. The prices vary from £5 to £30 for the electrically-operated models. Large quantities of these pumps, I noticed, were sold to South America, India, and nearly all the continental countries.

Considerable interest was shown in the "Fultograph," a receiving set for wireless pictures, and claimed to be capable of receiving a variety of broadcast picture transmissions. The apparatus, which was invented by Capt. O. Fulton, an Englishman, shows pictures of 9 by 12 cm., and is at present priced at £13 10s. The manufacturers, however, are not yet selling the complete set, but only its component parts, to wireless manufacturers in various countries. Great Britain proved one of the chief markets for these parts.

A lighting novelty is the "Jupiter" paying-board for use in stores and retail shops. As the customer puts down the money for his bill and touches the board mounted on a case, the latter lights up and shows advertisements on three sides which the customer cannot help noticing. The price is 25s. f.o.b. Düsseldorf.

A new daylight lamp, "Capri," which, it is claimed, achieves pure white daylight and 50 to 70 per cent. saving in current as compared with present daylight lamps, has been evolved by a German glass works. By a simple reflector arrangement and the use of a special glass nearly all the unwanted red rays are absorbed. I was told that more than 30 000 of the new reflectors had already been sold to Great Britain.

For the medical man a special lamp, "Rondolla Medica," ought to prove useful. The lamp fulfils about eight different functions, and not only the lamp arm and its rays can be directed in every possible way, but the reflectors, too, can be easily regulated, the light circle can be enlarged, and various absorbing and coloured glasses can be inserted by simply pressing a button.

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# LOOKING BACKWARD.

## Harvesting by the Electric Light Fifty Years Ago.

FIFTY years ago, as recorded in The Electrician of September 7th, 1878:—

An English agriculturist, Canon Bagot, rector of Atly, proposed to do his harvesting by the electric light.

M. Sieur's duplex telegraph apparatus was about to be adopted on the line between Paris and Rouen.

The Admiralty proposed to "have the electric light apparatus fitted on board every sea-going armoured vessel in the Navy as opportunity offers."

Experiments were being made with a magneto electric bicycle lamp, the only drawback of which was that "when the machine is at rest the light is apt to go out." The cost of the lamp was about £5.

At the annual meeting of the Barnet District Gas and Water Co., fears as to possible competition from electric lighting were discounted, it being pointed out that as it required a 70 H.P. engine for about 16 lights, it would be a long time before the electric light could come into general use, even for large spaces.

An unusual number of accidents by lightning, both serious and curious, were reported. "At Witham the lightning ran along the telegraph wires into the instruments at the Post Office, fusing the coil of the galvanometer, shooting from thence to the testing box, with a vivid blue flame, succeeded by a loud report, and passing out and along the wires to the Braintree Post Office, seven miles distant, where some slight damage was also done."

* * *

Twenty-five years ago, as stated in The Electrician dated September 11th, 1903:—

Nernst lamps were to be tried for lighting a Poplar street.

Imports of electrical goods and machinery during August were valued at £120 579.

The Liverpool, London and Globe, and the Royal Insurance Companies first issued rules with reference to the wiring of buildings.

Mr. W. B. Woodhouse resigned his post as resident engineer to the Newcastle Electric Supply Co. to take up the duties of chief resident engineer to the Yorkshire Electric Power Co.

Sheffield Electric Light Committee decided to pay to Messrs. Ballard and Howard—employees of the department—£100 for the use of a concentric fitting for fixing cables which they had invented.

A short circuit between the Bank and the British Museum stations of the Central London Railway caused a lengthy interruption of the service. Passengers made their way back along the track to the station.

Much money was being spent on official functions and banquets in connection with the opening of new electricity works and extensions, and considerable interest attached to the Local Government Board's approval of a proposal to surcharge members of the Hackney Borough Council for the amount of £209 15s. 1d. expended on the opening ceremony of their electricity works. Although it was decided to relieve the members of personal liability, it was clearly indicated that the expenditure was illegal.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Suggestions for the National Register.

[To the Editor.]

Sir,—We frequently hear the opinion expressed that the cause of many fires is faulty electrical installation, and this opinion, as expressed by experts and often published in the daily press, must create in the public mind a certain mistrust of electricity.

Of course, we all know the public have the cure in their own hands, viz., to employ reliable workmanship and materials only; but are the public sufficiently aware of this?

In this connection I would suggest that a body such as the N.R.E.I.C. should undertake propaganda to educate the public to the need for reliable installations and how they can differentiate between "reliable" contractors and the "shoddy wiring" contractor by "sending their orders and inquiries for electrical work to registered contractors only" and at the same time point out the moral of the maxim, "Penny wise and pound foolish," as applied to electrical installations, etc.—I am, etc.,

V. E. B.

August 29th.

[With the very limited funds at its disposal the National Register can hardly be expected to embark upon expensive advertising campaigns in the daily papers. The need would be better met by advertising in the "class" journals appealing to architects, builders, consultants and municipalities who are likely to be in a position to give orders for sizeable electrical installations. Having qualified for enrolment on the National Register, installation contractors might, we think, take individual steps to acquaint prospective domestic customers in their immediate locality with the advantages to be gained from employing registered contractors. Other aspects of this question are dealt with in a note under "Current Topics."—Ed.]

## "'Ack-'Acks' in the Air Raids."

[To the Editor.]

Sir,—Having perused the leading article under this heading in your issue of August 17th, 1928, may I be permitted to point out through your columns that the searchlight defensive organisation was not wholly manned by the London Electrical Engineers (26th and 27th A.A. Co.'s, R.E. (T.A.).

The complete organisation embodied the 1st A.A. Batt. R.E. Regular Army, and the Surrey, Essex, and Kent and Middlesex A.A. Groups, Territorial Royal Engineers, each of which played an equally important part in the defence in the recent aerial manœuvses.

May I further be permitted to add that your comments respecting vacancies apply equally to each of these additional Territorial units, and that attractive rates of pay are granted during the 15 days' annual training.—I am, etc.,

A. Grover,
Capt. R.E. (T.).

28, Pelham Road,
Gravesend, Kent.
August 29th.

## Electric Heating by Low Temperature Surfaces.

[To the Editor.]

Sir,—May I be allowed to congratulate Mr. H. Ambrose Carney upon his very excellent article on "Electric Heating by Low Temperature Surfaces," published in your issue dated August 31st?

In the autumn of 1926 the City of London Co. began to compete with central hot water systems by adding to its tariff an offer to supply electricity for low temperature systems through double tariff meters at the following rates of charge:—

Between the hours of 9 a.m. and 7 p.m.—1d. per kWh.

Between the hours of 7 p.m. and 9 a.m.—½d. per kWh.

the offer being subject to two conditions embodied in the form of an agreement, viz. (i) the apparatus employed to work at a low temperature, and (ii) the average loading not to exceed 700 W per 1 000 cu. ft. of the room contents. There are now over 100 systems installed and operating on the City Co.'s supply mains, with highly satisfactory results both to consumers and the company.

Mr. Carney's reference to the smaller number of B.Th.U.'s required for a low temperature electric system as against a central hot water system is of the utmost importance, the "B.Th.U. argument," as it has come to be called, constituting the main defence advanced by advocates of central heating. Experience has proved that the employment of low temperature electric convectors secures a much more efficient distribution of warmth than can be obtained from localised heaters such as stoves or radiators, and that this results in a more economical use of heat energy and a marked reduction in the normal heat losses through the fabric of the building. The "P.H." convectors to which Mr. Carney refers do not require to be fixed to the walls or ceilings, and can be placed wherever desired. The whole of the heat generated is usefully employed, there being no loss on account of proximity to the walls, windows and floors.

It will take time and considerable propaganda work to popularise low temperature heating, but there are clear indications that what has been done in that respect is beginning to bear fruit.—I am, etc.,

J. Lesser,

Falcon House, Aldersgate Street, London, E.C.1.
September 1st.

## Retail Selling Costs.

[To the Editor.]

Sir,—In view of the interesting facts revealed by the system of analysing retail selling costs published in your issue of August 24th, I decided to give the scheme a "try-out" in my own business. At the present time I have but few shop assistants, and counter-trade is not yet the most important side of my business, though I firmly believe that within a few years it will be far more remunerative than the purely wiring work. I found on working out my selling costs on the lines indicated that the distribution of my assistants' time was far less satisfactory than that given in the article, but, though it has only been in operation a few days, I have noticed some improvement. It is, of course, too early yet to gauge the extent of such improvement over a period, but it seems to me, with my very short experience, that it will certainly more than compensate me for the slight amount of extra work which its operation involves.

One feature I have noticed already is that use of this plan stimulates the sales people to greater activity, and once the system has been properly explained to them they endeavour in a spirit of friendly competition to obtain a better all-round percentage than their fellows.—I am., etc.,

"Registered Contractor."

Manchester.
September 4th.

## "Electricity on the Landscape."

[To the Editor.]

Sir,—As one of those engineers who are alive to the desirability of making as unobtrusive as possible the means by which a public supply of electricity is made available, I have been interested in your various references to this matter, and particularly with the remarks in the leading article in your issue of August 31st. Having had the opportunity of seeing Mr. Pierce's illustrations of the model Central Electricity Board tower and the illustrations taken from a photograph of an actual tower on the Halesowen to Stourport line, I agree that the main differences in appearance are due to the different angles from which the structures are viewed. Furthermore, the members of the model have a heavier look than would those of an actual tower designed on identical lines. It also seems to me that "the tendency towards dynamic uneasiness at the base" noted in the Halesowen tower would be equally apparent in the C.E.B. model if viewed from a slightly different angle.

As to the officially adopted single circuit tower its appearance would certainly be improved by a wider spacing of the arms. The problem of harmonising transmission line supports with the landscape furnishes an instance of the widely held, but, in my view, mistaken, idea that if any utilitarian object is fit for its purpose it will automatically follow that it will be pleasing to the eye. It is obvious that a tower could have been produced to satisfy the former requirement, but which would be an everlasting offence to the eye.

Even when a suitable standard tower design has been evolved, there is still the problem of accommodating it to its surroundings. A structure which is quite attractive against a background of trees or hills may seem unduly assertive standing gauntly on a flat stretch of country.—I am, etc.

B. J. Lievesley.

Bournemouth.
September 3rd.

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# NEWS IN BRIEF.

## Television Demonstrations at Berlin—Portuguese Telephone Agreement—New Transatlantic Cable—Northampton Polytechnic Scholarships—World Power Conference at Barcelona—Engineering Exhibition at New York.

THE telephone number of the Institution of Electrical Engineers has been changed to Temple Bar 7676.

The London Power Co., Ltd., is to erect two cooling towers and tanks at Acton Lane power station, Willesden.

Demonstrations of the possibility of television becoming an accomplished fact in the near future are being given at the Berlin Wireless Exhibition.

Mr. W. J. Jones, of the E.L.M.A., gave a lecture on shop window lighting at the Drapers' Chamber of Trade Summer School, Cambridge, on August 30th.

Damage estimated at £8 000 was caused by a fire on the premises of Whyte, Thomson and Co., electrical engineers and scientific instrument makers, Mountainblue Street, Glasgow, on August 31st.

The new laboratories which have been built at Sheffield for the Safety in Mines Research Board are now being taken into use. The Prime Minister has agreed to perform the formal opening ceremony on October 11th.

The tenth annual dinner of the E.P.E.A. (Southern Division) will be held at the Hotel Cecil, London, on October 6th at 5.30 for 6 p.m. Tickets are obtainable from Mr. P. Gordon Hieatt, 25, Parkhurst Road, London, N.22.

The Leningrad District Electricity Supply Company is busy removing the meters from the premises of some 10 000 consumers who will be prosecuted for non-payment of the rates for electricity consumed during the summer months.

Willesden Housing Committee has deferred consideration of the question of installing gas and electric fires in the bedrooms of houses on the Neasden Estate, pending a statement of comparative costs from the engineer and electrical engineer.

The Ministry of Health has approved the proposals of the Metropolitan Asylums Board for the provision of an automatic telephone installation at High Wood Hospital for children, subject to the receipt of satisfactory tenders for the work.

There has now been settled an agreement between the Portuguese Government and the Anglo-Portuguese Telephone Co. regarding tariffs. This will enable the company to meet the demands for the rapid development of the telephone system.

Major C. H. B. Williams, a brother of Dr. Watkin H. Williams, the retired Bishop of Bangor, has presented St. Asaph Cathedral with an electric light installation as a memorial to his late wife, who was a daughter of the sixth Viscount Falmouth. The scheme comprises floodlighting from the roof and arches.

The laying of the Western Union Telegraph Co.'s new cable between Bay Roberts, Newfoundland, and Horta, Fayal, Azores, by the Telegraph Construction and Maintenance Co.'s cable ship "Dominia" has been completed, the laying of the deep sea portion having been accomplished in six days. Communication over the line was established on September 1st.

An examination will be held on September 19th and 20th at the Northampton Polytechnic Institute, St. John Street, London, E.C.1, for the award of three scholarships in engineering value £18 per annum and tenable at courses extending over four years in civil, mechanical, electrical, aeronautical and radio engineering, and two including summer periods in the works of large industrial firms.

Chemical examination of samples in connection with water softening, boiler waters and condenser leakages at the London County Council's tramway power station at Greenwich has been continued throughout the past year. An investigation of the deterioration of turbine oils under continued use was carried out in part at the power station, and in part at the central laboratory, and other matters connected with the working of large turbo-generators have been investigated.

At the International Telegraph Conference, which will be opened on September 10th at Brussels, a proposal for the reduction of the number of letters in a code word from 10 to 5 will be discussed. Chambers of Commerce in this country and other parts of the Empire are opposed to the suggestion, the British Government has hitherto disapproved of it and the cable companies do not favour it, being of opinion that it would be injurious to trade. The British Post Office representatives at the Convention will be Mr. F. W. Phillips, Mr. J. Louden and Mr. F. Strong.

In America the percentage of houses wired for electricity supply is 60.

The all-electric ship "Brunswick" ran its trials on the Clyde on August 29th.

The Anglo-Spanish telephone service has been extended to the city of Ceuta, Spanish Morocco.

The Spanish Cabinet has decided to summon a world conference on electric power at Barcelona next year.

The West Riding Education Committee is adopting electric lighting at the new Middle School, Rossington.

The Morecambe autumn illuminations are now in progress. The sum of £1 500 has been spent on the scheme.

Brighton Corporation has invited tenders for alterations and additions at the North Road generating station.

The transmission of photographs by wire, by the Belin system, between Paris and London, and Paris and Edinburgh is in practice.

The Canadian Hydro-Electric Corporation expects early in November to be generating 50 000 H.P. at the New Bryson plant, on the Ottawa River.

The police force at Stalybridge is being reduced. This is understood to have been rendered possible by the successful working of the police telephone call-box system.

The first of the cables which are to supply light and power from the Shannon Electricity scheme to Dublin townships was laid on August 29th, at Deansgrange.

The Federal Public Works Committee is examining plans for converting the Melbourne central telephone exchange from manual to automatic working, at a cost of nearly £585 000.

The Directorate of the Vienna Fair has secured many passport concessions and reductions of fares for visitors to the Fifteenth Vienna International Fair, which is now being held.

Amongst the German municipal institutions inspected last week by Sir Kingsley Wood, Parliamentary Secretary of the Ministry of Health, is the municipal open air bathing establishment at Lichtenberg, an eastern suburb of Berlin. Warm water is supplied to the swimming baths and paddling pool from neighbouring electricity works.

It is officially stated that the capital invested in hydro-electricity enterprises in New Zealand has increased from £1 500 000 in 1918 to nearly £19 000 000 at the present time. There are now generated 138 925 kW, as against 43 980 kW in 1918, and the number of people to whom current is available has multiplied from 467 000 to 1 239 935.

The clerk of Seaham Harbour U.D.C. has visited the Electricity Commissioners in connection with the Council's application for a loan of £3 000 in connection with the assisted wiring scheme. The Electricity Committee seeks sanction for a further loan of £500 for the purchase of domestic apparatus for hire. The electrical engineer has been asked to instal an alarm system in the firemen's houses, at a cost of about £40.

The seventh National Exposition of Power and Mechanical Engineering will be held at New York from December 3rd to 8th next. The exhibits will include equipment for fuel combustion, power generation, distribution, transmission and utilisation; heating and ventilating, refrigerating, etc. British participation in this exhibition will be welcomed by the organisers, the International Exposition Co., Grand Central Palace, New York.

In the course of the Budget debate in the New Zealand Parliament last week, the Prime Minister, Mr. Coates, declared that the public works policy for railways, telephones and hydro-electric power was proceeding according to a definite plan, and the enterprises were gradually earning interest and paying their way. The hydro-electric works would be a great asset, and he predicted that in about 20 years they would be returning eight or nine millions above the capital charges.

Winnipeg will eventually have in the neighbourhood of 240 000 H.P. of hydro-electric power from its two sites on the Winnipeg River. Besides the 105 000 H.P. of installed capacity at Pointe du Bois, other installations on the Winnipeg River are the 112 000 H.P. installation of the Manitoba Power Company at Great Falls, which is to be increased to 192 000 H.P. and the Winnipeg Electric Company's development of 37 800 H.P. on the Pinawa channel. Six of the nine power sites on the Winnipeg River in Manitoba are still undeveloped.

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# BAKERS' EXHIBITION.

## Some of the Electrical Equipment at the Agricultural Hall.

THE General Electric Co., Ltd., are exhibiting from the wide range of industrial cooking equipment manufactured by them a number of items at the Bakers' and Confectioners' Exhibition, which opens at the Agricultural Hall, Islington, London, N., to-morrow, Saturday, and continues to September 14th. One of these items is a double-deck electric baking oven of the "Peel" type. This oven, the internal dimensions of each deck of which are 4 ft. by 4 ft., is fitted with a tiled sole, the walls and crown being constructed of sheet steel vitreous enamelled. Tubular elements are fitted in the top and bottom of each oven in such a manner as to enable them to be withdrawn from the front. These are controlled by suitable switches, by means of which three degrees of heat in both the top and the bottom can be obtained, and pilot lights are provided to indicate which elements are on circuit at any time. Specially calibrated thermometers, and interior illumination are also provided.

A "Humidor" steam boiler will be shown in juxtaposition with this oven. As is well known in the trade, if steam is injected into a baking oven at the right stage in operation, greatly improved results accrue, viz., a good thin crust with a fine bloom is obtained and, furthermore, bread will keep fresh for a much longer period. With these facts in mind the G.E.C. have given careful consideration to the type of apparatus to use for this purpose, and have as a result developed the "Humidor" steam boiler. Steam is generated by using low consumption heating elements, and by means of a patented system of atomisation it can be injected into the oven in adequate quantities at the exact stage in the baking operation to give the best results. This apparatus can be easily adapted to meet the requirements of one, two, or three deck ovens.

A double deck electric pastry oven will also be exhibited. The internal dimensions of each deck of this oven are 24 in. wide by 18 in. deep by 10 in. high. The oven is fitted with a tiled sole and has a vitreo-enamelled interior. Top and bottom elements are provided and are withdrawable from the side of the oven. They are controlled by suitable switches which enable three different degrees of heat to be obtained in top and bottom.

A third item to be shown is an electric doughnut cooker. A specially constructed basket, with hinged wire-mesh lid halfway down, is provided for the purpose of keeping the doughnuts immersed during cooking and to ensure even browning.

# LAMP PRICES.

## Further Price Reductions on Standard Gasfilled and Vacuum Types.

AS announced in THE ELECTRICIAN last week, the manufacturers of lamps comprising the Electric Lamp Manufacturers' Association, reduced the prices of their vacuum and gasfilled lamps from September 1st by amounts ranging from 2d. to 8d., according to the type, wattage and voltage.

REDUCTIONS IN PRICE OF STANDARD VACUUM AND GASFILLED LAMPS.

| Type. | Watts. | Volts. 100 105 110 115 120 125 130 Old Price. | Volts. 100 105 110 115 120 125 130 New Price. | Volts. 200 210 220 230 240 250 260 Old Price. | Volts. 200 210 220 230 240 250 260 New Price. |
|---|---|---|---|---|---|
| Vacuum: | | | | | |
| Clear .. .. Pearl .. .. Purlite .. .. | 15 | 2/2 | 2/– | 2 9 | 2/2 |
| | 25 | 2/2 | 2/– | 2 6 | 2/2 |
| Clear only .. | 40 | 2/2 | 2/– | 2 6 | 2/2 |
| | 60 | 2/2 | 2/– | 2 6 | 2/2 |
| Gasfilled: | | | | | |
| Clear only .. | 25 | 2 3 | 2/1 | — | — |
| Clear .. Pearl .. .. Purlite .. .. | 40 | 2 3 | 2/1 | 2 8 | 2 3 |
| | 60 | 2 8 | 2 3 | 2 8 | 2 3 |
| | 75 | 4/– | 3 6 | 4/– | 3 6 |
| | 100 | 4 9 | 4 3 | 4 9 | 4 3 |
| Opal .. .. | 25 | 2 7 | 2 4 | — | — |
| | 40 | 2 7 | 2 4 | 3 1 | 2 6 |
| | 60 | 3 1 | 2 6 | 3 1 | 2 6 |
| | 75 | 4 7 | 4/– | 4 7 | 4/– |
| | 100 | 5 6 | 4 10 | 5 6 | 4 10 |

These reductions constitute the fifth downward price movement in lamps since the war.

# PERSONAL.

MR. A. Fazalbhog, managing director of the Bombay Radio Co., Ltd., will be visiting this country this month.

The marriage of Mr. C. Ritchie and Miss B. Hindle was solemnised at St. Peter's Church, Durham, on August 18th.

The wedding of the Earl of Bective and Lady Clarke is announced to take place at Brompton Oratory on September 18th.

Estate of the gross value of £481 413 with net personalty £452 121 was left by the late Mr. Walter Claude Johnson, chairman of Johnson and Phillips, Ltd., who died on June 2nd, aged 80 years.

Aldershot Town Council has decided that the salary of the borough electrical engineer, Mr. F. Garside, shall be in accordance with the award of the A.M.E.E. His previous salary has been £600 a year.

Sir Robert Hadfield, chairman of Hadfields, Ltd., has offered to present a bronze statuary group representing "The Origin of Metallurgy" to the French Academy of Sciences, of which he is a corresponding member. The gift is to replace the historic clock of the Academy, which was stolen in mysterious circumstances some time ago. The offer has been accepted.

A short list for the post of city electrical engineer was drawn up by Hull Electricity Committee on Monday. The list includes Mr. P. G. Campling, engineer and general manager, Great Yarmouth Tramways Dept.; Mr. H. C. Fraser, Yorkshire Electric Power Co., Leeds; Mr. W. S. Johnson, engineer and manager, Dumfries Electricity Supply Dept.; Mr. N. Lee, electrical engineer, St. Helens; Mr. E. Morgan, borough electrical engineer, Wolverhampton; Mr. W. A. Royle, assistant manager, Sunderland; Mr. J. K. Struthers, Belfast; and Mr. J. N. Waite, Bradford. The position is made vacant by the appointment of Mr. H. Bell as chief engineer of the Glasgow undertaking.

A large number of friends gathered at Victoria Station on August 30th to wish "bon voyage" to Sir Hugo Hirst and the other members of the Government Mission to Australia. Sir Hugo Hirst was accompanied by Lady Hirst and Mr. Fitch, his private secretary; the other members of the party who entrained at the time same included Sir Arthur Duckham, the Leader of the Mission, accompanied by Lady Duckham, and Mr. Charman, private secretary; Mr. Dougal Malcolm, accompanied by Lady Evelyn Malcolm and Miss Farquhar; Mr. Norman E. Archer, and Mr. Henderson (secretary to the Mission). The party travelled overland to join, at Marseilles, the s.s. "Mooltan," which the remaining member of the Mission, Sir Ernest Clarke, joined at Tilbury. Among those present on the platform were Major-Gen. Sir Granville Ryrie, High Commissioner for the Commonwealth of Australia, Lord Queensbury, Mr. and Mrs. M. J. Railing; Mr. and Mrs. L. C. Gamage; Mr. and Mrs. Trevor Rose; Mr. and Mrs. Felix Rose; Miss Dolly Rose; Mr. and Mrs. S. Dixon Moyse; Mr. and Mrs. Norman Freudenthal; Mrs. A. Hirst, Miss Doris Hirst; Mr. and Mrs. M. Levenger; Mr. and Mrs. T. Settle; Mr. and Mrs. Maurice Dreyfus; Mr. F. M. McDougall; Mr. F. W. Duckham; Mr. Metcalfe; Mr. Griffith; Mr. F. Richards; Mr. E. W. Smith; Mr. J. S. Jeffrey; Mr. D. Rider and Mr. G. Hutchins. See page 271.

## Obituary.

MR. JAMES GEORGE ANTHONY HART, on August 23rd, of the Hart Electrical and Mechanical Engineering Co., of which he was the sole partner. He was for some time works manager for Bruce, Peebles and Co., and twenty-five years ago established his own business at Leith. He was a well-known Freemason.

MR. HENRY MATTINSON, aged 52 years. He joined the staff of the Manchester Corporation Tramways Department in the early part of 1901, when the undertaking of the old Carriage Co. was being taken over by the Corporation, and he took an active part in the work of reconstructing the track for the new electric cars. In 1904 he was appointed permanent way engineer, and subsequently civil engineer. In June, 1922, on the resignation through ill-health of Mr. J. M. McElroy, Mr. Mattinson was appointed general manager. He was later appointed general manager and chief engineer, which position he has occupied since. Among the more recent schemes for which Mr. Mattinson has been chiefly responsible reference must be made to his plan for an underground railway system in Manchester.

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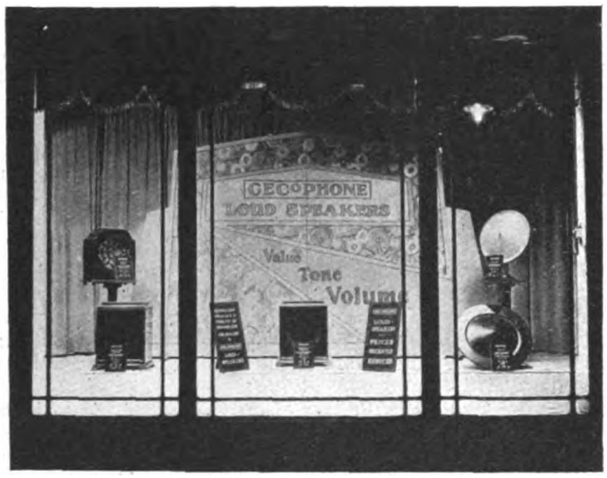
# BUSINESS ITEMS.

THE business of Messrs. E. M. Parsons has been removed to 57, Paragon Street, Hull.

A. H. Roper, Ltd., have opened new electrical showroom premises at 139, Shirley Road, Croydon.




**A special "Gecophone" loud-speaker window display at Magnet House.**

The Mullard Wireless Service Co., Ltd. announces that the Bristol depot has removed to 17, Redcliffe Street.

British patent No. 203 711, relating to "Improvements in multiplex electrical signalling," is offered for sale to British manufacturers.

Messrs. Callas, Sons and May, of Reading, carried out the lighting installation at the new central premises of the Reading Co-operative Society.

Showler, Ltd., radio engineers of Croham Road, High Street, Crowborough, have opened new premises at 133, Camden Road, Tunbridge Wells.

Messrs. Sweetman and Ansell, electrical engineers, of Bell Street, Reigate, have dissolved partnership, and the business will in future be carried on by Mr. A. Ansell.

The contract for installing the electrical equipment in the air liner "R.100," now under construction at Cardington, has, we understand, been secured by Newton Bros.

The name of Automatic and Electric Furnaces, Ltd., has been changed to Wild-Barfield Electric Furnaces, Ltd. The board of directors and management remain the same.

In connection with the death of Mr. J. G. A. Hart, announced on page 261, it is intimated that the business of the Hart Electrical and Mechanical Engineering Co., of Leith, will be continued on behalf of his widow.

George Green and Co. point out that our notice of their change of address on page 183 of the August 17th issue contains two errors. The postal district and number is S.E.27 not S.E.17, and the telephone number 8 727 not 8 272.

An Indian firm in Bombay, which has been established in Western India for a good number of years, desires to represent British manufacturers of boilers, steam engines, motors, dynamos, etc. Particulars from the Department of Overseas Trade. (Reference No. 180.)

A representative of a firm of agents in Auckland, N.Z., is in this country and wishes to interview British manufacturers of electrical appliances, etc., desirous of appointing agents in New Zealand. The Department of Overseas Trade has further details. (Reference No. 186.)

Mr. C. J. Justine McAlister, a Sydney business man, is at present visiting this country and desires to get into touch with manufacturers of domestic electric appliances with a view to agency arrangements. Mr. McAlister may be addressed c/o Australia House, Strand, London, W.C.2.

The Commercial Secretary at New York has forwarded to the Department of Overseas Trade a copy of a booklet, issued by the U.S.A. Department of Commerce, which gives particulars of recommendations by a conference of manufacturers and users of porcelain insulators for limiting the stock varieties of one-piece insulators, with a view to securing economy. The booklet is available for loan to British firms. (Reference No. B. 4 661.)

In connection with the British Medical Association Conference at Cardiff, it will be remembered that we published an illustration of the illumination of the south front and clock tower of the City Hall. We are now informed that a number of the floodlight projectors employed for this purpose were supplied by the General Electric Co., Ltd., the arrangements being carried out by the Lord Mayor, Alderman K. J. Hornett, in conjunction with the city electrical engineer, Mr. Morley New.

The new plant at Bootle of the Penpoll Tin Smelting Co., Ltd., makes considerable use of electricity in the various processes. Of the 18 electric motors in use at this plant, 13 are of Crompton Parkinson make, the draught necessary for the furnaces is induced by two Keith Blackman fans each driven by a 17 B.H.P. Crompton Parkinson motor. The exhaust is drawn through a Lodge Cottrill plant in order to recover any tin oxide which would otherwise be lost.

About a year ago Leicester Corporation ordered two Howden-Ljungström air preheaters to operate in conjunction with two existing boilers at Freemans Meadow power station. The Corporation has placed a repeat order with Howden-Ljungström Preheaters (Land), Ltd. for preheaters for four further boilers. At the same time the Corporation has ordered the same make of preheater for pulverised fuel fired boilers now under construction for the new extension to the power station. It is interesting to note that out of a total of thirteen preheaters ordered during July, ten are covered by repeat orders.

An interesting electrical detail in connection with the rescue of General Nobile and his party comes to hand from Mr. Ljunglund, the wireless operator of the rescue aeroplane "Uppland." It will be remembered that after the "Italia" crashed, the wireless operator succeeded in reporting the accident, giving the position of his group. The strength of the station however decreased daily and finally all signals from the group ceased. Among the stores dropped to the party from aeroplanes were batteries but these were all either crushed in falling or failed to operate for other reasons. The aeroplane "Uppland," however, carried three "Nife" steel plate batteries which, according to Batteries, Ltd., survived the ordeal.

A novel scheme was organised by Mr. A. J. Bridge, general sales manager, West Wilts Electric Light and Power Co., Ltd., for shop window lighting at the Melksham Hospital Carnival held recently. As one of the features of the carnival, a window dressing and illumination competition was arranged, prizes being offered by the West Wilts Electric Light and Power Co., for the three best windows. Assistance was also given by the company with the loan of illumination equipment. The competition attracted a large number of entries, and some very clever schemes were carried out. Electrical illumination was one of the main attractions of the carnival, over 5 000 lamps being used by trades people for decorating their premises. The showrooms and offices of the supply company were outlined with lamps, and a special "carnival" display in the showroom window attracted much attention.

The display men responsible for the dressing, three times daily, of the six model shop windows on the stand of the Empire Marketing Board at the Display Convention to be held at Southampton, will be relieved of any anxiety as to the lighting effects in that each window has been so equipped tha any desired effects can be obtained at will. The general lighting of the windows is by means of B.T.-H. X-ray reflectors fitted with gasfilled lamps. The reflectors are mounted on the ceiling near the front of the windows and are concealed from view by a pelmet across the top. They are spaced to given even distribution of light over the whole of the display, and although there is a very high intensity of illumination on the goods shown in the window, there is no glare. Colour slides of various colours can be used when desired, and in addition each window is equipped with a shop window floodlight at each end and a spotlight in the centre. The whole of the shop window lighting of the stand was designed by the British Thomson-Houston Co., Ltd.

## FACTORY LIGHTING.

### Lighting Campaign Conferences and Demonstrations in London, Home Counties and Provinces.

THE sales conference and demonstration for the London and Home Counties area will take place at the E.L.M.A. Lighting Service Bureau, Savoy Street, W.C., on Friday, October 5th, at 7.30 p.m., when the speaker will be Mr. W. J. Jones. Sales conferences will also be held on the same date at Glasgow, speaker Mr. H. E. Hughs; Newcastle, Mr. E. S. Evans; Manchester, Mr. R. C. Hawkins; Leeds, Mr. Victor W. Dale; Birmingham, Mr. J. H. Cooper; Bristol, Mr. H. W. Lingard; and Cardiff, Mr. G. S. Francis.

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# SELLING LINES.

FOR those desirous of using an a.c. supply for lighting the filaments of their radio valves, the introduction of a new range of Osram valves designed to dispense with the l.t. accumulator will prove of interest. The principle underlying the design of these valves is that of providing them with a special type of filament, so that this can be fed directly from the a.c. mains through a suitable transformer without the tendency to introduce into the receiving set the "hum" usually associated with operating sets from the mains. Three types of this valve will be produced, their titles being "H Point 8," "H.L. Point 8," and "P. Point 8." The "H. Point 8" has a high amplification factor, being designed for use in resistance-capacity or tuned anode coupled amplifiers, or as an anode bend rectifier. The "H.L. Point 8" is a general purpose a.c. mains type. It should be noted that none of these valves is suitable as a leaky grid rectifier, since this circuit requires a special valve if the introduction of a.c. hum is to be avoided.

## For Detector Purposes.

For a rectifying valve in circuits where the grid-leak principle is employed, the indirectly heated cathode valves, types K.H.1 and K.L.1 should be used. The filament characteristics of the new valves are 0·8 V 0·8 A. It has been found that this voltage is the best for this purpose, as a lower one would mean loss of characteristic efficiency and a higher would tend to the introduction of a.c. hum. A current consumption of 0·8 A has been chosen as the value most likely to provide for an efficient emitting filament, which will not result in emission flicker. These valves may be connected up in exactly the same way as accumulator valves, with the precaution of fitting a potentiometer (about 300 Ω is suitable) across the filament. The positive of the grid bias battery and all grid leads should be connected to the slider of the potentiometer, and it will be usually found that the a.c. hum will be minimised when the slider is about at the centre point. It is interesting to note that in an amplifier designed to operate moderately large or large loud-speakers, the last valve may be of a standard super-power type, such as the L.S.5, P.625, or P.625A, without introducing hum to any appreciable extent. As before, precautions must be taken to use a potentiometer across the filament for all grid return leads, and the mains transformer must have a secondary winding suitable for this valve. For small sets, however, the "H. Point 8" will be found quite suitable in the last stage. The "H. Point 8" has an impedance of 55 000 Ω, and an amplification factor of 40, while the "H.L. Point 8" has an impedance of 17 000 Ω with an amplification factor of 17, and the "P. Point 8" has an impedance of 6 000 and an amplification factor of 6.

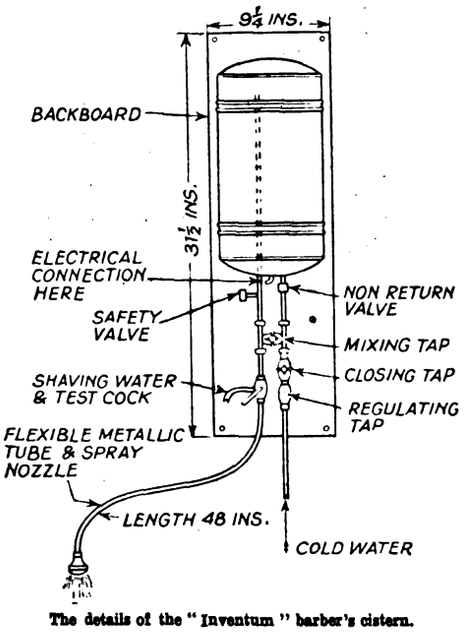
An appliance which is likely to prove of considerable practical value to electrical fitters, assemblers and builders of components from small parts involving the use of solder, has been introduced by Wright and Weaire, Ltd. The device is called a flux gun, and resembles somewhat the conventional grease gun. A long, fine nozzle is fitted, and it is claimed that a gun full of flux will yield sufficient of its contents to make 2 500 joints between wire and tag of average size.

"Sprayit Electrically" is a new device introduced by L. G. Hawkins and Co., Ltd., which, it is claimed, will do paint and any other spraying operations with results equivalent to those obtained with larger installations. When used with cellulose it will, we are informed, produce the standard high finish as on motor car bodies. It may also be used for whitewash and distemper. To small and large manufacturers who use paint, varnish or such materials the device should prove of interest, in that they may enjoy that finish which only spraying apparatus can give, or else spraying may be done anywhere in the works instead of taking the work to the spraying room. The instrument is portable, weighs 5 lb., and can be operated for ten hours for one kWh.

The new spraying device by L. G. Hawkins & Co., Ltd.

It will be remembered that among the most recent developments in the design and construction of X-ray apparatus demonstrated before the British Medical Association meeting at Cardiff last month was the "Metalix-Portable" outfit. Particulars of this new equipment have been sent to us by Philips Lamps, Ltd., and we understand that the outfit consists of a new type of "armoured" X-ray tube totally enclosed in metal, to which an extremely high voltage is applied through the medium of two specially insulated cables. Although the apparatus operates at 65 000 V, it is possible to handle any portion of the equipment without danger. Fed from the ordinary light socket, a compact step-up transformer supplies the necessary energy to the tube, whilst, when not in use, the entire apparatus, with the exception of the transformer, packs into a small suitcase. The transformer weighs 30 lb., is provided with a carrying handle, and is therefore readily transportable. We understand that many of the competitors at the Olympic Games at Amsterdam were examined with this new apparatus before the opening of the events.

We have received particulars from Mr. Alan Wright of a new Inventum barber's cistern, which, as its name implies, is an automatic electrical equipment from which hot water is obtained as and when required. The central feature of the cistern is a storage tank in which a constant supply of hot water is maintained. This container is surrounded by a thick jacket of heat insulating material, which practically prevents any loss of heat from the stored water. Electric elements, immersed in the container, heat up the water, and an automatic thermostatic device is fitted which switches off the current when a predetermined set temperature is reached. As hot water is drawn off an equivalent quantity of cold water enters the tank. The lower temperature of the incoming water affects the thermostat and the current is switched on; when the full temperature is restored the current is again automatically cut off. A supply of 1½ gallons of hot water, at about 195 deg. F., is maintained. The overall dimensions of the equipment are 31½ in. in height by 9¼ in. width, and the loading is 500 W.




The details of the "Inventum" barber's cistern.

The Loewe Radio Co., Ltd., have placed on the market a new reed electrical pick-up.

## A New Fan.

We have received from Viozone, Ltd., of 19, Cursitor Street, London, E.C.4., particulars of their "Viozone" ozone generating fan. This little electrically-driven appliance is claimed to be an advance on the ordinary types of electric fans, in that instead of circulating the existing air, vitiated or fresh as the case may be, the Viozone performs the double function of purifying the air and also circulating it. Becoming more and more recognised that vitality, energy and efficiency are much neduced by want of oxygen, a large demand is springing up for an apparatus which will supply the deficiency in so many ill-ventilated buildings. An apparatus designed to meet these modern requirements is the Viozone, which, by both generating and distributing ozone will, it is claimed, purify smoke-laden and impure atmosphere in workshop, office or public room. The apparatus has been passed by the Institute of Hygiene as fulfilling the standard of hygienic merit required by that body, and the Faraday House testing laboratories report that the apparatus may be used with safety. The fan may be run off the ordinary lighting circuit.

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Further publications by A. P. Lundberg and Sons, Ltd. are EL.49, dealing with a 5 A, 500 V machine switch; EL.63 describing 2 A, 250 V single and two-way push-pull switches; and EL.64 giving details of a 5 A, 250 V watertight switch.

Thermostats manufactured by Venner Time Switches, Ltd., are fully dealt with in list No. 46 published by the company. Time switches for late shop window lighting are dealt with in another new list, the reference being No. 45.

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# LAMP PUBLICITY.

## Further Details of Manufacturers' Lamp Advertising Material.

THE lighting season of 1928-9 is being inaugurated by the General Electric Co., Ltd., with a sales and advertising campaign in respect to Osram lamps on a widespread scale and in an intensive way. Although its lamps are so well known, there must inevitably be a recurring need each year to broadcast the merits they possess. Accordingly, a campaign has been prepared to meet this need for the 1928-9 season, and present users of electricity throughout the country, together with those who will utilise its service sooner or later, will be told what the name "Osram" stands for. They will learn that "The Nation's sight needs Osram light"—in the terms of one of the slogans adopted for the campaign, and they will also learn what is meant by the "Pearl Osram Simplified Line" of lamps, about which the campaign will primarily revolve. The introduction this year of this new "Simplified Line" campaign is so radical a departure from ordinary practice that it is deserving of special comment. What it means is that the range of lamps constituting the "Pearl Osram Simplified Line" comprises five lamps only, viz., 15, 25, 40, 60, and 600 W lamps. These have been standardised to replace no less than 65 different other lamps. In other words, any one of the 65 different lamps used hitherto can now be replaced by one only of the five lamps included in this new range. The outstanding advantages of such an arrangement must be obvious to the dealer. The carrying in stock of a large assortment of variously finished G.E.C. lamps to meet current demands is now unnecessary, as, generally speaking, it will be found that all requirements can be met from these five types.

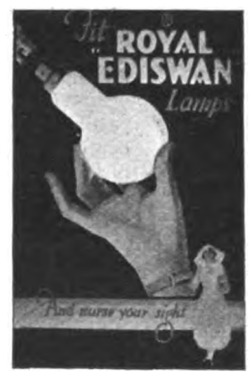
The means by which the General Electric Co., Ltd., purposes to get the issues involved in the campaign over to the dealer, and thereby to the eventual user, is by engaging in an advertising campaign embracing all the most representative technical and lay papers and periodicals throughout the country, and to equip the dealer in addition, with original and striking sales-aids in the form of showcards and folders and auxiliaries for window displays. The story of the "Pearl Osram Simplified Line" will be unfolded week by week in the electrical trade journals, and large users of electric lamps will be reached through the medium of their own press.

Concurrently throughout the autumn and winter months all the leading newspapers in the British Isles will carry compelling messages expounding the virtues of Pearl Osram lamps; and to supplement the impression of such messages a large number of the weekly and monthly magazines dealing with home life will perform a similar mission.

Siemens Electric Lamps and Supplies, Ltd., are also launching a special sales campaign for the lighting season, and, in this connection, are exhibiting posters entitled "Our Sunbeam" in London and the principal provincial towns. The posters are extremely pleasing in their colour scheme, and are of such a design that they will stand out from neighbouring advertisements. A reproduction of a photograph of the main poster is shown herewith. In addition, attractive framed advertisements will appear in the lifts of all tube railway stations, and on the platforms, these being mainly double crown posters of "Our Sunbeam" design. Posters of the clear gasfilled showcard design will also be displayed on railway and carrying companies' motor vans in London from October 1st, to the end of the year. Announcements will appear in the leading London dailies during October, November, and December, also in the good class monthly magazines, from October, 1928, to March, 1929. Further, a series of advertisements will be run through the medium of the leading trade journals, to appear from September to December.

Special window display centrepieces again featuring the "Our Sunbeam" poster design, wired with flex, lampholder, and adaptor are also being provided. The centrepiece is a display in itself, and opens out on struts. The boy on the

*WE are able this week to give further details of the advertising and sales campaigns of the various lamp manufacturers for the coming lighting season. Though our reproductions of the showcards, window displays, etc., have lost much of their beauty through our inability to give the colours, some idea of the general lines of the campaigns will, nevertheless, be understood.*




## *LAMP ADVERTISING.*

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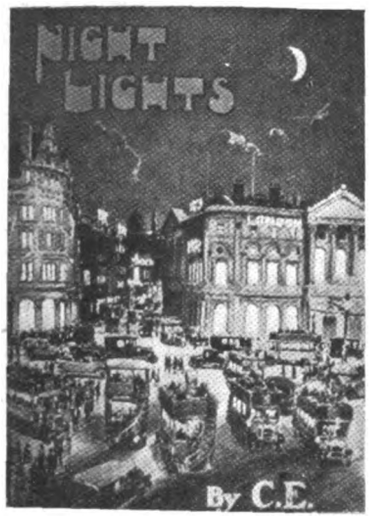
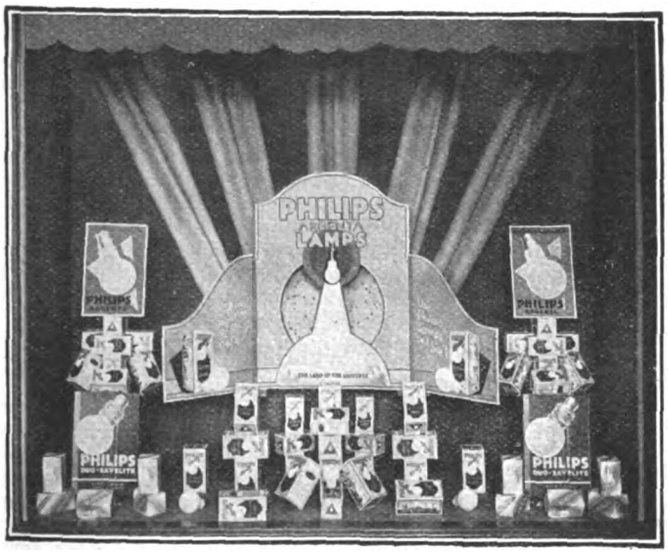



The attractive cover of the new catalogue issued by Cryselco, Ltd. The colourings are particularly striking and the scene is Piccadilly Circus, London.

A window bill announcing Cosmos price reductions.

## *LAMP SALES AIDS.*

The cover of a new booklet issued by The Tungsram Electric Lamp Works, (Great Britain) Ltd.




A window display showing the complete range of publicity material offered by Philip's Lamps, Ltd.

Illustrating how a complete window may be dressed by using the showcards, fittings, etc., published by the General Electric Co., Ltd. One of the new showcards is, however, omitted from the window, and some idea of the new design may be gathered from the reproduction given on page 269.

lamp is projected about 10 in., and with a lighted lamp in his hand it cannot fail to be a source of attraction. This display is 3 ft. 6 in. high by 2 ft. 6 in. wide. Two special lamp showcards have also been produced.

Metro-Vick Supplies, Ltd., have also introduced new literature for the 1928/9 season. This includes a new brochure in orange, green and black, while a number of folders available for over-printing are shortly to be published. These latter are this year more comprehensive than formerly, covering the complete range of 100/130 and 200/260 V gasfilled and vacuum lamps, together with certain other additions, including B.A.S. ratings of auto lamps. Special window bills announcing the reductions in the prices of Cosmos lamps are also available.

A special campaign in connection with the sale of domestic lamps is also being launched by the Edison Swan Electric Co., Ltd. A special catalogue including the reduced prices has been prepared, while special folders and window bills have also been arranged. A broadsheet explaining the campaign in detail is available to the trade and this indicates the papers of national importance which will carry Ediswan lamp publicity. The Ediswan nurse again plays her part in the campaign, while a number of sale aids and a wide range of display material have been prepared for distribution.

Further advertising material with respect to lamps is also available from Cryselco, Ltd. A comprehensive catalogue bearing the title "Night Lights" has been published, in addition to Pearl, opal, automobile and general lamp lists. A special showcard has been designed, and an attractive cut-out in which is featured Colonel Chris Elco is in course of preparation. A complete catalogue in colours giving details of the range of Cryselco lamps and reduced prices is also now available. The Tungsram Electric Lamps Works (Gt. Britain), Ltd., have also prepared a number of folders and other material suitable as sales aid to the coming lighting season. We have also had an opportunity of seeing details of the lamp campaign of Philips Lamps, Ltd., and this is intended not only to make a big appeal to the householder, but also industrial and commercial users. The appeal to the householder will be made by large space advertisements in the London and provincial daily and evening papers, while the industrial and commercial users will be approached through spaces in every important trade journal. These efforts will be followed up by the use of window displays, the designs and colourings of which are particularly attractive. The service offered by Philips Lamps, Ltd., in connection with window displays is one which relieves the trader of a considerable amount of trouble, a staff of window experts being available.

*D*

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# MACHINE TOOL EXHIBITION.

## Items of Electrical Interest at the Machine Tools and Engineering Exhibition.

THERE opened at the Olympia, London, on Wednesday, the fourth Machine Tools and Engineering Exhibition, at which a number of firms are showing exhibits of electrical interest. The exhibition continues until September 22nd, and among the items to be seen may be mentioned the extensive range of Wild-Barfield electromagnetic hardening furnaces shown in operation on Stand No. 86, the exhibit of WILD-BARFIELD AND ELECTRIC FURNACES, LTD. We are given to understand that Charles Taylor (Birmingham), Ltd., are hardening parts of their chucks in a vertical type furnace, while Lehmann Archer and Co., Ltd., tap and die makers at Fairlop, are using a horizontal furnace for tool hardening. These facts are interesting in that a new model of furnaces similar to those in use is exhibited. This is a vertical type with chamber measuring 16 in. diameter by 28 in. long, and has been specially designed for the correct hardening of gear wheels and similar parts. An internally heated furnace, suitable for carburising, annealing, enamelling, etc., is also shown. This is entirely automatic in operation, the temperature being controlled by an adjustable regulator, while the time of heating up or shutting down is regulated by a time switch. Two new types of high speed steel hardening furnaces are exhibited, in which the current consumption has been considerably reduced. Further, to overcome the usual disadvantage of carborundum heating elements, owing to great increase in resistance with age, a patent ballast resistance is fitted, which, it is claimed, extends the life of the elements. Two types of tempering ovens are on view, these being in operation.

### Electric Switchgear.

The selection of electric switchgear exhibited by the IGRANIC ELECTRIC CO., LTD. (Stand No. 152A), includes a few of the firm's range of control devices, embracing specialised models for almost every industry and every engineering purpose. The exhibit includes automatic pillar type panels fitted with multiple finger self-acting starters and double pole contactors, suitable for direct current circuits; automatic star delta starting panels; a framework carrying an automatic a.c. control panel and multiple contactor type starter for direct current; an automatic motor starter for squirrel cage induction motors; across-the-line type motor starter for squirrel cage induction motors fitted with thermal overload protection; a multiple finger type self-acting starter for d.c. motors; a Dean valve control unit fitted to valve; a 14 in. type "M" magnetic brake; a universal starting panel; magnetically-operated contactor switches; battery charging panels; an a.c. reversing drum controller, type No. 977; cinema dimmers; plate type field regulators; multiple lever starters; inductive time limit control panels; "Dwarf" universal control panels for direct current motors; type "Y" three-pole hand-operated switches; and a number of other devices. In addition, an interesting exhibit is a working model (to scale) of the Igranic newspaper conveyor. Another model, in miniature, is that of a lifting magnet, similar to the type adopted by many iron and steel manufacturers. These magnets, we understand, are made in all sizes up to 76 in. diameter. Other exhibits include various accessories for use in conjunction with electric control gear.

Representative working examples of slow speed direct electric drive are displayed by the LANGHAM ENGINEERING Co., on Stand No. 81B. Units are shown coupled to various machine tools, pumps, etc., the normal motor output being from ¼ to 30 H.P. for d.c. and a.c. at motor speeds of 1 500 revs. per min. Ironclad starting panels for d.c. and a.c. motors, operated by hand or from remote control push button stations are the chief exhibits of BROOKHIRST SWITCHGEAR, LTD. (Stand No. 82), and while there are on this stand only two representative control gears many other examples may be seen elsewhere in the exhibition. Alternating current motors in various stages of manufacture and ranging in size from 1 to 50 H.P. are exhibited by BROOK MOTORS, LTD., Stand No. 92. While, in addition to the standard machines, buffing motors, motor generator sets and various a.c. motors wound and made specially for operating machine tools, crane motors with square end shafts made totally enclosed and suitable for working in exposed positions and pipe ventilated motors are exhibited. Another interesting item is a special line of interchangeable motors, *i.e.*, d.c. motors made to similar dimensions as the Brook a.c. motors, so that machine tool makers may be able to make up their machines, leaving seatings suitable for taking a motor which can be either d.c. to any voltage or a.c. to any frequency or system of supply.

Demonstrations of their complete range of electric tools are being given by B.E.N. PATENTS, LTD. (Stand No. 114A), including "U.S." portable electric drills, screw drivers, belt setters, tappers and grinders, B.E.N. electric saws and hammers. An exhibit of wide range of Reliance and Gec-automatic telephones in various standard, de luxe and period finishes, designed to meet the requirements of factories, offices, institutions, hospitals, town and country mansions, mines, banks, service flats, etc., is made by the RELIANCE TELEPHONE CO., LTD., on Stand No. 116A. Automatic direct inter-communication, secret and conference lines, staff and general call devices are a few of the facilities offered. Various models are fitted with a special throat transmitter, which enables them to be used in noisy places, while the latest types of Gec-automatic telephone exchanges are shown under working conditions. These equipments are similar to the public automatic exchanges supplied to the Post Office. The exhibit also comprises audible and luminous signalling equipments, bell apparatus, burglar and fire alarms, telephone attachments, such as hygienic glass mouthpieces, extending telephone arms, etc., and also various labour saving devices.

The BRETTS' PATENT LIFTER CO., LTD., are giving on Stand No. 25B, a demonstration for a 10 cwt. electrically driven friction drop hammer with compound tye guide rods, while a number of electric motors of interest are exhibited by RANSOME AND MARLES BEARING CO., LTD., on Stand No. 25B. On Stand No. 38, occupied by the BRITISH SECHERON CO., LTD., is shown a range of a.c. welding machines, including a portable welding set designed for either a.c. or d.c. This latter machine is made in a range of five sizes, single phase or three-phase. The universal butt, spot and a.c. welding machine is also exhibited, while many examples of electrodes are included. Electrically driven planing machines and boring and turning drills are shown by JOHN STIRK AND SONS, LTD., Stand 54, together with a self-contained electric grinder by HORACE GREEN AND CO., LTD. Various sizes of country house lighting plants are among the exhibits of R. A. LISTER AND CO., LTD., Stand 59A, while various electrically driven rotary cutting off machines and gear driven lever operated sawing off machines for non-ferrous section rods are shown by CHARLES TAYLOR (BIRMINGHAM), LTD., on Stand No. 76.

### Arc Welding Plant.

Demonstrations of two operator 200 A motor-generator Wilson arc-welding plant fitted with K5 automatic current control panels are being given by G. D. PETER AND CO., LTD., on Stand No. 5B. Other plants on view include a single operator 75-200 A equipment for outdoor use, and a single arc motor generator set. Arc-welding equipment also forms one of the exhibits of ALLEN-LIVERSIDGE, LTD., on Stand No. 6. An interesting range of push button controls is shown by the WATFORD ELECTRIC AND MANUFACTURING CO., LTD., their controls of electrical interest being d.c. or a.c. contactors, a wheel lathe control panel for use with a 50 H.P. 220 V d.c. motor push button control for starting and stopping, for speed control, etc., a similar control panel for use with a 50 B.H.P. 220 V three-phase slip ring wound rotor motor, a machine tool control panel for use with a 4 H.P. 220 V d.c. variable speed motor, a similar panel for a 15 H.P. 220 V d.c. motor; and a control panel for use with a 15 H.P. 220 V three-phase slip ring wound rotor motor. Other exhibits include a reversing control panel for a drilling machine for use with a 5 H.P. 220 V d.c. variable speed motor push button control to "run up" to a pre-set adjustable speed in a forward direction and different adjustable speed in a reverse direction for tapping; a plate edge planer control panel for use with a 20 H.P. 220 V three-phase squirrel cage motor to give push button "start" and "stop" control and "change over" limit switches for reversal, and a marine type control panel for use with a 10 B.H.P. 220 V d.c. motor, showing tank type float switch control for ships' pumps.

Automatic electric trucks for various uses form one of the exhibits of H. C. SLINGSBY, on Stand No. 124, including platform trucks and lifting-tiering trucks for loads up to two tons. The application of electric lighting to the photographic, engraving and photo-printing industries is demonstrated on Stand No. 127, by E. N. MASON AND SONS, LTD. Electrically operated tools of various types are being shown by the SUN ELECTRICAL CO., LTD., on Stand No. 155B, and by the VIDAL ENGINEERING CO., LTD., on Stand No. 149.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

SOUTHPORT CORPORATION.—Electric light installation at the Ainsdale branch library, Southport. Particulars from the Borough Electrical Engineer.

EDINBURGH CORPORATION, September 7th.—Steel work for coal bunkers, in connection with extension of Portobello generating station. Schedule from the City Architect.

BOROUGH OF COLCHESTER MENTAL HOSPITALS, September 8th.—For the supply, delivery and erection of electric cables, conduits and contact gear at Brentwood Mental Hospital. Specifications, etc., from Mr. H. H. Gepp, Essex and Colchester Mental Hospital, Chelmsford; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 10th.—Supply of steel conduits and fittings for electric wiring. Forms of tender, etc., from Controller of Supplies, King Charles Street, London, S.W.1.

KEIGHLEY CORPORATION, September 10th.—Electrician's work in connection with the renovation of the registrar's house at the Cemetery. Specifications from the Borough Architect, Gas Offices, Cooke Lane, Keighley.

OLDHAM GUARDIANS, September 10th.—Electric lamps and fittings, for the Institution, Rochdale Road. Forms of tender, etc., from the Clerk, Union Offices, Oldham.

STOKE-ON-TRENT CORPORATION, September 10th.—Six months' supply of electric lamps. Specification and form of tender (No. 15) from the City Surveyor, Town Hall, Stoke-on-Trent.

DEWSBURY BOARD OF GUARDIANS, September 11th.—Electrical work at new casual wards at Staincliffe. Particulars from the architects, Messrs. W. Hanstock and Son, Branch Road, Batley.

MANCHESTER CORPORATION, September 11th.—Supply of (*a*) motors, and (*b*) controllers, for electric tramcars. Specifications, etc., from Corporation Tramways Department, 55, Piccadilly, Manchester.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of two water tube boilers having normal evaporative capacity of 260 lb. per sq. in. Specifications, etc., from City Electrical Engineer; deposit £2.

STOKE-ON-TRENT CORPORATION, September 12th.—Supply and erection of one secondary battery with storage capacity of 1 200 A, for a normal pressure of 100 V. Specifications, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

DUNDEE CORPORATION, September 14th.—Supply of 8 and 9 m.m arc lamp carbons, suitable for Angold magazine flame arc lamps. Specifications, etc., from the Manager and Engineer, Electricity Dept., Dundee.

DUNDEE CORPORATION, September 14th.—Supply of e.h.t. and l.t., paper insulated, lead covered and double-sheet tape armoured cable to B.E.S.A. specification for 6 600 and 600 V working pressure respectively. Specifications, etc., from the Manager and Engineer, Electricity Dept., Dundee.

BATH, CLUTTON, MIDSOMER NORTON AND RADSTOCK JOINT HOSPITAL COMMITTEE, September 17th.—Installing electric light at a new isolation hospital at Paulton, near Bristol. Particulars from the architect, Mr. A. J. Pictor, 14, Queen's Square, Bath.

CHARD CORPORATION, September 17th.—Motor and pump houses, electric motors and other works in connection with water scheme. Details from the engineer, Mr. Sydney R. Lowcock, 6, Queen Anne's Gate, London, S.W.1, or from the Town Clerk, until September 17th.

EDMONTON GUARDIANS, September 17th.—Six months' supply of electric lamps. Forms of tender, etc., from the clerk, Mr. E. Ridley, 77, Bridport Road, Edmonton, London, N.18. Stamped, addressed envelope to be sent.

BOOTLE CORPORATION, September 18th.—Electrician's work in connection with erection of 100 houses at Linacre Park. Specification, etc., from the Borough Engineer, Town Hall, Bootle; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 18th.—Renewal of battery plates at the National Physical Laboratory, Teddington. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

WEST RIDING EDUCATION COMMITTEE, September 18th.—Electric light installation at Rossington New Middle School. Specification, etc., from the Education Department, County Hall, Wakefield.

MERSEY RAILWAY CO., September 21st.—Supply of metallic and carbon filament lamps and fittings, etc. Tender form (No. 10) from the Manager and Secretary, Central Station, Birkenhead.

REMENHAM (BERKS) PAROCHIAL CHURCH COUNCIL, September 21st.—Electric lighting installation in the church and parish hall. Specifications from the Rector.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, September 28th.—Supply of electrical fittings. Forms of tender, etc., from the Clerk, 22, Lombard Street, West Bromwich.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

LEEDS CORPORATION, September 29th.—Supply and erection of three phase switchgear, for Kirkstall generating station. Specification, etc., from Mr. C. N. Hefford, Electricity Dept., 1, Whitehall Road, Leeds; deposit £2 2s.

METROPOLITAN ASYLUMS BOARD, October 3rd.—Installation of automatic telephones at Princess Mary's Hospital, Cliftonville, Margate (specification G); and wiring for outside supply of electricity at Colindale Hospital (specification H). Specifications, etc., from the Board's office, Victoria Embankment, London, E.C.4; deposit £1 for each.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

SOUTH INDIAN RAILWAY CO., LTD., September 7th.—Supply of electrical materials and fittings. Specification (fee 5s.), etc., from the company's offices, 91, Petty France, Westminster, London, S.W.1.

STATE ELECTRICITY WORKS, MONTEVIDEO, September 10th.—Supply of 338 000 metres of insulated conductors, for outdoor use (Hackethal type).

VICTORIAN ELECTRICITY COMMISSION, September 10th.—Supply of synchronous condenser and accessory plant. (Reference B.X. 4 545.)

LATVIAN POSTS AND TELEGRAPHS, September 11th.—Supply of galvanised iron and steel wire for telegraph cables. (Reference A.X. 6 779.)

NEW ZEALAND POSTS AND TELEGRAPHS, September 11th.—Supply of single conductor cable. (P. and T. 151/1 003.) (Reference B.X. 4 704.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 11th.—Supply of two 10 cwt. electric travelling indoor cranes. (Reference A.X. 6 545.)

RAND WATER BOARD, September 11th.—Supply of turbo-alternator, for Vaal River scheme (contract No. 310). (Reference B.X. 4 585.)

VOLKSRUST (S. AFRICA), MUNICIPALITY, September 11th.—Supply of switchgear, motors, meters, cables, etc. (Reference B.X. 4 599.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, September 12th.—One 60-ton electric overhead travelling crane, for Ultimo power station. Particulars from Chief Electrical Engineer, 61, Hunter Street, Sydney.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, September 12th.—Telephone cable (P. and T. 151/998). (Reference B.X. 4 672.)

VICTORIAN GOVERNMENT RAILWAYS, September 12th.—Supply of high speed circuit breakers and accessories. (Reference B.X. 4 542.)

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## LAMP SALES 1928/9

An attractive showcard by Metro-Vick Supplies, Ltd.

The cover of a new booklet by Philips Lamps Ltd.

Showing the various lamp material by the Edison Swan Electric Co., Ltd.

CAPE TOWN ELECTRICITY DEPARTMENT, September 14th.—Supply of a.c. meters. (Reference B.X. 4 648.)

WATERFORD CORPORATION, September 14th.—Supply of single-phase and three-phase house service and other meters. Specifications, etc., from Messrs. Macentee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 17th.—Supply and delivery of 4 500 metres of paper insulated, lead covered and steel tape armoured cable, together with junction and terminal boxes. (Reference B.X. 4 608.)

INDIA STORE DEPT., September 18th.—Supply of 187 miles D2 and D8 electric cable. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 19th.—Supply and delivery of 250 V lead covered conductors. (Reference B.X. 4 607.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 20th.—Supply and delivery of one electrically-driven heavy duty double face-plate wheel lathe for Germiston wagon repair shops. (Reference A.X. 6 660.*)

WATERFORD CORPORATION, September 21st.—Supply of materials required for consumers' overhead services; and erection of consumers' overhead services. Specifications, etc. from Messrs. Macentee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £3 3s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

ANTWERP PORT AUTHORITY, September 27th.—Supply and erection of 32 electric travelling cranes. (Reference A.X. 6 712.)

BRUSSELS MUNICIPALITY, September 27th.—Transformer plant, at central power station. Further details from the Hôtel de Ville, Brussels.

JOHANNESBURG MUNICIPALITY, September 27th.—Supply of 750 kW rotary converter, etc., (contract 35). (Reference B.X. 4 688).

JOHANNESBURG TOWN COUNCIL, September 27th.—Supply and delivery of 6 600 V switchgear. (Reference B.X. 4 668.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 27th.—Supply and delivery of arc welding sets. (Reference B.X. 4 647.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th.—Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

IRISH FREE STATE ELECTRICITY BOARD, October 1st.—Supply and erection of complete electrical equipment, including switchgear and three transformers, each 12 000 kVA (38 000/5 000 V), for Shannon transformer station at Fleet Street, Dublin. Specification, etc., from the Secretary to the Board, 60–62, Upper Mount Street, Dublin; deposit £5, returnable.

SALISBURY (RHODESIA) MUNICIPALITY, October 1st.—Supply and erection of h.t. transmission lines and transformers. (Reference B.X. 4 669.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st.—Supply of porcelain insulators. (Reference B.X. 4 643.)

TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—For the supply and delivery of 250 ornamental electric lamp standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date.)—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

ANGORA POSTS AND TELEGRAPHS, October 3rd.—Copper wire. (Reference A.X. 6 761.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

INDIA STORE DEPT., October 4th.—Supply of 245 electric ceiling fans. Form of tender (5s.) from Director General, Belvedere Road, London, S.E.1.

ROYAL SCHOOL OF ENGINEERING, GIZA, EGYPT, October 4th.—Electrical plant, etc. (Reference B.X. 4 703.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, October 4th.—Supply of telegraph line material. (Reference B.X. 4 655.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, October 4th.—Supply of copper wire and lead covered cable. (Reference B.X. 4 657.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

ARGENTINE DEPARTMENT OF NAVIGATION AND PORTS, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 694.*)

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, October 5th.—Supply of lead fuse wire, silver fuse wire, copper wire for bell installation, insulating tape, porcelain counterweights, quick-break lever switches (single pole, double pole and triple pole), tumbler switches (single pole), switches (single pole and double pole), rotary combination switches for staircases (3-way and 4-way), rotary switches for indoor use (single pole and double pole), switches (double pole) for flush mounting, rotary combination switches (3-way) for flush mounting, rotary switches (single pole) for flush mounting, normal Edison screw lampholders, without key switch,

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enamelled lampshades, porcelains for sockets and plugs for double pole fittings, insulating compound, transformers for bell installations, hard vulcanised rubber tubing, cast-iron cable boxes, glass globes for arc lamps, etc.

ANGORA POSTS AND TELEGRAPHS, October 6th.—Bronze wire and sleeves. (Reference A.X. 6 754.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, October 10th.—Ironclad switchgear for Sefton sub-station. Specification (2s. 6d.) from Chief Electrical Engineer.

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 11th.—Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 15th.—Electricians' pliers, wire drawing machines, etc. (Reference B.X. 4 702.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639).

STATE ELECTRICITY WORKS, MONTEVIDEO, October 17th.—Automatic voltage regulator. (Reference B.X. 4 699.)

RANGOON MUNICIPALITY, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on close circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

POSTMASTER-GENERAL'S DEPT., MELBOURNE, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-stations. (Reference B.X. 4 622.)

MELBOURNE CITY COUNCIL, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944.) (Reference B.X. 4 698.)

POSTMASTER-GENERAL'S DEPT., MELBOURNE, October 27th.—Supply of loading coil pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353.) (Reference B.X. 4 638.)

## Tenders Accepted.

TODMORDEN GUARDIANS.—Smith Bros., electric bell installation in casual wards, £25.

CRANBROOK GUARDIANS.—Powell, Ltd., laying electric cable to laundry and casual wards.

POST OFFICE STORES DEPARTMENT.—Metro-Vick Supplies, Ltd., part contract for Cosmos gasfilled and vacuum tungsten lamps for 12 months.

GLASGOW CORPORATION.—Darroch and Espie, electric light installation in 852 houses comprised in Knightswood housing scheme, No. 4 area, £3 883.

MERSTHAM PARISH COUNCIL.—County of London Electric Supply Co., Ltd., conversion of existing street gas lamps to electricity, and supply of electricity, £1 17s. per lamp per annum, subject to three years' agreement.

SCUNTHORPE AND FRODINGHAM URBAN DISTRICT COUNCIL.—Standard Telephones and Cables, Ltd., 3 400 yards 1·25 sq. in. three core cable, 11s. 6d. per yard. Metropolitan-Vickers Electrical Co., Ltd., isolating links for cable, £51 16s.

SOUTHEND CORPORATION.—General Electric Co., Ltd., 1 000 kW rotary converter, £3 059 12s., and automatic switch gear, £3 225, for Leigh sub-station, and 750 kW rotary converter, £2 419 6s.; and automatic switchgear, £3 145, for Thorpe Bay sub-station.

ALDERSHOT CORPORATION.—Callender's Cable and Construction Co., Ltd., 750 yards e.h.t. cable, £391; 1 400 yards l.t. cable, £692 12s.; 4 000 yards e.h.t. cable for housing scheme, etc., 10s. 5½d. per yard; 3 000 yards l.t. cable for general extension of l.t. distributors, 9s. 11½d. per yard.

# WORK IN PROSPECT.

ALTRINCHAM.—School extensions, for Cheshire Education Committee, to cost £2 499. Particulars from contractors, Gladden and Davies, Ltd., Manchester.

ASHFORD.—Additional housing scheme, for the Urban Council. Particulars from Surveyor.—Council chamber and offices, for the Urban Council. Particulars from architect, Mr. E. A. Jackson.

BATH.—Rehousing scheme (250 flats), for the Town Council. Particulars from Borough Surveyor.

BEBINGTON AND BROMBOROUGH.—Houses (90), for the Urban Council. Particulars from contractors, Hughes, Ltd.—Additional 110 houses for the Urban Council. Particulars from Surveyor.

*ONE of the new showcards issued by the General Electric Co., Ltd., in connection with the "Simplified Line" campaign, details of which will be found on page 264. Various other lamp publicity material published by lamp manufacturers is shown elsewhere in this issue.*

BLACKBURN.—Additional 60 houses, Intack, for the Town Council. Particulars from Borough Surveyor.—School, Audley, to cost £36 572, for the Borough Education Committee. Particulars from Director of Education.

BIRKENHEAD.—Houses (208), for the Town Council. Particulars from contractors, Lloyd, Cross, Ltd.

BIRKENHEAD.—Four schools (3 400 places), for the Borough Education Committee. Particulars from clerk, Mr. E. W. Tame.

BRIDGWATER (SOMERSET).—Additional 100 houses, Victoria Road estate, for the Town Council. Particulars from Borough Surveyor.

BRISLINGTON.—Houses, for Keynsham Rural Council. Particulars from contractor, Mr. A. W. Norris, Eastville.

CANNOCK.—Mining College to cost £15 230, for Staffs Education Committee. Particulars from contractors, Green and Bird, West Hill, Hednesford.

CLITHEROE.—Two schools, for the Borough Education Committee. Particulars from director of education.

COLCHESTER.—Theatre. Particulars from architect, Mr. John Fairweather.

CREWKERNE.—Housing scheme (12), for the Urban Council. Particulars from surveyor, Mr. R. W. Herring.

DUMFRIES.—Additional 72 houses, for the Town Council. Particulars from burgh surveyor.—Showrooms, offices, garage, etc., Annan Road, for E. M. Beattie and Co.

FOLKESTONE.—Parish hall, St. Peter's Parish. Particulars from Vicar.

HALESOWEN.—Houses (62), for the Urban Council. Particulars from contractors, J. Harper and Sons, Blackheath, Birmingham.

HALIFAX.—Housing scheme (94), for the Town Council. Particulars from Borough Engineer, Crossley Street.

HALIFAX.—Operating theatre, to cost £15 000, for the Guardians. Particulars from architect, Mr. Williams, Birkenhead.

HASTINGS.—Reconstruction of White Rock Baths, to cost £100 000, for the Town Council. Particulars from Borough Engineer, Mr. S. Little.

HUNTINGDON.—Housing scheme (12), for the Town Council. Particulars from Borough Surveyor, Mr. E. J. Saunders.

KENDAL.—Extensions to Commercial Hotel, for Mr. W. Simpson. Particulars from architect, Mr. John Hutton.—Extensions, County Hospital. Particulars from architects, J. F. Curwen and Son, Highgate.

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# ELECTRICITY SUPPLY.

## Wayleaves and Royalties on Current—Proposed Extensions at Halifax—Salford's Further Improved Position—Willesden U.D.C. and the North Metropolitan E.P.S. Co.—Mains to be Extended to West Malling.

CONGLETON is to apply for a Special Order to supply electricity in the borough and in the urban district of Buglawton.

Sanction has been received by Watford T.C. to a loan of £700 for mains extensions, in connection with the extension to Bourne End.

Shoeburyness U.D.C. is applying for a loan for wiring work in connection with the electricity scheme, and will make a canvass of the district.

The manager of the Cornwall Electric Power Co. has expressed the hope that the town of Helston will be lighted electrically before Christmas.

Dalbeattie T.C. has decided to revert to electricity for street lighting, and the work is to be carried out by the Dalbeattie Electric Light and Power Co.

An inquiry is to be held at Chipping Norton by the Electricity Commissioners, following applications for powers by the Wessex Co. and Messrs. Cecil Cooper and Co.

Potterne P.C. has agreed to the supply of electric light in the village by the West Wilts Electric Light and Power Co., but the proposals are first to be submitted to a parish meeting.

Maidstone T.C. proposes to extend the supply of electricity to West Malling, from the mains at the Malling research station and the refrigerating station, at an estimated cost of £9 000.

The Northern Government has again refused to sanction the loan applied for by the Coleraine (County Derry) Urban Council for carrying out an electric lighting scheme for the township.

Morecambe Electricity Committee has asked the Lighting Committee to meet representatives of Lancaster Corporation in order to reconsider the terms and conditions for the supply of electricity.

Halifax Tramways and Electricity Committee has decided again to ask the Council to consider an application to borrow £159 028 for electricity works extension. A similar proposal was recently referred back.

Warwickshire County Council has given consent to the proposal of the Birmingham Tame and Rea Drainage Board to lay two underground electric cables across the Tyburn-Curdworth main road at Kingsbury.

The Haslemere U.D.C. has decided to raise no objection to the draft Provisional Order for the transfer of the Hindhead and District Electric Lighting undertaking to the Aldershot Gas, Water and District Lighting Company.

The scheme for the electrification of the Wirral Peninsula is being rapidly developed, and the next stage will be the erection of an overhead transmission line from the Prenton sub-station across the Peninsula to join up with the line at Heswall. This part of the Wirral R.D.C.'s scheme, and the work of laying the mains, etc., is being executed by Birkenhead Electricity Committee.

Boston and District Electricity Supply Co. has informed the Spilsby R.D.C. that it is applying for an Order to supply electricity in an area including Skegness, Burgh, Croft, Friskney, Ingoldmells, Wainfleet All Saints and St. Mary, and a portion of the parish of Addlethorpe. The Council has invited representatives of the villages concerned to meet the electricity committee and the manager of the company to go fully into the matter.

Morecambe Works Sub-Committee has interviewed applicants with respect to a supply of electricity to their buildings on the White Lund Estate, and the borough electrical engineer estimates the cost of the scheme at £950. The T.C. has approved the project.—Application is to be made to the Electricity Commissioners for consent to the supply by the Corporation of electricity in the rural district of Heaton with Oxcliffe.

At last week's meeting of Evesham T.C. it was reported that the General Purposes Committee had discussed the charges which were being made for electricity by the Shropshire, Worcestershire and Staffordshire Electric Power Co. It was thought that, considering the number of users in the town, the company was charging too much. Correspondence had taken place with the power company, but so far without satisfactory result.

Willesden Electricity Committee reports an increase of 16 per cent. in the quantity of electricity purchased from the Power Co. during the June quarter, 1928, over the corresponding period of 1927, with an appreciable decrease in the total cost, following the operation of the new bulk supply agreement.

The Lighting Committee of Preesall U.D.C. has discussed the question of the apportionment of the charges to be made in connection with an overhead supply of electricity in Springfield Road, and other extensions of mains, and has decided to give a supply provided consumers on the proposed new mains guarantee the amount of the sinking fund and interest charges.

Chelmsford Corporation has received a letter from the Electric Supply Corporation, Ltd., stating that the company can see no prospect of reducing the rate charged for power until some arrangement is arrived at in regard to making further provision for its requirements in the way of a bulk supply or additional plant. The company is to be informed that the Council is still dissatisfied with the charges for power, and is to be asked again to make a further reduction for this purpose.

During the past year, there has been an increase of 9·5 per cent. in the revenue of Salford electricity department, the total being £318 823. Net profit was £55 663 of which £21 713 is being placed to reserve, £18 950 devoted to capital expenditure charged to revenue, and £15 000 applied in relief of rates. The sales amount to the record figure of 60 696 636 kWh. The number sold under the all-in domestic rate increased by 40 per cent. All round reductions of charges have been adopted.

The Law Committee of Willesden U.D.C. recommends that proceedings be commenced in the Chancery Division against the North Metropolitan Electric Power Supply Co. for an injunction to restrain them from emitting or discharging smoke, dust, grit, gritty particles of ashes from the chimney stacks at their power station in Taylor's Lane, in the urban district of Willesden, so as to be a nuisance to the annoyance or injury of the public, and for further or other relief and costs. The Council has adopted the recommendation.

The Committee appointed by the conference of local authorities in the County of Middlesex convened by the Middlesex District Council's Association, has passed a resolution that on the assumption that all the local authorities in Middlesex are prepared to transfer to the London and Home Counties J.E.A. their right of purchase of the electricity undertakings within their respective areas, the J.E.A. be asked to submit a statement of all the points in their proposed scheme, and the extent of the control to be exercised over the Joint Boards with regard to prices, capital expenditure, etc.

The Callington Electric Lighting Co., which has carried out the lighting of Callington for the two past seasons, recently submitted a tender of £110 for 51 lights for the coming season, while the Callington Gas Co. tendered at £90 for 40 lights. Subsequently the companies were each asked to tender for 26 lights. A meeting of ratepayers was held last week to protest against this action by the U.D.C. Mr. A. Richards, chairman of the Lighting Committee of the Council, said the tenders last year were the same as this year, when the voting for electric light was nine to one. A resolution was passed asking the Council to consult the ratepayers before deciding to discontinue lighting by electricity. The Council has since decided that the town be lighted electrically during the coming winter.

At a Ministry of Transport inquiry, held by Mr. F. Gordon Tucker last week into an application by the Leicestershire and Warwickshire Electric Power Co. for compulsory wayleaves over land held by Mr. W. Ramsey, near Markfield, Mr. Ramsey submitted that, as royalties were paid to private owners for the passage of coal over their land, he was entitled to a royalty for the passage of electric current over his land. The Inspector said he was afraid the Ministry would not be able to do that. They would have to get the law of the land altered; and he was afraid the electricity industry would never consent to saddle the whole thing with royalties to that extent. He had taken a note of the point. It was an interesting one, but he had conducted inquiries from Cornwall to Northumberland, and had never heard it suggested before.

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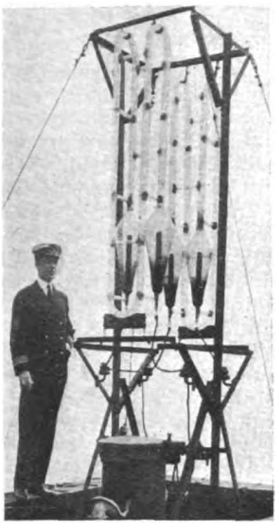
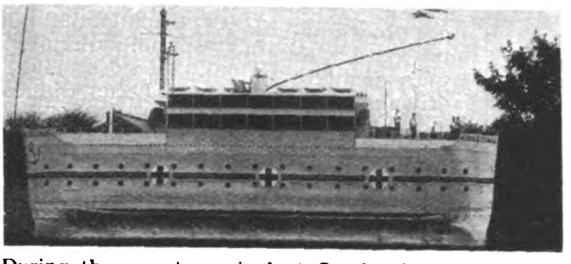
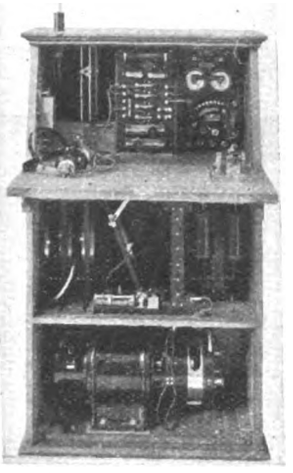
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.



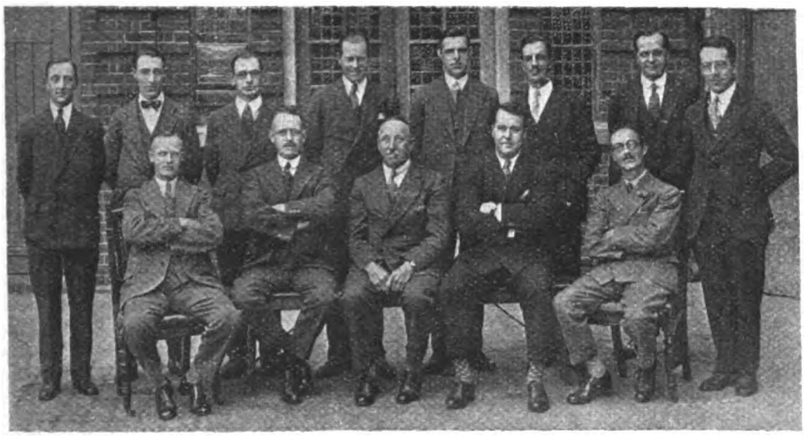
The Commander Byrd aerial beacon, a flashing Neon light situated on the roof of the Biltmore Hotel, New York, to serve as a guide to airmen. In the photograph Commander Byrd is seen about to press the switch which brought the flasher into circuit.



During the recent carnival at Southend-on-Sea, one of the Corporation tramcars was decorated to represent a hospital ship. The "vessel" was dressed with electric lights along its gunwale, water line and hospital mark, making at night a really spectacular display.

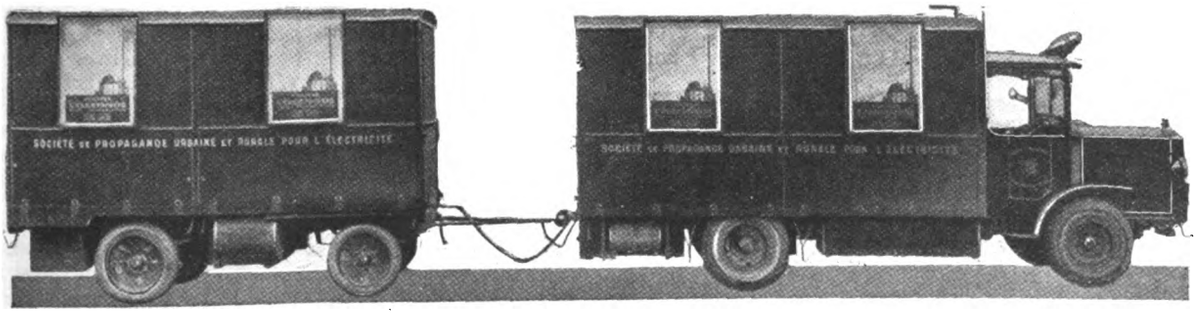


A wireless transmitting and receiving equipment was shipped from London early this week to Pitcairn Island, probably the world's loneliest island settlement. The installation is being presented to the inhabitants by the Marconi International Marine Communication Co., Ltd.



A group of some of the staff taken at the offices of A. H. Hunt, Ltd., including the directors and managers, together with nine of the company's representatives. The photograph was taken on the occasion of the last general representative meeting.

Sir Hugo Hirst and Sir Granville Ryrie, Australian High Commissioner (left), on the platform before Sir Hugo's departure on Thursday, August 30th. See page 261.



A Latil tractor and trailer which are employed by the Société de Propagande Urbaine et Rurale pour l'Electricité, for educating French outlying districts into the use of electric domestic appliances. The bodies of both vehicles are provided with hinged sides which open out so as to form awnings and counters for the display of electrical goods. When arranged for display the two vehicles are joined by a wooden platform and a central corridor is thus formed from front to rear. Apart from the usual domestic appliances, electrically-driven chaff cutters, oat crushers, grindstones, circular saws, and similar equipment are also carried. Current is provided by a 200 V dynamo driven by the tractor engine. [Photo: "The Commercial Motor."]

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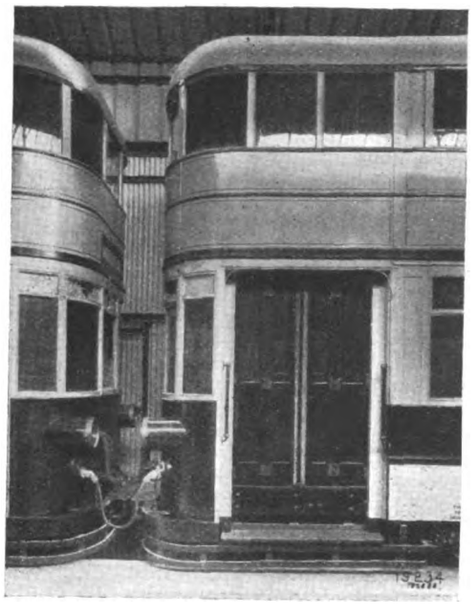
# ELECTRIC TRACTION.

## Electrification of Swansea and Mumbles Railway Nearing Completion.

IT is understood that electrical working of the Swansea and Mumbles Railway will come into operation some time this month, and we give below brief details of some of the electrical equipment as supplied by the British Thomson-Houston Co., Ltd.



Coupling arrangements on two coaches of an electric train on the Swansea and Mumbles Railway.

The new rolling stock at the outset comprises eleven double-deck top covered coaches of the bogie type, each coach being fitted with two-motor driving equipments and air braking equipment. The traction motors are each of 60 H.P. on 600 V, and are of the box frame, interpole, fully ventilated, roller bearing type. The control is of the electro-magnetic contactor type, only small control currents being dealt with by the master controller, the heavy motor currents being broken on individual contactors. Each coach is arranged for operation singly; or, alternatively, two coaches may be coupled for operation as a two-coach train, each coach being provided with double end control.

On account of the somewhat unusual physical features of the route, which has the sea on one side and the highway on the other throughout its length, the control has been so arranged that the master controller is located on the same side of the coach at each end, also the entrance and exit are on the same side of the coach, there being no doors on the opposite side. The coaches were supplied by the Brush Electrical Engineering Co., Ltd., Loughborough, all the motive power equipment and the whole of the air brake system being by the British Thomson-Houston Co., Ltd. The latter is of the straight type with emergency feature, and arrangements are provided for coupling the air system between coaches. Dead man features are provided in the handles of the master controllers, to ensure that power is cut off and brakes are applied in the event of the driver becoming incapacitated, and overloads are taken care of by a relay which opens the line contactors, which can only be reclosed when the master controller is returned to the "off" position. The control is arranged for bridge transition; and as there is no 'bus line running through the train, each coach picks up its own motor current through its own pantograph collector, but the control current for the train is taken from the leading pantograph only.

Sheffield Tramways Committee has obtained authority to borrow £185 065 for the provision of new tramcars, and £148 705 for the construction and equipment of new tramways. —The Corporation have obtained further powers regarding the removal of obstructions on tramway tracks, for the prevention of trespass on tramways laid as separate tracks.

The reconstruction of the Charing Cross tube railway station is expected to be completed by January next. The station is now used by about 90 000 passengers a day, and after the completion of the reconstruction it will be capable of dealing with 50 000 000 a year. Two new escalators have been put into service at this station for the Hampstead tube, and two others are being constructed for connecting the intermediate circulating area, below the District Railway, with the street. The passimeter system is to supersede the present booking offices.—A further 200 ticket issuing machines are to be installed at London tube railway stations.

# WIRELESS NOTES.

## Alteration of Wavelengths of Relay Stations—Television and the Trade.

THE British Broadcasting Corporation announces that during November and December, ten relay stations will take over the national exclusive frequency of 1 040 kilocycles (288·5 metres), replacing the international common frequencies which they have been sharing with stations abroad. The process will be a gradual one, and the few programme changes involved will take effect on November 1st. Heterodyne interference, it is stated, has become so serious on the international common frequencies that the service areas of relay stations have shrunk during the hours of darkness. Pending the introduction of the regional scheme, rather than withdraw the relay stations, an attempt will be made to revive their usefulness by the expedient of single wavelength working. It is anticipated that this will considerably improve conditions of reception, particularly in the areas of Liverpool, Stoke-on-Trent, Bradford, Hull, Sheffield, Swansea, Plymouth, and Dundee. Leeds will continue on its present frequency of 1 080 kilocycles. The exclusive frequency of Bournemouth, 920 kilocycles, will be transferred to Aberdeen. The transmitter at Bournemouth, however, will continue its service on the national frequency. It is anticipated that this arrangement will provide adequate service for Bournemouth itself, while the surrounding district will normally get its programmes from Daventry 5XX. The disadvantages of the changes will be found in some reduction of the proporation of local programme material at relay stations. During the main evening period of transmission, all ten relay stations will be bound to radiate the same programme. Experience proves that after nightfall stations on the same frequency, even a considerable distance apart, radiating different programmes, seriously interfere with each other's service. This disadvantage is partly offset by the probability that in the daytime, when interference is less acute, "group" transmissions will be satisfactory. "Group" programmes are programmes originating within the region concerned. While they will be composed mainly of material from the regional centres, Manchester, Glasgow, and Cardiff, it is hoped to retain and incorporate the best and most characteristic items of established local features. Nottingham will take its place beside Birmingham in the service area 5XX and 5GB, and the transmitter at Nottingham will give way to the more efficient and uninterrupted transmitters at Daventry.

### Television and the Wireless Industry.

According to "The Wireless Trader" it is the intention of the Baird Television Development Co., Ltd., to co-operate, as far as possible, with the wireless industry with respect to the sales of television equipment, and to grant licences to *bona fide* manufacturers of wireless apparatus who may be desirous of adding television to their existing activities. The actual terms of the licence, states our contemporary, have not yet been decided, but the royalties are expected to be moderate.

In order that it may satisfy its readers and the trade in general that television is as yet sufficiently attractive from the trade point of view, "The Wireless Trader" proposes to ask Mr. Baird to give a demonstration of his system under conditions comparable with those obtaining when the apparatus is handled by the public. As witnesses to the demonstration it is proposed to invite two or three well-known scientists, who will pass opinions upon the merits or otherwise of the demonstration.

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The 100 W fixed wavelength telephone set, type XMB1, the single and multi-way directional receiver and types T.2, T.1, and T.A.1, are described and illustrated in three new publications by Marconi's Wireless Telegraphic Co., Ltd., the reference being leaflets 1 077 and 1 082, and pamphlet No. 241, respectively.

C. E. A. G., Ltd., have issued a special book entitled "Notes on the Construction, Operation and Maintenance of Miner's Electric Safety Lamps." Besides giving details of the construction, etc., of the company's make of miners' lamps, there is also included a little of the history of the electric lamp, and a few technical points of interest. The purpose of the book is among other things, to inspire the interest of the lamp man and miners in general. It is written in non-technical language with full descriptions and illustrations.

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# BERMONDSEY TELEPHONES.

## Details of New Automatic Exchange in the London Telephone Area.

THE opening of a new automatic exchange at Bermondsey marks a further important step in the conversion of the London telephone area consisting of over 100 exchanges to automatic working. The exchange has an initial capacity of 2 600 lines, and will considerably relieve the heavily loaded manually-operated exchanges serving the district. The equipment has been supplied and installed by Standard Telephones and Cables, Ltd., in accordance with specifications prepared by the General Post Office. It is typical of the step-by-step register translator system adopted by the G.P.O. for London, and is similar to that which was put into operation recently at Sloane exchange. A subscriber at Bermondsey can now obtain any subscriber on any exchange within ten miles of Oxford Circus without speaking to an operator. A call from Bermondsey to another automatic exchange in the London area, such as Sloane, is now put through without the assistance of any operator, even though there is no direct line between Sloane and Bermondsey and the call has consequently to pass through an intermediate exchange. The chief agent in this process, the register translator, translates the first three letters of the exchange name (SLO) into the code necessary for sending the call through the various stages to the wanted exchange. It then registers the four digits of the subscriber's number so that when it has directed the call as far as the wanted exchange, it can guide it further to the particular line required. Having seen the call to its destination it frees itself from the line and is ready to pilot another call through. If the wanted subscriber is at Bermondsey, the process is the same, but takes place entirely in the one building. In a call from Bermondsey to a manually-operated exchange, the process appears just the same to the calling subscriber, but in this case the register translator directs the call to an operator at the distant exchange. The required number appears as a group of illuminated figures on a screen in front of this operator, and she completes the call without speaking on the line. Although automatic, Bermondsey has 18 operator's positions, 5 of these are required to deal with calls incoming from manual exchanges with direct lines to Bermondsey. The operator at the manual exchange gives the order to one of these special " cordless B " operators who, by means of a set of ten press button switches, directs the call through the automatic apparatus to the required subscriber. Other operators are required to deal with calls from coin boxes, to give assistance to subscribers in trouble, to offer trunk calls to subscribers already engaged on another call, and for other special work. Like other automatic exchanges in London, Bermondsey is equipped with " routiners " which periodically apply tests automatically to the important switches in the exchange and give warning to the maintenance staff if any switch is not functioning correctly.

## TRADE PUBLICATIONS.

GIRLINGS, Ltd., have issued a new booklet dealing with their electric fires.

Wright and Weaire, Ltd., have published two new leaflets concerning their components.

The A.D.C. multi-operator welding dynamo is fully described in list ADC/1, by Mawdesley's, Ltd.

John Shaw and Sons, Wolverhampton, Ltd., have published a new price list of Trojan electric lamps.

The Liefa Company, Ltd., has published a folder illustrating and describing battery operated portable lamps.

Describing the range of Sadia automatic electric water heaters, list H.S. has been issued by Sadia, Ltd.

We have received from Drake and Gorham, Ltd., list No. 100 which describes the " Metesco " e.h.t. oil switch-fuse.

A new leaflet dealing with a d.c. mains unit, has been sent to us by Philips Lamps, Ltd. The reference is No. 109.

A new catalogue of Fluvent, Aeroflex type, electrical switchgear has been published by Parmiter, Hope and Sugden, Ltd.

Bulletin No. 130, dealing with " Falcon " specialities for electrical heating has been received from H. O. Swoboda, Inc.

Prescot electric resistance welders (spot welder section) are the subject of a new publication by British Insulated Cables, Ltd., having a reference P. 235.

The Cambridge Instrument Co., Ltd., has published a special brochure containing illustrations of a number of interesting installations of Cambridge instruments on heating and ventilating plants in public and private buildings.

# COMPANY NEWS.

## Electrical Descriptions of all Classes Mainly Dull.

A CONTINUED quiet market for electrical shares—supply, transport, and equipment—has provided few outstanding features in a comparison of price changes. Ever Ready shares are very near 30s., with a rise of 3s., and both Brush and Metropolitan-Vickers ordinaries show small advances, while General Electrics have re-acted to a slight extent only. County of London Supply shares are 1s. 6d. up. Marconi's Wireless Telegraph ordinary have risen 3s. 9d., and Eastern Telegraph Stock is again up to 250. The market otherwise may be said to be generally quiet.

| Last Annl. Divd. | Description | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/-* | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½* | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/-* | 23/6 | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 40/6 | 39/- | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/6* | 27/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48 1½ | 48/9 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 25 7½ | 25 7½ | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10¾ | 10¾ | 10½ | 6/13/6 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 33/- | 33/- | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 36/- | 36/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 126 | 126 | 120½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72½ | 72½ | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79¼ | 79¼ | 102¾ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. .. | 80 | 80 | 98¾ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 66½ | 66½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 66½ | 66½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79½ | 79½ | 66½ | 12¾ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73¾ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/- | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½* | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 85/- | 85/- | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109¾ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/1½ | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 20/3 | 20/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 17/6 | 17/6 | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 20/- | 20/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 29/9 | 26/9 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 41/6 | 42/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 110/- | 110/- | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 33/9 | 33/1½ | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 28/9 | 28/9 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3¾ | Anglo-Am. Tele. Ord. Stk. .. | 62½ | 62½ | 68½ | 40 |
| 4 | Commercial Cable 4% Deb. .. | 77½ | 79½ | 77¾ | 60 |
| 10 | Eastern Ord. Stk. .. .. .. | 250 | 245 | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 69½ | 69½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25 | 24½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 46½ | 46½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 70/- | 66/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 50/6 | 51/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24½ | 24½ | 23 | 11/3/6 |

(*a*) 1s. 7 ⅞d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d.

* Ex-dividend. ‡ Including 1s. bonus.

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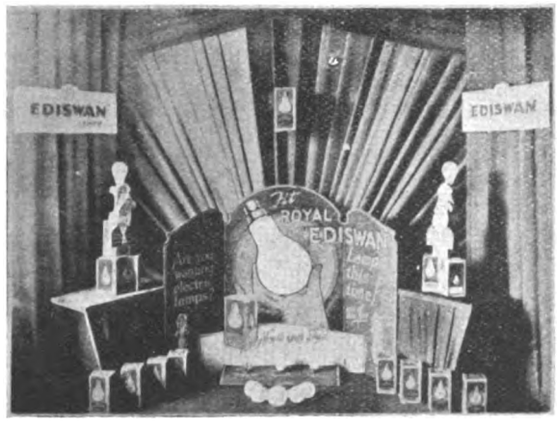
## Reports and Dividends.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD. Quarterly div. of 1½ p.c. on cum. pref. shs. will be payable on October 1st.

CLARKE, CHAPMAN AND CO., LTD.—Interim div. of 3 p.c., less tax, on ord. shs. (against 2 p.c. last year) will be payable on September 12th.

ENGLISH ELECTRIC CO., LTD.—The directors announce that they are unable to recommend payment of an intm. div. on the 6 p.c. pref. shs.




*AN attractive window display composed of the advertising and publicity material issued by the Edison Swan Electric Co., Ltd., in connection with the lamp campaign launched by the company. Details of this and other firms' activities will be found on pages 264 and 265.*

POWER INVESTMENT CORPORATION, LTD.—The pref. stk. register will be closed from Sept. 22 to Sept. 29, inclusive, in order to prepare for the paying of divs.

RANGOON ELECTRIC TRAMWAYS AND SUPPLY CO., LTD.—Interim div. of 8 annas p. sh., free of Indian tax (same rate as last year), will be payable on October 31st.

YORKSHIRE ELECTRIC POWER CO., LTD.—An instalment of 5s. p. sh., making 19s. p. sh. called up, will be payable on September 10th on the 897 000 ord. shares issued in February, 1928.

CANADIAN GENERAL ELECTRIC CO.—Quarterly div. of 1¾ p.c. for three months ending September 30th on pref. stock will be payable on October 1st. Last div. on common stock was for 1924.

SOCIEDAD ANONIMA CAMPANIA DE TRAMWAYS ELECTRICOS DEL SUD.—Profit for past year $48 702, plus $190 719 brought in. Miscellaneous appropriations amount to $30 515. Balance $208 906. Div. of 3 p.c. required $118 978, and renewals fund $40 000. Forward $49 927.

GENERAL ELECTRIC CO., LTD.—The co. is callg. an extraordinary gen. mtg. with the purpose of altering the articles of association. It is proposed that in future only British hldrs. shld. be entitled to vote, so that no danger may arise of the control of the co. passg. out of the hands of British shldrs. residg. within the Empire.

QUEBEC RAILWAY, LIGHT, HEAT AND POWER CO., LTD.—Notice is given that the co. will redeem all its outstandg. 5 p.c. con. gold bds. (which would, accordg. to their terms, mature and become payable on Dec. 1, 1939) on Dec. 1, 1928, at 105 p.c., with secured interest to Dec. 1, 1928, at the offices of the Montreal Trust Co., Montreal, or the Bank of Scotland, London.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—A progress statemt. has been issued showg. that the gross rev. for 1927 was £930 291, compared with £779 790 for 1926, and the div. on ord. shs. was 12 p.c., plus cash bonus of 4d. p. sh., compared with 12 p.c., plus bonus, in fully paid ord. shs. Houses connected at Dec. 31, 1927, were 24 985, agst. 22 200 at end of 1926; and electricity sold during 1927 was 129 090 227 kWh, agst. 108 895 477. Sales for six mos. to June 30, 1928, were 69 499 876 kWh, agst. 61 761 340 in 1927.

ATIBIBI POWER AND PAPER CO., LTD.—A meeting of the holders of 1st mtge. 6 p.c. serial gold bonds issued and outstanding under the deed of trust and mtge. between the Co. and the Royal Trust Co. dated February 18th, 1914, will be held at the office of the latter co., 105, St. James Street, Montreal, on October 1st to consider a resolution to sanction a modification of the rights of the bdhldrs. It is proposed to authorise the Co. to redeem on November 1st, 1928, all outstanding 1st mtge. 6 p.c. serial gold bonds of the Co., at prices varying from 100½ p.c. to 107½ p.c., according to the respective serial maturities, with accrued interest. Form of proxy and voting certificate from the Bank of Montreal, 47, Threadneedle Street, London, E.C.

## New Companies.

EDGAR OATES, LTD.—Cap., £1 000. To acquire business of electrician, etc., carried on by Edgar Oates at 19, Lees Road, Oldham.

H. CONSTANTINE AND SON, LTD.—Cap., £250. Dealers in electrical fittings and appliances, etc. Reg. office: 19, Barton Avenue, Blackpool.

CAVENDISH TRADING CO., LTD.—Cap., £1 000. Electricians, manufacturers of wireless, telegraphs or telephones, generators, accumulators and apparatus, etc. Reg. office: 5A, Palace Chambers, Bridge Street, London, S.W.1.

CLARMAC ENGINEERING CO., LTD.—Cap., £1 000. Manufacturers and repairers of switchboards, electrical apparatus, motors or machinery for light, heat, motive power or otherwise, etc. Reg. office: 108, Douglas Street, Glasgow, C.2.

JOHN LIGHTFOOT, LTD.—Cap., £10 000. To acquire business of electrical engineer now carried on by J. Lightfoot at 94, Oxford Road, Manchester, as "John Lightfoot," and to carry on business of electricians, electrical and mechanical engineers, etc.

BATTLE CREEK EQUIPMENT CO., LTD.—Cap., £4 000. Buyers, importers, exporters and manufacturers of and dealers in electrical, scientific and other apparatus, etc. Solicitors: William Sturges and Co., Caxton House, Westminster, London, S.W.1.

HYDRAULIC AND ELECTRICAL CO., LTD.—Cap., £12 500. To adopt agreements with T. L. R. Cooper and R. E. Smart, and to carry on business of mechanical engineers, manufacturers of motors, machinery, electrical and other tools and implements, etc. Reg. office: 40, Broadway, London, S.W.1.

ARMITAGE MANUFACTURING CO., LTD.—Cap., £200. To carry on the business of manufacturers of and dealers in radio receiving and transmitting sets, television sets, wireless accessories, components and parts; mechanical engineers, metal workers, etc. Reg. office: 9, St. Stephens House, Victoria Embankment, S.W.

NORTH SURREY ELECTRICAL FACTORS, LTD.—Cap., £600. Manufacturers, importers and exporters of, agents for, and dealers in electrical and mechanical machinery, apparatus, lamps, accessories and fittings, wireless apparatus and accessories, cables and wires, televisor apparatus, etc. Reg. by C. F. Turner, 23, Hunter Road, Thornton Heath.

FOWNES FORGE AND ENGINEERING CO. (1928), LTD.—Cap., £10 000. To acquire the leasehold premises known as The Cardiff Forge, in East Moors Road, Cardiff, to adopt an agreement between T. H. Major and L. Macarthy, and to carry on the business of electrical engineers, etc. Solicitors: Ingledew and Co., Milburn House, Newcastle-on-Tyne.

GASKELL AND GARRAWAY, LTD.—Cap., £1 000. To acquire business of electrical and refrigerating engineers now carried on by J. C. P. Madden Gaskell and A. Garraway as "Gaskell and Garraway" at Bridge Street, Taunton; and business of wireless engineer and dealer in wireless sets now carried on by J. C. P. Madden Gaskell at Bridge Street, Taunton. Reg. office: Bridge Street, Taunton.

JAMES WM. GLOVER AND SONS, LTD.—Cap., £6 000. To acquire as from April 25th, 1927, the business of James Wm. Glover and Sons, Ltd., and to carry on the business of makers and repairers of, agents for and dealers in agricultural implements, electrical engines, tractors, automobiles and other locomotive vehicles and their accessories, etc. Reg. Office: 6/8A, Coventry Road, Warwick.

MERSEY RADIO AND GRAMOPHONE CO., LTD.—Cap., £2 000. To adopt an agreement with H. A. Woodyer and W. P. Woodyer, and to carry on the business of manufacturers of and dealers in and repairers of, agents for the purchase and sale of and dealers in all kinds of instruments, apparatus, accessories, books, literature, and materials used in connection with radio or wireless telegraphy, telephony, or television. Reg. office: 19, Water Street, Liverpool.

BURNDEPT WIRELESS (1928), LTD.—Cap., £200 000. The objects are to acquire all or part of business of wireless instrument manufacturers carried on by Burndept Wireless, Ltd., at Blackheath, S.E., and elsewhere, and to manufacture, instal, etc., wireless, telegraphic and telephonic apparatus, valves, instruments, equipment and accessories, electrical, magnetic and radio-active instruments, etc., and to adopt agreements (1) with the said old company and its liquidator and (2) with Johnson and Phillips, Ltd. Directors: C. W. Rooke, C.A. (chairman), T. A. Barson, W. Horridge, W. H. Lynas (director of British Phototone), and A. F. H. S. Simpson. Solicitors: Herbert Smith and Co., 62, London Wall, London, E.C.2. (Public Co.)

### COMING EVENTS.

September 7th-22nd.—Machine Tool and Engineering Exhibition, London.

September 7th-12th.—British Association. The University, Glasgow.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts, they may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ASSOCIATED ELECTRIC PLANT CO., Amberley House, Norfolk Street, Strand, W.C., manufacturers. £10 11s. 4d. July 13th.

AUSTIN, Mr. R., 82, Harleston Road, Grantham, wireless dealer. £25. July 23rd.

BROADFIELD RADIO CO., LTD., New Hedges, Tenby, engineers. £20 17s. 8d. July 27th.

ELECTRICAL CONTRACTING CO., 7, Christmas Street, Bristol, electrical engineers. £22 14s. 3d. July 24th.

ELECTRICAL INSTALLATIONS AND SUPPLIES CO., Boot Hotel Buildings, Aberdare, engineers. £20 13s. 7d. August 1st.

ELECTRIFICATION, LTD., 137, Victoria Street, S.W., electrical engineers and contractors. £30 6s. 6d. July 25th.

FIFIELD, Frederick W., 2, Small Street, Bristol, electrical engineer and factor. £10 15s. 9d., July 25th; and £18 12s. 6d. July 25th.

GUDGEON, Robert (trading as GUDGEONS), 23, Colebrook Avenue, Southampton, electrical engineer. £36 10s. 6d. July 24th.

MALDEN ELECTRIC AND RADIO STORES, 155, Malden Road, Kentish Town, wireless agents. £11 1s. 6d. July 23rd.

NANTWICH ELECTRIC CO., Church Lane, Nantwich, electricians. £11 11s. 5d. July 24th.

ROCHDALE BATTERY SERVICE CO., 28, Baron Street, Rochdale, electricians. £20 7s. 3d. July 26th.

SENIOR, A., AND SON, Back North Terrace, Darlington, electrical engineers. £18 17s. 6d. August 1st.

SOUTHWOOD, Mr. T. S., Pound Farm, Whyke Road, Chichester. electrical contractor. £12 11s. July 28th.

STEPHENS BROS., 83, Stretford Road, Manchester, electrical engineers. £14 14s. 4d. July 27th.

STUBBS, Mr. A., 27, North Brook Place, Bradford, electrical dealer. £35 3s. 3d. July 27th.

WAKELIN, John, 50, Charing Cross, electrical expert. £25 16s. 6d. July 24th.

## Bill of Sale.

PENNINGTON, Albert, 147, Billinge Road, Wigan, electrical engineer. Dated August 18th, filed August 21st. £95.

## Receiverships.

CAMDEN ENGINEERING CO., LTD.—R. C. Sheen, of Caple House, 54/62, New Broad Street, E.C., was appointed receiver and manager on August 23rd, 1928, under powers contained in debenture dated December 21st, 1922.

NEW UNION ELECTRIC COMPANY, LTD. H. A. Leach, C.A., of Windsor House, Victoria Street, S.W.1, was appointed Receiver on August 27th, under powers contained in debenture dated January 4th, 1928.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BASTIAN METER CO., LTD.—This company, whose debenture holders last month appointed a receiver, was originally registered in the middle of 1897, as the Penny-in-the-Slot Electric Supply Syndicate, Ltd., the name being changed in 1899, in which year the Electric Lighting Extension Syndicate was absorbed. In 1925, the company took over the business of Bastian and Allen, electrical engineers, 58, Haymarket. The company's issued capital comprises 54 672 ordinary shares of 5s. each, and 3 000 preference shares of £1 each. At the beginning of 1926 the company's profit and loss account showed a debit balance of £4 029, and for the ensuing year there was a further loss of £1 274, making at the end of 1926 a total debit balance of £5 303.

RUDOLPH, CHARLES AND GOFF, LTD., High Road, Goodmayes, electrical dealers, etc. At the statutory meeting of the creditors in this voluntary winding up the liquidator, Mr. F. Hyde, of 34, London Wall, E.C.2, said that the company was formed in May, 1924, and at the outset turned its attention to the sale of electrical fittings and to building operations by way of purchasing land and erecting houses for subsequent sale. At a later date, the company opened a furniture and toy business at the Arcade, Goodmayes. On March 29th, 1924, the company issued a debenture for £400, in favour of a Mr. L. Randall, who had advanced that sum to the company to finance its building operations. During the last week in May of this year, the Sheriff was put in at the company's property by two execution creditors, and they were paid out by Mr. Randall, who then gave notice to the company and appointed Mr. Hyde as receiver, on June 5th last. The building operations which formed the company's main business was profitable, but the electric and estate agents business had been unprofitable. The net assets were about £500, to meet creditors' claims totalling approximately £2 450. It appeared that allowing a reasonable margin for costs, etc., the creditors would receive a dividend of about 3s. or 3s. 6d. in the £. After some discussion, the meeting broke up without any resolutions being passed, and, therefore, the voluntary liquidation of the company will be continued with the present liquidator.

## London Gazette, etc.

### Company Winding-up Voluntarily.

BERRY'S ELECTRIC, LTD. By special resolutions, August 14th, confirmed August 30th. C. F. Saffery, 14, Old Jewry Chambers, London, chartered accountant, appointed as liquidator, and empowered to divide any shares or other consideration received for the sale of the undertaking and assets of the company to Berry's Electric (1928), Ltd. Meeting of creditors at the liquidator's office, September 17th, at 3 p.m. (All creditors have been, or will be, paid in full.)

### Bankruptcy Information.

DAWSON, Joseph Edward, High Street, Boston, Lincoln, wireless engineer. First meeting, September 10th, 2 p.m., 4 and 6, West Street, Boston. Public examination, October 18th, 12 noon, Municipal Buildings, Boston.

ELLIOTT, William, and ELAND, Percy, 13, Cow Lane, Burnley, trading as "BURNLEY ARMATURE REPAIRS," electrical engineers. First meeting, September 8th, 11 a.m., Official Receiver's Office, District Bank Chambers, Blackburn. Public examination, October 9th, 11 a.m., County Court House, Bankhouse Street, Burnley.

PERKINS, Sydney, 1, Lodge Lane, Beeston, Leeds, wireless dealer. Receiving order, August 30th. Debtor's petition.

WELBERRY, Frederick John, The Beeches, Seathorn Estate, Skegness, electrician. Receiving order, August 29th. Debtor's petition.

### Partnerships Disolved.

BREGA'S RADIO SERVICE (Dante Charles BREGA and Alfred Jesse PRICE), wireless engineers, 305, King's Road, Chelsea, S.W.3, by mutual consent as from August 30th, 1928. Debts received and paid by D. C. Brega, who continues the business.

HILL UPTON AND CO. (William Tichborne UPTON and Henry James BUTTERFIELD) electrical engineers, George Street, Oxford, by mutual consent as from December 31st, 1927, so far as concerns W. T. Upton, who retires from the firm.

POOLE MARINE ENGINEERING WORKS (Malcolm Rippon Caird DALEY and Percy Norris TURNER), East Quay, Poole, Dorset, by mutual consent as from July 1st, 1928. Debts received and paid by M. R. C. Daley, who will continue the business under the old style.

## Bankruptcy Proceedings.

HURLES, Edward James Gordon, 8, Blackfriars Road, S.E.1, wireless dealer. A receiving order was made against this debtor on August 15th, and it appears from his statements in preliminary examination that, formerly a toy maker specialising in dolls' houses, in 1922 he commenced trading as a dealer in wireless valves from his private address, which business he continued until August, 1924, when, he states, a valve ring was formed. His business connection was subsequently lost because he was not given preferential terms, it being contended that he was not entitled to preferential terms as he was not trading from a business address. It was about twelve months before he was able to get into the valve ring. In August, 1925, he entered into a verbal agreement with another person to trade together in the name of INDUSTRIES, at 69, Blackfriars Road, S.E., for the purpose of selling R.I. transformers and T.C.C. condensers. Application was made to the B.R.V.M.A. to deal in valves under the name of "Industries," and in November, 1925, they were successful in their efforts and were permitted to trade. Subsequently he severed his connection with his partner, the latter continued to trade in accessories only and the debtor in valves, but they both continued to use the name "Industries." In 1927 he lent money to three persons, none of whom had repaid him, and this was the primary cause of his present position. In August, 1927, he was owing the B.R.V.M.A. clients about £1 420 and, as a consequence, he was removed from the ring. He made strenuous efforts to get back again, and it was not until December, 1927, that he was successful, when he had to have a new agreement with them accepting lower discounts and paying £100 per month in reduction of his previous debt. He then traded as the INDUSTRIES WIRELESS VALVE CO., but the business was not a success, and early in August of this year he was again removed from the ring. He was sued by the petitioning creditors (The Mullard Wireless Service Co., Ltd.) who obtained judgment against him in July last and immediately instituted the bankruptcy proceedings upon which the receiving order was made. He estimated his liabilities at £1 426, and he had no assets. His failure was attributed to lack of capital, keen competition, heavy overhead expenses, and bad debts. The estate was left in the hands of the Official Receiver.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed replies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### August 17th.

23 717 A. K. Croad. Therapeutical lamps.
23 700 A. C. Gunstone. X-ray apparatus.
23 716 B. H. Leeson, A. Reyrolle and Co., Ltd., and E. W. M. Scott. Electric protective arrangements.
23 727 Siemens Schuckertwerke Akt.-Ges. and E. Wille. Armoured cables.
23 728 Siemens Schuckertwerke Akt.-Ges. Electrical distribution installation. (20/8/27, Germany.)
23 736 Siemens Schuckertwerke Akt.-Ges. Lighting system for mines. (3/10/27, Germany.)
23 754 Siemens Schuckertwerke Akt.-Ges. Testing of high tension lines. (29/9/27, Germany.)
23 749 W. O. Simmons. Earthed electrical and general service board.
23 756 W. S. Veness. Light projectors.
23 755 Westinghouse Lamp Co. Electric discharge devices. (8/9/27, U.S.)

### August 18th.

23 801 J. W. Adamson and J. A. Morton. Electric contact breaker.
23 821 F. A. Andrews. Electric signs.
23 826 Chloride Electrical Storage Co., Ltd., and H. Dean. Electric battery testing appliances.
23 843 Siemens Schuckertwerke Akt.-Ges. Device for indicating line breaks. (10/9/27, Germany.)
23 842 Siemens and Halske Akt.-Ges. Audiometer. (1/9/27, Germany.)
23 795 C. W. I. Thomas. Picture transmission system.

### August 20th.

23 860 G. P. Achurch and Parker, Winder and Achurch, Ltd. Thermostatic controlling devices.
23 883 R. D. Ball and English Electric Co., Ltd. Alternating current machines.
23 934 British Thermostat Co., Ltd. and J. E. Sherlock. Regulating devices for refrigerating machines.
23 881 T. Brown. Device for joining flexible stranded wire.
23 913 A. Callsen and Siemens-Schuckertwerke A.G. Resonance relays.
23 893 L. Goldstein. Furniture for wireless receiving apparatus.
23 915 E. Hewitt. Means for wiring electrical instruments.
23 900 International General Electric Co., Inc. Sparking plugs. (30/8/27, Germany.)
23 918 S. Keller. Utilisation of magnetic power.
23 876 J. C. and W. A. Macfarlane. Rotary converters. (9/2/28.)
23 966 M. I. Pupin. Balancing electromagnetic wave conductors.
23 914 E. Quartier. Means for controlling electromagnetic device.
23 875 J. Smithies. Gauge for fixing electric switches, etc.
23 873 W. Stafford. Electric signs.
23 942 C. M. and S. Williamson. Apparatus for joining wires.

### August 21st.

24 067 Akt.-Ges. Brown, Boveri et Cie. Rotary magneto. (25/8/27, Germany.)
24 074 A. D. Arter and Pennant Manufacturing Co., Ltd. Device for preventing use of electric switches.
24 022 Associated Telephone and Telegraph Co. Telephone systems. (17/9/27, U.S.)
24 028 Ateliers de Constructions Electriques de Charleroi. Cooling enclosed electric machines. (10/11/27, Belgium.)
24 019 J. L. Baird and Television, Ltd. Television, etc.
24 027 British Electric Transformer Co., Ltd. and A. C. Whish. Switch mechanism for transformers.
24 064 Chloride Electrical Storage Co., Ltd. and W. S. Naylor. Accumulators.
24 005 P. A. Craven. Electric plugs or couplings.
24 044 C. M. Foucault and J. L. Matabon. Starting synchronous machines. (22/8/27, France.)
23 988 F. J. C. Jones. Wireless apparatus.
24 001 A. Lane. Cells for electrolytic reproduction of gases.
23 987 C. R. Matthews and S. S. Wrightson. Tramway rail chairs, etc.
24 046 Siemens-Schuckertwerke A.G. High power light projectors. (24/8/27, Germany.)
24 055 Siemens-Schuckertwerke A.G. Power plants. (28/9/27, Germany.)
23 997 A. Tradewell. Means for utilising water current energy.
23 996 A. H. Whiteley. Thermionic valve holders, etc.
24 075 Wireless Music, Ltd. and M. Trouton. Electromechanical vibrating devices for loud speakers.

### August 22nd.

24 191 Associated Telephone and Telegraph Co. Telephone systems. (27/8/27, U.S.)
24 157, 24 160, 24 166 Brandes, Ltd. and M. S. Hoban. Electromagnetic sound reproducing devices.
24 158 Brandes, Ltd. and M. S. Hoban. Electromagnetic systems.
24 159 Brandes, Ltd. Sound reproducing devices, etc.
24 162 British Thomson-Houston Co., Ltd. Circuit controllers. (24/8/27, U.S.)
24 110 J. Erskine, Falkirk Iron Co., Ltd. and H. J. Kennard. Imitation fires, etc.
24 125 L. Gaston. Mechanism for controlling lighting of vehicles. (8/11/27, U.S.)
24 184 J. Joseph. Electrical transformers.
24 197 E. Kelsen. Apparatus for electrically producing metal alloys. (24/8/27, Austria).
24 131 Loewe-Audion Ges. and B. Wienecke. Glass support for electron tubes. (22/8/27, Germany.)
24 172 Metropolitan-Vickers Electrical Co., Ltd. Dash-pots, etc.
24 190 N. V. Philips Gloeilampenfabrieken. Illuminating devices. (26/5/28, Holland.)
24 184 Radio Instruments, Ltd. and W. L. Shaw. Transformers.
24 111 L. E. Ryall. Thermionic amplifying devices.
24 115 Standard Telephones and Cables, Ltd. (G. Deakin). Metering arrangements for telephone systems.
24 146 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Methods of producing magnetic materials.

### August 23rd.

24 255 Allgemeine Elektricitats Ges. Base for electrically-heated hot water bottles. (23/8/27, Germany.)
24 334 Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline and S. R. Smith. Automatic switches for telephone systems, etc.
24 313 F. Conrad. Electric clocks. (17/3/27, U.S.)
24 208 A. Campbell. Apparatus for measurement of capacitance factor of electrical condensers, etc.
24 282 C. Chaffer and J. H. Dand. Magnetic compasses.
24 259 British Insulated Cables Ltd. and L. G. Lauder. Extrusion of metal, etc.
24 241 G. H. Crock. Operation of electric lamps.
24 253 F. Forrest and General Electric Co., Ltd. Electrical precipitation of dust from gases.
24 269 Hevi Duty Electric Co. Mounting for heating element. (22/5/28, U.S.)
24 209 W. P. Herst. Thermionic valve.
24 286 A. E. Isted and C. Lavington. Mouthpieces for telephones, etc.
24 333 K. D. P., Ltd. Insulating material. (23/8/27, Germany.)
24 204 J. Neale. Picture transmission.
24 219 R. Nettl. Electric ceiling roses, etc.
24 265 H. J. Osborn and A. Wright. Calibrating thermostats.
24 336 S. M. Ruinagur. Electric traction systems for railways.
24 271 Siemens-Schuckert A.G. Universal household machine. (26/8/27, Germany.)
24 323 Siemens and Halske Akt.-Ges. Treatment of live cells by light rays. (6/9/27, Germany.)
24 266 J. G. Smith. Crystal detectors for wireless telegraph apparatus.
24 329 Standard Telephones and Cables, Ltd. and E. P. G. Wright. Telephone systems.

### August 24th.

24 364 J. E. Allan. Controlling electric motors, etc.
24 365 J. E. Allan. Motor starting apparatus.
24 445, 24 447 Associated Telephone and Telegraph Co. Telephone systems. (14/3/27, U.S.)
24 441 W. E. Beatty (Bell Telephone Laboratories, Inc.). Telegraph receiving systems.
24 375 R. W. Biles and A. Reyrolle and Co., Ltd. Electric protective arrangements.
24 399 W. H. Bull and J. E. Scheel. Producing high frequency alternating currents (24/8/27, Germany.)
24 417 M. Charles. Electric switches. (27/9/27, France.)
24 349 O. G. Culverwell. Electric treatment of poultry.
24 352 A. Davies. Electromagnetic separation of minerals.
24 429 P. Dunsheath and W. T. Henley's Telegraph Works Co., Ltd. Insulation of cables.
24 366, 24 367 R. W. Grant. Electrolytic apparatus for gas manufacture.
24 433 Igranic Electrical Co., Ltd. Newspaper conveyors.
24 392 H. Lawley. Wireless receiving apparatus.
24 391 D. N. Sharma. Television systems.
24 440 C. Tourne. Incandescent lamps, etc. (9/3/28, France.)
24 434 Westinghouse Lamp Co. Method of introducing active metals into sealed containers. (9/9/27, U.S.)

### August 25th.

24 523 C. R. Belling. Electric fires.
24 528 C. G. Carrothers and R. O. Kapp. Protective arrangements for electric power lines, etc.
24 467 A. J. Corke. Coloured lighting effects for theatres, etc.
24 457 J. A. Crabtree and J. R. Dolphin. Manufacture of switch covers, etc.
24 488 J. N. Dean, W. Gardner, H. J. Garnett and W. S. Smith. Insulating materials.
24 480 W. R. Edwards. Electric cells.
24 487 M. Latour. Electro-capillary devices. (25/8/27, France.)
24 486 G. W. Melland. Electric tuning inductances.
24 495 L. M. Myers and Universal and General Radio Co., Ltd. Light sensitive cells.
24 466 J. Neale and C. W. I. Thomas. Traffic regulating signals.
24 516 E. Small and M. B. Wild and Co., Ltd. Electric cable winches.
24 479 Westinghouse Electric and Manufacturing Co. Vacuum electric discharge devices. (29/8/27, U.S.)
24 460 F. G. Woodall. Grid leak holder.

# ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* Gee and Co., *Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

*Opposition to the registration of the following trade marks can be lodged up to September 29th.*

Magnavisor. 490 076. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Radiovisor, Ltd., 26, Church Street, Cambridge Circus, London, W.C.1; merchants and manufacturers. April 2nd, 1928.

Milletone. 492 705. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. Millett's Stores (1928), Ltd., 83 to 85, Granby Street, Leicester; contractors and storekeepers. June 25th, 1928.

# METAL AND CHEMICAL PRICES.

Tuesday, September 4th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected .. | per ton | £65 5 0 | 5s. od. | — |
| Electro Wirebars .. | „ | £69 5 0 | — | — |
| H.C. Wires, basis .. | per lb. | 9 15/16 d. | — | — |
| Sheet .. .. .. | „ | 10⅛d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis .. .. | per lb. | 1s. 0 15/16 d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis .. .. | per lb. | 8½d. | — | — |
| Sheet „ .. .. | „ | 9⅝d. | — | — |
| Wire „ .. .. | „ | 9⅞d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants .. | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. | „ | £14 15 0 | — | |
| *Lead Pig*— | | | | |
| English .. .. | per ton | £23 15 0 | 10s. od. | — |
| Foreign or Colonial .. | „ | £22 5 0 | 5s. od. | — |
| *Tin*— | | | | |
| Ingot .. .. .. | per ton | £213 10 0 | £4 10 0 | — |
| Wire, basis .. .. | per lb. | 2s. 9½d. | ½d. | — |
| *Aluminium Ingots* .. | per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. | „ | £24 15 0 | 5s. od. | — |
| *Mercury* .. .. | ..per bottle | £23 5 0 | — | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2½d.
„ Roll, „ £10 15 0

*Sulphuric Acid* (Pyrites, 168°) per ton £6 15 0

*Copper Sulphate*—Ton £25 to £25 10 0

*Boric Acid* (Crystals) „ £30 *Sodium Bichromate*—Per lb. 3½d.

*Rubber*—Para fine, 10⅜d.; plantation 1st latex, 9⅜d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

## LEAD MARKET REPORT.

In reviewing last week's lead market, James Forster and Co. state that there has been a steady and slightly rising market. American prices have advanced 10 points to 6.40, but offers in Europe are at the London parity.

Closing prices on August 31st were at £22 5s. for August, and £21 18s. 9d. for November, a rise of 5s. and 1s. 3d. per ton respectively on the week. The drop of 6s. 3d. per ton exactly reverses the position a month ago, when a contango of 6s. 3d. was in force.

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Universities and Industry.

THERE has been held this week at the Trafford Park Works of the Metropolitan-Vickers Electrical Co., Ltd., a Summer School for Professors and Lecturers in Engineering. As its name implies, the object of the school is to bring together for mutual benefit those responsible for the technical training of the young engineer and those responsible for his practical training and future employment. It is often found in industry that the student, though well-versed in theoretical design, is sadly lacking in practical application, and it is with a view to showing the university tutors the practical qualifications necessary in engineering education that the school is being held. Wherever possible, representatives of each university or College are conducted round the works by their own ex-students, thereby placing the one-time scholar in the position of teaching his former master. The lectures and tours which have so far been given each day this week, concerned design and modern practice in the manufacture of electrical equipment, at the same time pointing out where the courses at the various technical colleges fall short of their requirements. Another object of the school has been to bring the university and college professor closer in touch with modern demands of electrical apparatus, and to revive his memory in the matter of manufacturing requirements as against those of strictly academic character. Though schools of a type similar to that now proceeding at Manchester have been held many times in America, we believe that this constitutes the first gathering of the kind to be held in this country, and the Metropolitan-Vickers Electrical Co. is to be congratulated on its enterprise. If the enthusiasm shown by those attending the school is any criterion, then the effort has been well worth while, for though the hours of attendance have been long, each tour and meeting has been generally enjoyed, and each discussion has been live and to the point. The last of the lectures is being given to-day (Friday), and the course will end with a visit to the Barton power station this afternoon, and a dinner, at which Sir PHILIP A. M. NASH will preside, this evening. Whether or not a similar school will be held next year is at the moment a matter for conjecture, but the unqualified success of this, the first assembly, should make almost certain the holding of future meetings.

## Business in the Holiday Season.

ABOUT a year ago we felt it our duty to deplore the general inertia which seemed to have shown itself in one form or another in most businesses during the summer months. Careful observation this year lends a certain amount of practical support to the hope that this holiday season slackness was due more to habit than to anything more serious, and though we have not yet attained to the ideal of "business as usual" throughout the year, we seem, in the electrical industry, to have got through the holidays this time with less interruption of normal procedure than usual. We are apparently coming to realise the futility of allowing the holiday of some man in a "key" position to hold up real activity in his department during the whole of his absence, and by so organising the work that the remaining staff is able successfully to cope with all but the most unusual and unexpected difficulties or problems, we not only ensure uninterrupted productivity, but add to the interest of the work of those who are left temporarily in a position of unwonted responsibility. The pride of the understudy who is able to show his chief some evidence of initiative displayed during his stewardship is good to see and to encourage.

## Activity at "World's End."

AWAY up on Heptonstall Moor, which lies between Hebden Bridge and Burnley, and more than one thousand feet above sea level, is a lonely spot marked on the map as "World's End." This is hardly a spot where the traveller would expect to find a large number of fellow creatures, and yet at Gorple, which is but a stone's throw from World's End, he would find a veritable hive of human activity. Not only is the country-side swarming with men engaged in various tasks in connection with the moving of quantities of soil, cement, stone and rock, but their labours are aided by a variety of up-to-date machinery, and dotted around are the huts in which they live. Our traveller would, perhaps, be surprised to find so much mechanical power being used without the presence of disfiguring smoke, and if curiosity impelled him to investigate, he would notice winding up the valley from the direction of Hebden Bridge three slender wires supported on light wooden poles for the transmission of electrical energy to the scene of activity. On Widdop Moor and Wadsworth Moor close by, are reservoirs providing water for Halifax, but more water is needed, and the intense activity at Gorple is in connection with the construction of further reservoirs. As most of our readers are well aware, the construction of a reservoir necessitates the erection of one or more dams,



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and in order that a dam may be secure it is necessary to excavate a deep and wide trench into the rock so that firm foundations may be laid. It is usual before cutting the trench to put down a number of small bore holes in order to ascertain particulars of the underlying strata, and in some cases it is found necessary to force cement down these holes to fill up interstices in the rock and consolidate the ground. In this class of work power is required for many purposes, among which may be mentioned pumping water, compressing air, transporting materials, and mixing concrete. In addition, where the power is derived from electricity the supply may also be used for the lighting and heating of the huts accommodating the workmen, cooking their meals and providing hot water, thus considerably adding to their comfort. Reservoirs are similarly being constructed with the aid of electric power from the mains of the Yorkshire Electric Power Co. by the Wakefield Corporation on Rishworth Moor, known as "Ryburn Reservoir"; for the Batley Corporation at Holmbridge, and by the Barnsley Corporation at Scout Dike and Royd Moor.

## Feed Water Treatment.

OPERATING experience with the 1 300 lb. pressure boiler unit at the Lakeside station by the Milwaukee Electric Railway and Light Co., has proved definitely that with high pressures some form of feed water treatment is imperative, even though ideal evaporated-make-up water conditions are maintained. Scale forming materials are so greatly less soluble at 1 300 lb. pressure, and corrosion so much more active, that experience with moderate pressure boilers is definitely inapplicable to those with 1 300 lb. It has been proved that under conditions at which 300 lb. boilers could operate with untreated make-up water in considerable quantities for a year without cleaning, and then contain only a relatively small amount of scale, a 1 300 lb. boiler has been found to collect scale so rapidly from solids in condenser leakage water only, that operation without tube failures was only a matter of weeks. Higher tube temperatures and stresses are partly blamed for the tendency towards tube failure, but the rapidity of scale formation without feed water treatment is such that no practical methods of eliminating condenser leakage suffice to allow continuous operation. Though the 300 lb. boilers in the Lakeside station have been operated since new without any indications of corrosion in spite of relatively high oxygen content in the feed water and no necessity for paying attention to boiler water alkalinity, the 1 300 lb. boiler developed severe corrosion failures within a few weeks after raw water make-up was discontinued. Solution of the above scale and corrosion difficulties has, however, been obtained just as definitely as the difficulties presented themselves. The greater tendency toward scaling and corrosion is not a condemnation of high pressures, but rather a means of emphasising the need for scientific feed water control. In the same manner that solution of these high pressure troubles very pointedly shows the great value of a simple feed water treatment in preventing serious difficulties, application of the same principles to moderate pressure boilers would undoubtedly help the electricity supply undertakings to a great extent.

## Applications of Ultra-Violet Light.

JUST as, only a few years ago, new applications of electricity for domestic use were constantly being discovered, one now notices similar rapid progress in the branch of the industry which provides apparatus for ultra-violet ray treatment. From the purely medical application of the rays there has been a rapid growth in the additional fields in which it is thought this form of light may be advantageous. A promising application, referred to in these columns recently, and of which more will doubtless be heard, is in the sterilisation of the water used in swimming baths. The latest development is in the irradiation of baker's dough during the mixing operations. The remarkably beneficial effects which are claimed to attend this treatment of one of the staple items of the nation's food are already being widely advertised to the general public, but some details of the process itself and analytical tests of the product are necessary for a proper evaluation of the possibilities in this direction.

## Electricity in the Philippines.

THOSE who have not been there usually associate the islands of the Pacific with sunshine, ukeleles and perpetual ease. That life is, after all, not so rosy as this is revealed by the publication of statistics concerning the electrical position in the Philippine Islands, of which that up-to-date Americanised city, Manila, is the capital. Without commenting upon the technicalities of the electricity supply industry of the islands, it may interest readers to know that when one of our associates first went to Manila just after the war, the chief hotel furnished the only good example of modern electrical service. The next best example was at Santanna, some miles outside the city, where the main attraction was a well-lit, spot and floodlight-equipped dance hall. The position now is that there are no fewer than 100 electric power and lighting companies operating in the islands, of which 67 are privately owned and operated, 15 are owned and operated by provincial governments, and 19 are owned and operated by municipalities, in addition to which there are some 29 uncompleted projects. The nature of the islands is such that the hydro-electric system is most favoured, though the population is not big enough to make worth while the complete development of all the water power available. The natives are industrious, progressive and appreciative of things electrical, though, at the moment, the opportunities for domestic electrification are restricted by the fact that the native quarters are not wired to their full extent. The market, both industrial and domestic, is largely served by American and German manufacturers, the islands, of course, being under the American flag. The fact that the American product finds favour is, therefore, not without reason, for the majority of the white population is American; but what reason can there be for the entry of German goods to the practical exclusion of those of British make. Manila is about two days' steaming from Hong Kong in the north, and some five to seven days from Australia in the south. Singapore and Penang are also nearby; they are also British. These points are interesting, for, in the matter of geographical position, we have everything in our favour, the nearest German possession being Germany itself, some 10 000 odd miles distant, and the United States, about 8 000 miles away. With sufficient enterprise and some attention paid to local requirements and idiosyncracies, the British manufacturer should not only be able to find a footing in the growing electrical trade of the islands, but should be able to corner a good percentage of the imports for himself.

## Electrifying the Russian Village.

ACCORDING to the plans elaborated by the Central Electrical Department of the Soviet Union, Russian electrification will not proceed on "big-station" lines, for during the next five years no fewer than 800 new electricity supply stations of a total capacity of only 160 000 kWh, are to be built in the Soviet Union. Towards the end of that period it is expected that the total number of village supply undertakings will be 1 800, and their total output is estimated to amount by that time to 180 million kWh, as compared with 33 million kWh at the present time. The proposed average capacities of stations, at 200 kW per station, compare with 25 kW, the present average. The capital cost of electrification is estimated at 196·8 million roubles. Of this sum 112 million roubles will be obtained from budget allocations and bank credit, while the remainder of the sum required will be supplied from local resources.

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# SUB-STATION DENSITY.

## A Rapid and Simple Approximate Method for Determining the Number of Sub-stations that will Entail Least Expenditure on a Distribution System—A Practical Illustration of the Plan in a Definite Area.

By C. G. WATSON.

THE number of sub-stations that will entail least expenditure on a distribution system may be determined by preparing detailed estimates of costs with varying number. But, as such a procedure takes up much time, a method enabling the number to be calculated in a few minutes possesses advantages which, even if the solution is only approximate (and the variation in local conditions, such as irregularity of plan and inequality in load distribution, allows no more than proximity in any general solution), makes a useful tool.

To evolve that tool is now my purpose:—Firstly, the assumption will be made that (1) the primary distribution is by h.t. mains originating from a centre which may be a generating station or the point of receipt of a bulk supply; (2) the h.t. mains feed sub-stations wherein the h.t. supply is converted to l.t. for distribution to consumers; and (3) l.t. feeders radiate from the sub-stations to equally spaced points on a distributing network.

In such a system, the cost of the l.t. network may be considered as a fixed quantity. Therefore, in any comparison of economic advantage, its cost may be neglected. With a given load, the cost of the l.t. feeders will vary with the number, and consequently the cost, of the sub-stations. In fact, as the cost of the sub-stations goes up, the cost of the l.t. feeders goes down. That is to say, there is an optimum number of sub-stations to secure least capital expenditure.

Other than the network, the chief items of capital cost of a distribution system are (1) the l.t. feeders; (2) the sub-stations; and (3) the h.t. mains. Or, the total capital cost of feeding the l.t. network may be written

$$L F_c + N_1 S_c + H M_c \quad . \quad . \quad . \quad 1$$

where $L$ = total length of l.t. feeders in yd.
$F_c$ = cost per yd. of feeder installed (this cost will include cable laying, excavation and reinstatement).
$N_1$ = number of sub-stations.
$S_c$ = cost of each sub-station.
$H$ = total length of h.t. mains in yd.
$M_c$ = cost per yd. of h.t. main installed.

With streets intersecting at right angles, the average length of a l.t. feeder will be approximately one half of the distance between adjoining sub-stations. Therefore, if sub-stations are equidistant from one another,

$$L = 0{\cdot}5\ D\ N_1 n \quad . \quad . \quad . \quad . \quad 2$$

where $D$ = distance in yd. between adjoining sub-stations,
$n$ = number of feeders per sub-station,
and $N_1$ and $L$ as already set forth.

But, assuming, as always, that each sub-station area is square in plan, and that the whole district is square in plan too,

$$D = \sqrt{A N_1^{-1}} \quad . \quad . \quad . \quad . \quad 3$$

where $A$ = area of district in square yards.

And, $$N_1 n = x F^{-1} \quad . \quad . \quad . \quad . \quad 4$$

where $x$ = total kVA capacity of district
and $F$ = kVA capacity of each l.t. feeder.

Therefore, $$L F_c = {\cdot}5 F_c\ x F^{-1} \sqrt{A N_1^{-1}} \quad . \quad . \quad 5$$

The cost of a sub-station (site, building, and equipment) will vary with the locality and the design, but for the present and illustrative purpose, I assume that the cost varies as the root of the size in kVA, so that

$$S_c = s \sqrt{S} \quad . \quad . \quad . \quad . \quad 6$$

where $s$ = a constant depending on conditions
and $S$ = sub-station capacity in kVA

But as $$S = x N_1^{-1} \quad . \quad . \quad . \quad 7$$

Therefore, $$N_1 S_c = s \sqrt{x N_1} \quad . \quad . \quad . \quad 8$$

Assuming, further to the preceding assumptions, that there are many sub-stations connected together by a ring main, and that each sub-station is supplied also by a direct main from the district centre, the total length of h.t. mains will be, approximately again,

$$(\sqrt{N_1} + {\cdot}5 N_1) \sqrt{A} \quad . \quad . \quad . \quad 9$$

And, $$H M_c = M_c \sqrt{A}\ (\sqrt{N_1} + {\cdot}5 N_1) \quad . \quad . \quad 10$$

Therefore, the total capital cost of feeding the l.t. network is

$$0{\cdot}5\ F_c\ x F^{-1} \sqrt{A N_1^{-1}} + s \sqrt{x N_1} + M_c \sqrt{A}\ (\sqrt{N_1} + {\cdot}5\ N_1) \quad . \quad 11$$

Or, putting $$0{\cdot}5\ F_c\ x F^{-1} \sqrt{A} = K_1$$

$$s \sqrt{x} = K_2$$

and $$M_c \sqrt{A} = K_3$$

the capital cost is

$$= K_1 \sqrt{N_1^{-1}} + K_2 \sqrt{N_1} + K_3 (\sqrt{N_1} + {\cdot}5 N_1).$$

By differentiating the cost with respect to the number of sub-stations and equating to zero, the value of $N_1$ to give least capital cost may be obtained. Thus:

$$-K_1 0{\cdot}5\ N_1^{-1{\cdot}5} + K_2\ 0{\cdot}5 N_1^{-{\cdot}5} + K_3\ (0{\cdot}5 N_1^{-{\cdot}5} + 0{\cdot}5) = O$$

Whence $$N_1 \left( \sqrt{N_1} + \frac{K_2 + K_3}{K_3} \right) = \frac{K_1}{K_3} \quad . \quad . \quad 12$$

whence $N_1$ may most readily be evaluated by trial and error.

So far, only the number of sub-stations to give least capital cost has been considered. Now, the economic number will be considered: To arrive at that number, the variable yearly charges have also to be taken into account.

I shall take as constant, independent of the number of sub-stations, such yearly charges as sub-station losses, rates, labour for maintenance and operation, and consider as variable only the $C^2R$ losses in the l.t. feeders. This course may not be strictly correct, but in taking it the result will be vitiated but slightly—except when attended sub-stations are concerned, in which case the cost of attendance should certainly be allowed for.

The capitalised value of the $C^2R$ losses in the l.t. feeders will be

$$10^{-3}\ C V_2 L\ fm\ 8760\ Cm\ p^{-1} \quad . \quad . \quad 13$$

wherein $C$ = max. current in each feeder in amperes,
$V_2$ = volts drop per yd. due to conductor resistance,
$f_m$ = mains loss factor,
$C_m$ = cost per unit of energy lost in feeders,
$p$ = yearly cost of interest and depreciation of capital, referred to unity.

But, $$C = 10^3 V_L^{-1} F \quad . \quad . \quad . \quad . \quad . \quad 14$$

where $V_L$ = volts to neutral of l.t. supply (this permits of the same formula for 1 φ 3 wire, and 3 φ 4 wire).

And, $V_2$ depends upon the resistance of, and the current density in, the conductors. I shall take the resistance at working temperature of 1 sq. in. of copper as 0·026 Ω per 1 000 yd. And, as, in an economic discussion, all factors should be on an economic basis, shall digress in order to fix the current density. So:

The cost of an installed cable may be written

$$F_c = \alpha + \beta A_2 \quad . \quad . \quad . \quad . \quad 15$$

where $\alpha$ = a constant made up of the cost of excavation and reinstatement, and the constant part of the laying and cable cost.
$\beta$ = a constant depending on the class of cable and the cost of manufacture.
$A_2$ = effective cross section of the cable conductors. That is to say, in a triple concentric or four-core cable, the neutral copper is not counted.

As the constant $\alpha$ does not affect the economic current, so we need not worry about its value, and this is as well because its value varies very much with local conditions. But the constant $\beta$ is an essential one and, luckily for the present purpose, its value varies but slightly with locality. Its value for the cables I have in mind, that is triple concentric and four-core armoured cables, is about £1 500 per 1 000 yd. of cable, and that is the value I shall use here.

From Kelvin's law, the economic current can be obtained by equating the yearly cost of interest and depreciation of the

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conductor to the yearly cost of the losses in the conductor. That is,

$$p\beta A_2 = C^2 R f_m \, 8760 \, C_m \, 10^{-3} \quad . \quad . \quad . \quad 16$$

where, in addition to symbols already defined, $R$=resistance of conductor in ohms per 1 000 yd. of cable.

With $P$=0·08, $R$=0·026 Ω per sq. in., $f_m$=0·195, and $C_m$=£0·00418,

$$C = 800 \text{ amperes per sq. in.}$$

(The increase of resistance due to skin effect and to the heating of the conductors will make the economic current density vary with the size and disposition of the conductors and with the class of cable, but as the effect is small, it is here neglected.) Therefore, returning to formula 13,

$$V_2 = 800 \times 0{\cdot}026 \times 10^{-3} = 0{\cdot}021 \text{ volt.}$$

From equation 5, $L = 0{\cdot}5 x F^{-1} \sqrt{A N_2^{-1}}$. $N_2$ being the economic number of sub-stations.

$f_m$ will be taken as equal to $\frac{f+f^2}{2}$, where $f$ is the yearly load factor of system referred to unity.

And $$C_m = 240^{-1} (0{\cdot}0274 \, a f_m^{-1} + b) \quad . \quad . \quad 17$$

where $a$=max demand charge per kW per year in pounds, and $b$=charge per unit in pence.

Therefore, the capitalised value of the l.t. feeder losses is

$$K_4 \sqrt{N_2^{-1}} \quad . \quad . \quad . \quad . \quad 18$$

where $$K_4 = 92 \, x \sqrt{A} \, V_L^{-1} f_m \, C_m . \, p^{-1} \quad . \quad . \quad 19$$

The $C^2R$ losses in the h.t. mains may be neglected, because, assuming that each sub-station is normally fed by the direct h.t. main from the district centre, that is, that the ring main acts as a duplicate for use only in emergency, then the h.t. mains losses are constant, whatever be the number of sub-stations. This can be seen by referring to formula 13, wherefrom, if H is substituted for L, the $C^2R$ losses may be obtained: $C = 10^3 \, x \, V_H^{-1} \, N_2^{-1}$, $V_H$ being the h.t. volts to neutral; $H = {\cdot}5N\sqrt{A}$; and the other factors as before. Hence the total h.t. mains loss is $131 \sqrt{A} \, V_H^{-1} f_m \, C_m p^{-1}$ . . . 20

Wherein $N$ does not appear.

The total capitalised cost of a distribution system is, then,

$$K_1 \sqrt{N_2^{-1}} + K_2 \sqrt{N_2} + K_3 (\sqrt{N_2} + {\cdot}5N_2) + K_4 \sqrt{N_2^{-1}} + K_c \quad 21$$

$K_c$ being the capitalised value of the constant charges.

Putting $K_5 = K_1 + K_4$, differentiating and equating to zero, we get

$$N_2 \left( \sqrt{N_2} + \frac{K_2 + K_3}{K_3} \right) = \frac{K_5}{K_3} \quad . \quad . \quad . \quad 22$$

By way of example, take an area of ten million sq. yd. (roughly 3 sq. miles); a load of 10 000 kVA, a sub-station cost constant, s, of £100; a low tension feeder cost of £2 10s. per yd.; a l.t. feeder capacity of 100 kVA; a h.t. main cost of £3 per yd.; a yearly load factor of 0.3; a l.t. voltage of 100; a total capital charge of 8 per cent.; a maximum charge of £5 per kW per year; and a charge per unit of 0·3d. Then $K_1 = 395 \times 10^3$; $K_2 = 10 \times 10^3$; $K_3 = 0{\cdot}48 \times 10^3$; $K_4 = 296 \times 10^3$; $K_5 = 691 \times 10^3$; $N_1 = 8$; and $N_2$, the economic number of sub-stations = 13.

## BOOK REVIEWS.

**Telephone and Power Transmission.** By R. Bradfield and W. S. John. (London: Chapman and Hall.) Pp. xi + 238. 21s.

The principles governing the transmission of electrical energy along conductors have been known for many years. Their development was necessary in the first instance to investigate and explain the behaviour of long telephone lines, and without them the development of such circuits would have been commercially impossible.

As a result the practice of long distance telephony has been completely revolutionised. Instead of costly and bulky heavy gauge aerial lines it is now possible to use loaded underground cables of comparatively light gauge, occupying little space and requiring a minimum of maintenance. The use of thermionic telephone repeaters has given further impetus to this development.

In recent years the extending use of long transmission lines for the distribution of electric power has made it necessary to apply the same principles to the study of such circuits, as in such cases the effects of inductance and capacity of the lines themselves cannot be ignored.

The present volume is not so much a treatise as a series of notes on lectures delivered by the authors to students of the London University, and the object specially aimed at is to present the subject in as concise, simple and practical a form as possible. The book is written for that vast majority of students and practical engineers who are engineers first, and mathematicians only so far as their profession demands.

The book has been divided into two parts; the first, due to Mr. Bradfield, consists of 64 pages dealing with telephone transmission. It consists of four chapters, the first of which is a mathematical introduction, followed by the general theory of transmission, the application to telephone transmission, and, finally, line constants and their measurements.

The second part, due to Mr. W. S. John, deals with power transmission. It consists of five chapters dealing respectively with power transmission, effect of transformers, travelling waves and switch-in-phenomena, typical examples of travelling waves in transmission lines, and, finally, an introduction to mathematical theory of travelling waves.

The first of these chapters deals generally with the steady state conditions, while the third deals with transients. In the final chapter the theory which connects the solutions for the transient and steady conditions is given.

The purpose of the authors appears to be admirably fulfilled, and it is possible for a reader with a minimum of mathematical training to attain a working knowledge of the subject, and to be able to make all ordinary calculations in connection therewith.

An excellent feature of the book is the numerous examples fully worked out to illustrate the practical application of the theory. In some cases this has been done twice in order to illustrate the differences between a simplified method and a precise one.

The portion of the book dealing with telephone transmission is perhaps too abbreviated for the requirements of the telephone engineer, but is sufficient for the student who wishes to obtain a general grasp of the subject.

An inversion of subject matter occurs in Chapter 2, where the two last paragraphs on attenuation and wavelength constants, and on conditions for minimum attenuation on pages 38 and 39, should obviously come before the paragraph on distortionless lines on page 34, otherwise some of the succeeding matter becomes meaningless to a beginner.

The book is well printed and indexed. It contains numerous diagrams and a number of useful tables. It will form a very useful addition to any electrical engineer's library.

E. H. S.

**Transmission Line Engineering.** By W. W. Lewis. (London: McGraw-Hill Publishing Co., Ltd.) Pp. 356. 20s. net.

This book treats in a theoretical and practical way with some of the more important electrical problems which engage the engineer designing and operating constant voltage e.h.t. power transmission systems. In an able manner the author discusses some of the most important questions of the moment, viz.: disturbances on e.h.t. transmission systems, short-circuit currents and their calculation, inductive interferences, common earthing systems, and so forth.

System disturbances and dangers due to flashovers and short-circuits are receiving special attention at these times. It is one thing devising and installing means for minimising their occurrence, but it is another thing devising and applying means to minimise their spreading, their magnitude and their resulting dangers—the most important conditions involved being those of keeping to a minimum the voltage of the arc, and the time-period for quenching the arc.

The question of induced pressure rises opens up a field for investigation in which inductive interference is closely associated with design, disposition and arrangement of line conductors, system connections, etc. As time goes on the question of telephone interference will engage the attention of power system engineers of this country.

Short-circuits are among the most serious kinds of transients, and three-phase short-circuits are more serious than single-phase short-circuits. It is therefore evident that just as careful study is required in the design of the line as is given to the machinery, apparatus, switching, and relaying problems. And, it would seem that one of the best solutions of this problem is to arrange the line conductors in a horizontal plane, and not in the manner proposed for the 132 kV main transmission lines of this country.

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With or without an earthed neutral, and, whether we insulate the line and transformers for delta or star connection (full voltage between phases) or not, we cannot lose sight of the fact that what we require is *insulation* best capable of reducing or mitigating impulse flashover as well as maximum voltage due to (or across) arcing earths for any given method of protection and design of line—the solidly earth neutral systems are best, and are still more effective with overhead ground wire properly installed. These problems are clearly discussed in the book.

The power limit of transmission systems involves certain assumptions, and there are many factors that are difficult to attain. In the matter of stability of a system, there is likely to be a heavy disturbance or shutdown with every flashover; the resistance to earth through the tower may be 10 Ω for one, 100 Ω for the next tower, and not far short of 1 000 Ω for another tower on the same system. The whole question resolves itself into facilitating the stability problem at the expense and efficiency and effectiveness of lightning protection, relaying, inductive interference, phase-to-phase short-circuit by spreading of the arc, etc.

It is easy to calculate the maximum power that can be transmitted over a simple transmission system, and for steady state stability. For a transmission network, such as the "grid" for this country, the steady state stability problems become somewhat complicated, also transient stability problems involve so many unknown variables that only approximations can be made. In the text, the author presents fictitious and equivalent systems as a basis for his calculations.

At the present juncture, when this country is about to construct 132 kV overhead transmission lines and outdoor sub-stations throughout its length and breadth, methods for earthing the systems at the stations should prove helpful to engineers, and the book should also be found useful in this respect.

The book deals with many theoretical problems in a very practical manner. It should prove helpful to all interested in the design of transmission lines for operating voltages at and above 66 000 V.

WILLIAM T. TAYLOR.

**Costs for Manufacturers.** By CHARLES SMITH. (London: Sir Isaac Pitman and Sons.) Pp. viii + 90. 5s. net.

This book is largely devoted to the detailed explanation of a so-called new principle for the application of overhead expenses to costs. The principle propounded is not new, but it has not come into more general use, in spite of its well known good points, because of the clerical work necessarily involved in the setting-up of rates, and in their periodical revision.

There is no justification for the claim that the method can be applied *with advantage* to every kind of manufacturing business. There are many methods, and the most suitable to the particular needs of the business must be adopted after taking everything into consideration. The author is too condemnatory of the percentage relationship between overhead and labour method, apparently overlooking its extreme simplicity and ease of manipulation, combined with reasonable accuracy when properly worked.

All his arguments in favour of the unit expense rate method are universally acknowledged as sound, differentiating as it does between classes of product, and while it is right for the cost man to endeavour to obtain actual costs as accurate as possible—and in this the application of overhead is a large factor—yet it must be remembered that ultimate selling price determines saleability; and this should be based, if necessary, on a regulated overhead absorption.

Much is made of the question of the idle time whereby, if working hours become curtailed for one reason or another, the expense rates are correspondingly increased and absorbed on future production. This creates a higher commodity cost at a time when, possibly due to business depression, lower costs are actually needed to stimulate orders. This is much more a matter for the factory than for the selling departments, and the cost accountant should not be contented merely to ascertain actual costs as they are.

The composite time sheet could not be used in any establishment handling a large variety of products unless they all passed through the same processes, over the same machines, and handled by the same groups of workers. Where the manufacturing is in the nature of a process, arrangements can be, and usually are, made to group workers as suggested; but as a general practice, in any but a small concern, the composite time sheet is impracticable. Its use must even then be restricted to the bookings of time workers, for if piecework is in force, as is now the general case, then times taken for each operation have to be stated by the workers, not to evaluate the work completed, but to calculate absorbed expenses, which are based on working hours. All this is avoided under straight piecework with the percentage expense to labour.

The statement, on page 60, that expenses are halved if the output is doubled (for a prolonged period) cannot be supported in practice.

The method of obtaining cost of orders (i.e., bookings of labour, expense and material) might be workable in a small processing factory, but otherwise it is unsuitable.

The explanations of the system are good, but a qualification is required to the effect that this plan is best suited to process work, as cable-making, insulations, paints and varnishes, etc.

W. FEIL.

**Les Moteurs a Courants Alternatifs.** By LOUIS LAGRON. (Paris: Libraire Scientifique Albert Blanchard.) Pp. 429. 25 fr. net.

This is the second volume of the new electromechanical encyclopædia published under the direction of M. E. Pacoret; the first volume dealt with transformers and induction coils. The work under review is written in fifteen chapters, and it may be said to be a complete treatise on the theory, calculations, construction and application of induction motors, including commutator motors.

The first chapter deals with the classification of induction motors, both synchronous and asynchronous, and relations are given—in tabular form—between single-phase, two-phase, and three-phase line currents at unity power factor. The second chapter is valuable, since it deals vectorially with lagging and leading currents. The third chapter is a treatise on the constants of polyphase induction motors; here special attention is given, and many examples are worked, to types of stator and rotor slots, air gaps, reactance, and reluctance. This chapter is illustrated with many graphs showing how the various coefficients are determined, and giving H.B. values under various conditions.

A very good treatment of the circle diagram is given in the fifth chapter; the illustrations in this section should have been full-page ones, so that the various angles and values could be more readily followed; the symbols and references are much too crowded. The seventh chapter deals chiefly with auto-transformers and the calculations of resistance values for the stators of various motors; the diagrams in this section are very clear. The tenth chapter deals entirely with induction motor calculations; methods of determining the principal dimensions of motors, slot sizes, conductor capacities and current values are well discussed.

In the twelfth chapter are included several winding diagrams which, it must be admitted, are valuable, especially to the winder. The latter part of this section gives details of machine construction; this may be considered as out of place, since it would be in better rotation if placed in the earlier sections. The next chapter deals very effectively with the applications of induction motors, and chapter fourteen is devoted to the treatment of characteristics and operation of repulsion induction motors. The last chapter deals with the connection of induction motors in cascade; many valuable illustrations, diagrams and vectors are given. The book is written by an engineer who undoubtedly knows his job; it is not too mathematical, and to those engaged in the design and winding of induction motors, it should prove to be of some value. At the price this volume represents remarkably good value.

CYRIL SYLVESTER.

## Books Received.

"Geschichtliche Einzeldarstellungen aus der Elektrotechnik." Part I. Issued by the Elektrotechnischen Verein E.V. (Berlin: Julius Springer.) Pp. 98. 7 marks.

"Die Ausbreitung der elektromagnetischen Wellen." By Dr. Alfred Sacklowski. (Berlin: Weidmannsche Buchhandlung.) Pp. xii + 129. 4.50 marks; bound, 6 marks.

Journal of the Institution of Electrical Engineers. Vol. 66. No. 380. August. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) 10s. 6d net.

"Wirkungsweise Elektrischer Maschinen." By Dr. Milan Vidmar. (Berlin: Julius Springer). Pp. vi + 223. 13.50 marks.

"The Wireless Manual." By Captain Jack Frost. (London: Sir Isaac Pitman and Sons). Pp. vii + 220. 5s. net.

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# THE TESTING OF D.C. TRACTION MOTORS.

## Notes on Usual Methods—A Disadvantage of the Continuous Rating—Necessity for Insulation Resistance Test—The Vexed Question of Overspeed Tests.

By WALLACE FORD, Wh.Sc., A.C.G.I., B.Sc., D.I.C.

AFTER complete assembly, and before being put into service, a traction motor, whether d.c. or a.c., must be exhaustively tested in order to make sure that it will perform the duty assigned to it without possibility of breakdown. The tests usually carried out are as follows :—(1) Flash Test. (2) Insulation Test. (3) Heat Test. (4) Commutation Test. (5) Speed Test. In addition, a test for the starting torque from stand-still may be required. These tests, of course, apply to both a.c. and d.c. motors, but the remarks below apply primarily to d.c. traction motors.

When a traction motor is ordered from the manufacturer the chief requirements stated are mechanical output at the shaft (in horse power), terminal voltage and speed at full load ; other information regarding the starting torque and the characteristics of the vehicle to be driven and of the track upon which the train will run is also necessary.

### Basis of Motor Output.

The output of the motor may be based on either the continuous rating or the one-hour rating, or on both. The one-hour rating is more usual for traction motors. Both these ratings are based on the temperature-rise of the motor in service.

The continuous-rated output is the power which can be developed at the motor shaft continuously until the motor settles down to steady temperature conditions without the temperature-rise of the hottest accessible spot when measured by thermometer, or the average temperature rise of the commutator and armature windings, when measured by the " resistance " method exceeding a certain specified amount. The one-hour rated output is the power which can be developed at the shaft for one hour without the temperature rise exceeding a pre-determined amount.

The British Standard Specification No. 173–1928 for the Electrical Performance of Series-Wound D.C. Traction Motors practically limits the method of measuring temperature-rise to the " variation of resistance " method, and gives a table of permissible temperature-rises for both the continuous and one-hour ratings. It will be appreciated that the one-hour rating is greater than the continuous rating.

The heat test of a traction motor is a test of the rating, and two separate tests may be carried out to prove both the continuous and one-hour ratings assigned to the motor. The motor is tested at the works and is fixed to a test bed, all the motor covers and any cooling system being arranged as in service, but usually no attempt is made to reproduce the cooling effects on the motor case such as are present when the motor is driving a vehicle.

For a heat test at the one-hour rating, the motor is loaded until it develops at the shaft its rated one-hour output. After an hour's run at this load the motor is stopped and the resistance of the armature between two marked commutator segments is measured. The resistance between the same two segments having been ascertained prior to the test (motor cold), it is a simple matter to deduce the average temperature rise of commutator and armature windings.

For a heat run to prove the continuous rating the motor is loaded on a test bed until it develops its continuous-rated load at the shaft. The load is then maintained until it is evident that the motor has reached steady conditions. The temperature-rise is then determined as before, and should not exceed the specified amount.

Perhaps a few words on the rating of a traction motor may not be out of place. Both the one-hour and continuous ratings are arbitrary, since a traction motor performs intermittent work and is never loaded in service for periods of the order of one hour. Again, the test-bed method of test does not represent service conditions, since the cooling is totally different from that experienced on the track ; due to the movement of the vehicle there is a considerable cooling effect on the motor casing, and definite cooling periods occur when the train is at rest at stations, after the train has accelerated to full speed and is coasting or braking, and during lay-overs at a terminus.

The rating of a traction motor in accordance with a standard method such as that in B.S.S. No. 173 provides a means of readily comparing the capabilities of two motors constructed by different makers and intended for use on different railways, and a heat run on a test bed is by far the most convenient method of proving the rating assigned to a motor.

Suggestions have been made for computing the temperature which will be reached in service by causing the motor to work a car of specified weight over an actual line, and conforming to an agreed schedule, observing agreed stops and speed restrictions. If such a method were used as a basis for rating, then either manufacturers would have to use the same or similar test-tracks, or a motor would have a series of different ratings depending upon the track and the time table to which the train worked.

Although the continuous or one-hour rating is convenient, there is one disadvantage. In order to increase the rating of a traction motor as shown by shop tests, designers may strive to meet conditions of no real importance, and hence may tend to hinder progress.

The heat test has been dealt with first as it is the most important, but the first test would probably be a "Megger" test for insulation. There is, however, considerable controversy among railway engineers as to whether a routine insulation-resistance test is necessary, although B.S.S. No. 173 definitely requires such a test to be carried out, and gives a formula for the minimum allowable insulation resistance.

The flash test is carried out with an alternating test voltage, the value of which is usually 1 000 V plus twice the nominal service voltage. It is usual to fix some minimum for the test voltage, and a high-voltage test is usually only applied to new motors. The test voltage is applied for about one minute between the windings and the frame of the motor. For motors which are designed to work two or more in permanent series a more severe flash test is applied. It is standard practice to apply the flash test to the motor immediately after the heat run.

It is essential to carry out commutation tests on traction motors in order to ensure that the design provides for two distinct requirements.

First, that the compensation of armature reaction and reactance voltage is sufficient at all loads up to the maximum permissible overload to ensure that there shall be no destructive sparking at the commutator and so prevent the wearing, overheating and burning of brushes and commutator segments.

Second, to ensure that, under all conditions of operation, there is no concentration of voltage near the trailing edge of the brushes which will tend to start and maintain arcing between commutator segments, and so produce a flash-over.

### Sparkless Commutation.

The first requirement, that of sparkless commutation, depends upon the speed of rotation, the current density in the brushes and the strength of the commutating poles ; the last two are proportional to the load current. If a motor will perform without sparking and dangerous heating of the brushes and commutator at rated voltage, and with a load current in excess of the rated full-load current, it can be considered satisfactory. It is usual to carry out this test at about twice normal full-load current.

The tendency to flash-over, whether at the brushes or at any other part of the commutator, will depend upon the flux distortion produced by armature reaction and upon the terminal voltage. The armature reaction depends upon the relation between armature ampere-turns and field ampere-turns, and if the latter is high the distortion of flux will be small. Also, the line voltage on electric railways is liable to considerable fluctuation, and it is necessary when testing for the " flashing " tendency to employ a voltage which allows a safe margin over and above the maximum voltage expected to be met in service. The test covering the second requirement is usually carried out at rated full-load current and with a voltage from 20–30 per cent. in excess of the rated voltage.

For motors which have to operate two in permanent series the percentage over-voltage for this test is usually increased to 50, since, in the event of a fault on one motor, the second may be subjected to considerably more than its usual terminal voltage.

In cases where field control is provided, it is not usually

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considered necessary to carry out commutation tests with any other than full excitation, since when the motor is accelerating from rest against load, the full field-winding is in circuit.

Routine commutation tests are carried out when the motor is hot, and are generally as follows :—

*Test* 1.—The terminal voltage is the normal rated voltage and the current is usually about twice rated full-load current, and the motor is run under these conditions for a period of from one to two minutes. Since a traction motor must be capable of running equally well in both directions with fixed brush positions, the test is repeated with the direction of running reversed. Between the two tests it is standard practice to run the motor under rated full-load conditions in the direction of running of the second test for a period of about five minutes in order to run-in the brushes and commutator.

*Test* 2.—The above test is repeated, except that the conditions are rated full-load current and from 20–30 per cent. over-voltage. If the motor is intended to be worked with other motors, two or more, in permanent series, the over-voltage for this test may be 50 per cent.

With regard to speed tests, a test may be carried out under rated conditions as to voltage and full-load output at the shaft in order to ascertain that the speed at full load is within an agreed tolerance above or below the designed speed.

Then comes the vexed question of over-speed tests. There are very considerable arguments both for and against including an over-speed test in the routine tests of a traction motor, and even amongst those who prefer to include such tests there is no agreement as to whether the test speed should be a multiple of the one-hour rated speed or a function of the maximum permissible vehicle speed.

Over-speed is a fundamental factor in the design of traction motors, and many leading manufacturers base their designs on the maximum safe speed permitted on the tracks for which the motors are to operate. In such cases, therefore, the manufacturers would prefer to have, as a basis for over-speed tests on the completed motor, the maximum safe speed of the vehicle, and not any multiple of the one-hour rated speed.

In the matter of over-speed tests based on vehicle speed, various authorities suggest that the test speed for the motor should be anything from 10 to 25 per cent. in excess of the speed corresponding to the maximum permissible vehicle speed. Generally, however, it is preferred to leave the fixing of the percentage to be a matter of agreement between purchaser and manufacturer. Modern methods of manufacture enable safe peripheral speeds for both armature and commutator to be continually increased, and it is thought that any rigid specification for over-speed would tend to retard progress.

## Allowance for Over-speed.

When a customer specifies a maximum vehicle speed he generally makes sufficient allowance for over-speed above the maximum regulation speed of the railway. Hence, if a test speed 25 per cent. in excess of the specified maximum vehicle speed is required, an unduly high test speed would be obtained. This would be reflected in the design and manufacture, with the result that a larger, slower and more costly motor would be produced. This point rather counterbalances the claim that standardising a test speed as a certain percentage above the vehicle speed would tend to obstruct progress—the only way to reduce motor size is to increase peripheral speed.

The customer is really in the best position to specify the speed for an over-speed test, since he alone knows the real service conditions under which his trains have to perform. Over speed conditions would be obtained on long, straight down grades, and often the only indication a driver has that he is driving too fast is the excessive swinging of the vehicle. The settling of the test speed really becomes a matter for judgment on the part of the customer.

In view of the fact that some engineers make an allowance in stating the maximum vehicle speed, and that therefore no further over-speed allowance may be necessary in computing the motor test speed, there is much to be said for specifying the over-speed without reference to the vehicle speed. Suggestions for the manner of determining the test speed on a "rating" basis are many and various—2, 2½ or 3 times the one-hour rated speed, or twice the continuous-rated speed—but here again some authorities consider that the test speed should be based on the vehicle speed, with the provision that the test speed must not exceed some multiple of the rated (one-hour or continuous) speed.

Generally speaking, a speed of double the one-hour-rated speed would be quite insufficient for railway motors used for inter-urban trains, or on a suburban service. In some systems the maximum train speed may be of the order of three times that corresponding to the rated full-load speed of the motor, while for certain classes of locomotive work the ratio may be conceivably below 2 to 1. It would seem, therefore, that any arbitrary ratio could not meet the case.

It may be suggested that a useful shop test would be with an over speed corresponding to, say, 20 per cent. above the balancing speed of the train on level track, with normal voltage applied to the motors; this would be a useful guide to the designer in cases where no over-speed is specified in the order.

Probably the best practice in respect to over-speed tests is to specify the probable maximum vehicle speed, and to require the motors to be designed for, and tested at a speed, say, 10 per cent. in excess of this, for a period of, say, 10 minutes immediately following the heat run of the motor.

## Diverse Conditions.

There is, however, too much diversity in the various conditions which have to be met by traction motors, such as those for tramways, light railways, shunting locomotives, express locomotives, suburban and inter-urban locomotives, freight locomotives and multiple-unit trains, under different conditions of operation to make it practicable, or even desirable, to make a single method of computing the test speed applicable to all traction motors.

The foregoing notes set out the usual methods of testing d.c. motors for railway traction. Other tests, such as a "stalling" test for finding the starting torque from standstill, may be considered important for certain classes of work, but are not essential for all motors. It will be realised that very stringent tests are essential for motors which have to meet the arduous and varied traffic conditions experienced on most electric railways.

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# INSTITUTE OF METALS.

## Papers at Annual Autumn Meeting at Liverpool.

Among the papers read at the autumn meeting of the Institute of Metals at Liverpool, last Wednesday, was one on "Laboratory Experiments on High-Temperature Resistance Alloys," by Dr. C. J. Smithells, Mr. S. V. Williams, and Mr. J. W. Avery (communication from the staff of the Research Laboratories of the General Electric Co., Ltd.) The paper dealt with a series of nickel-chromium alloys containing from 10 to 60 per cent. of chromium, and a few ternary alloys containing tungsten and molybdenum, which have been made from specially pure materials melted in hydrogen. They have been subjected, together with some commercial nickel-chromium alloys, to new forms of test for resistance to oxidation, and resistance to sag, at high temperatures.

For the binary alloys, resistance to oxidation increases with increase in chromium content up to 30 per cent. With more than 40 per cent. of chromium a second phase appears, and resistance to oxidation falls. Ternary alloys containing only 10 per cent. of chromium show low resistance, whilst those containing 20 per cent. of chromium show high resistance to oxidation. The composition of the oxides formed on the alloys has been determined by X-ray analysis. For high resistance to oxidation, the oxide layer must contain at least 50 per cent. of chromic oxide. The composition of the oxide layer is determined by, but is not generally the same as, the composition of the alloy.

For the binary alloys, resistance to sag at high temperatures decreases with increase in chromium content. The ternary alloys sag more than the binary alloys having a similar nickel content.

The presence of small amounts of impurities has a marked effect in lowering both the resistance to oxidation and sag. Commercial alloys are inferior to the experimental alloys, having the same nominal composition, for this reason.

The electrical resistivity of all the alloys has been determined between 20 and 1 000 deg. C.

In a "Note on Practical Pyrometry," by Messrs. G. B. Brook and H. J. Simcox, presented on September 6th, the authors outlined difficulties, such as stray current and magnetic fields of great intensity, which are peculiar to industries where large currents are used.

An instrument has been designed which eliminates these, and is accurate even when placed in the field surrounding a conductor carrying as much as 20 000 A.

Various minor difficulties were dealt with, and a description was given of a quick-reading thermocouple which is suitable for use in non-ferrous foundries.

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# THE INFLUENCE OF ENGINEERING ON CIVILISATION.*

## Great Importance of Electrical Engineering—Reminiscences of the Early Days of Telephony —Growth of Industrial Applications—United Benefits in the Domestic Sphere.

By SIR WILLIAM ELLIS. G.B.E., D.Eng.

EACH branch of engineering has added its quota to the comfort of our lives, and I think it may be claimed that no other profession has so direct an association with our modern civilisation. Can we say which branch has most directly been associated with modern civilisation? I do not find that any one branch can claim the premier position.

Electrical engineering covers a very wide range of subjects, and affects our social life almost more intimately than any other type of engineering, except perhaps the supply of good water and efficient drainage installations. It is impossible for me to attempt to cover the whole range of subjects embraced in electrical engineering. Telegraphy, telephony, wireless, electric lighting, electric heating, electric driving, and electric power in their various ranges all enter into and affect the comfort of our domestic life.

### Dependence on Pure Science.

In considering this branch of engineering as a whole I find it very difficult fairly to divide the credit for its development between the pure scientist and the electrical engineer. The researches and experiments in the early part of last century on the part of Wheatstone, Faraday, and Lord Kelvin, and later, coming to our own time, of Sir Oliver Lodge, Senator Marconi, and other eminent scientists, have undoubtedly prepared the road to the later applications of electricity for domestic and engineering purposes, and no electrical engineer to-day can efficiently carry out his duties without a greater knowledge of pure science than may be regarded as essential in other branches of engineering.

It is interesting at this meeting in Glasgow to recall that it was at the British Association meeting in this city in 1876 that Graham Bell, in conjunction with Lord Kelvin, brought to the Association's notice the telephone, and, further, the fact that at the Plymouth meeting of this Association in 1877 I shared with many eminent members of the British Association the interesting privilege of telephoning from the saloon to the bridge on the excursion steamer, with Prof. Graham Bell on board, going to and from the Eddystone Lighthouse. I allude to this fact because in those days it was regarded as a wonderful scientific invention which fascinated the most eminent scientific men. Yet to-day we take it all for granted, and hardly realise the comfort and convenience that the introduction of the telephone has brought into our lives.

I admit that the introduction of wireless telephony and telegraphy has amazed the world to a greater extent than that of the telephone, and it is certainly more within the capacity of the pure scientist than of the engineer to explain the scientific problems involved. I am not going to state whether the introduction of wireless broadcasting into our homes is an amenity or not, *chacun son goût*, but when we turn to the application of wireless telegraphy we accept without hesitation the benefits it has brought into the world. It is impossible to say what number of lives have already been saved by boats in distress having been able to secure help from other vessels by means of wireless communication.

The development of electricity as a mechanical driving power was very slow up to a certain date. For instance, I went by electric train from Berlin to Charlottenburg in the spring of 1882. The running of the railway appeared to be quite satisfactory, and yet it was at least ten, and I think fifteen years before any real development took place in the way of electric railways or trams, the difficulty, I believe, being in producing satisfactory dynamos on an economic basis.

The first electric railways in this country, so far as I know, were the Liverpool Overhead Railway in February, 1893, and the Liverpool to Southport Railway in April, 1904. The practicability of electric driving on main lines is still a matter under discussion. The only country which has wholeheartedly adopted this system is Switzerland, a country which has undoubtedly been influenced by the uncertainty of obtaining a uniform supply of coal at reasonable prices, coupled with the fact of an efficient and amply supply of water power for their generating stations. The Barberine reservoir, which has now been completed, and the large reservoir at the Grimsel Hospice now under construction, are fine examples of civil engineering work carried out for the purpose of developing electric current for the Swiss railways.

In this country considerable developments are taking place on the various main lines, but engineers are at present concentrating on the use of electric driving mainly for suburban traffic, and not at present on main line long-distance expresses. It is probable that the great extension of high-power installation throughout the country contemplated by the Electricity Commissioners will render possible a more extensive use of electric trains on our main lines.

The application of electricity for driving purposes in the various large works in this country made very rapid strides as soon as electrical machinery for the purpose was available. I remember showing to a former president of this Association, Sir William White, the first set of Belliss and Morcom engines we had installed in a works in the Midlands, the various machines in these works at that time being driven by steam engines in different shops and line shafting. Sir William said to me then, "Do you realise that within ten years every machine in these works will be electrically driven?" I think few engineers realised at that time that electric driving would replace so rapidly the existing methods.

Apart from the economy represented by its introduction, the change enabled the management to register the amount of power used by each type of machine under varying loads of service, a circumstance which was impossible with belt-driven machines, when the power varied according to the tightness and width of the belt.

The greater efficiency, however, is really represented by the fact that in a large works electricity can be produced in bulk at a central power station at a low rate of cost, and the loss in distributing to the various departments through high-tension cables and transformers to lower voltage in the different sections of the works is insignificant compared with the saving represented by a consumption of coal and a cost of maintenance far below what is possible with direct steam driving.

Electricity has in some measure been introduced into mining engineering; electric winding engines have been adopted with satisfactory results, but as the fuel supply for steam raising at the various collieries, especially where coke ovens are installed, is much less costly for providing power than in a works without such auxiliary facilities, the economy in the use of electric winding versus steam is not so great.

### Electricity in Domestic Life.

The public, I think, fails to realise that electric lighting for domestic purposes, if charged at a reasonable rate, does not represent any real charge on the household. It is so clean in its application that, in my opinion, the necessity for cleaning and decorating which is avoided in many cases represents a greater saving than the amount paid for electric light. In addition we have the great advantage that it does not burn oxygen, and therefore we have more healthy conditions in our rooms, compared with any other method of lighting.

I feel sure that those who have introduced electricity into their houses for the purpose of cooking and hot water supply will never go back to the old system of kitchen fires for this purpose, owing to the former's efficiency and cleanliness in application. It appears to me that all that is wanted for a much larger use of electricity domestically is a reduced charge by the various supplying companies and corporations, at least to the level which exists in many of our cities already. It is hoped that the work of the Electricity Commissioners in installing bigger units of power throughout the country may bring down the cost so as to place electricity within the reach of every householder. Those of us who are spending our lives in engineering work may justly be proud of the large share the members of our profession are taking in promoting and advancing the civilisation of the world.

* Extracts from the President's Address to Section G of the British Association at Glasgow on September 7th.

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# INDUSTRIAL LIGHTING EQUIPMENT.

## Modern Methods in a New British Factory—Special Steels for Making One-piece Reflectors—Comprehensive Facilities for Research and Testing Work.

TO mark the opening of the new works of the Benjamin Electric, Ltd. at Tariff Road, Tottenham, a number of visitors were invited to inspect the manufacture of the company's various products, notably the industrial lighting fittings with which its name is primarily associated.

The new buildings at the Tottenham works—incidentally the second extension since the removal from the old premises in Rosebery Avenue—give double the floor space, and the works are now organised for producing up to 25 000 lighting reflectors a week, apart from other specialities such as wireless valve holders—of which over 1 500 000 have been made and sold in two years—Boyce Motometers, and electric horns for motor cars.

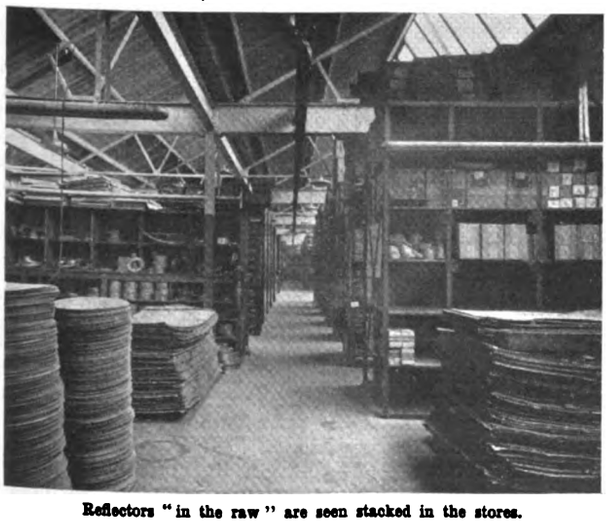
The new building is a two-storey construction of brick and steel, and comprises eight large North lighted bays, the second storey being used for executive and general offices, which were previously located in the old building. The ground floor of the two-storey building is used for packing, despatching departments, and packing case makers, covered-in loading ramps being provided, and overhead conveyances running throughout the stores.

### High Illumination Standard.

The interior of the old building has been completely reorganised, and is now used solely for production purposes. Although the factory contains all types and sizes of machines, the lighting is by means of general lighting only, local lighting being dispensed with entirely. The standard of illumination throughout the works is 10 ft.-candles, and is obtained by means of the standard Benjamin R-L-M reflector. Earthing is obtained by running the bare wire of every fitting and making contact round the hook, which, through the chain and on to the fitting, insures a good earth by using a standard product.

One of the most spectacular processes was seen in the spinning section, where reflectors of special design are produced, and where spinnings up to 4 ft. in diameter can be handled.

In order to eliminate the seam between the skirt and the neck, which always presented some amount of difficulty, and perhaps weakness, in the vitreous enamelling process, new presses have been developed which permit the manufacture of reflectors in one piece. Though it may sound easy to construct a reflector from one piece of steel, it may be noted that the British steel makers had no light task in producing a quality of steel which would stand the stresses and strains involved in shaping from one blank a 20 in. diameter reflector 17 in. high.



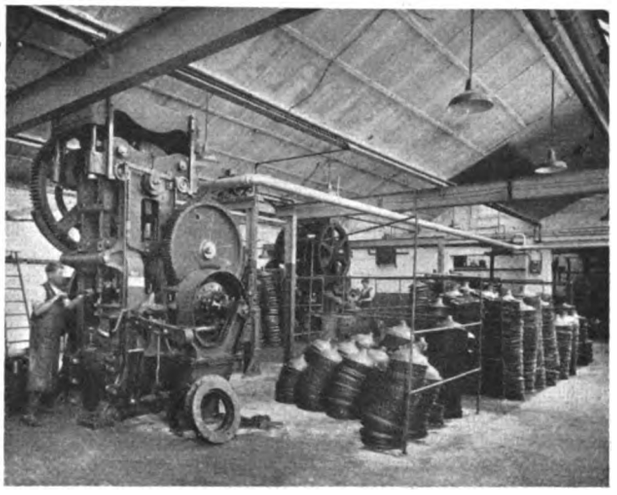
**Reflectors "in the raw" are seen stacked in the stores.**

Many processes of pickling and annealing are necessary to preserve the ductility of the metal, and this in itself is a somewhat involved process, in order to prevent scale, which would seriously affect the coatings of vitreous enamel.

For some reflectors alone the metal has to pass through the press seventeen times.

A tour of the executive and general offices showed what lighting specialists consider to be a suitable lighting intensity for clerical labour; this is 8 ft.-candles, the lamps being fitted in the standard industrial type R-L-M reflector with bowl frosted lamps. The illumination of the whole of the Benjamin works, in fact, is such that the factory operatives and office staff could be employed during the whole twenty-four hours of the day, as efficiency would not be lowered by the falling off of the natural light.

The company is especially proud of its new testing and research laboratory, which permit this highly specialised work, previously carried out by Commander Haydn T. Harrison, in his research laboratory at Canterbury, to be done on the premises. Space was therefore provided for the pur-



**One of the presses used to fashion industrial type reflectors from the metal discs seen on the left of the other illustration.**

pose, and arrangements made whereby the contents of the Canterbury laboratory should be housed with those of the works testing department, thus forming not only a very complete light and testing department, but also a laboratory for general research work in connection with the other special manufacturing work carried out by the company.

The main photometer room, which is used, not only for research work, but also for testing the products of the company, accommodates a photometer 40 ft. long, which is used for measuring light intensities from fractions of a candle to over 250 000 c.p., also for calibrating the well-known Benjamin light meter.

The tests carried out in this laboratory are based on standards provided by the National Physical Laboratory, and practice has already proved, that even in the more elaborate tests, such as measurement of total luminous output by the angle method, extreme accuracy has resulted.

### Practical Test Conditions.

The flood-light and projector flat which is situated above the main photometer room is open to the sky on three sides, thus not only allowing for the projection of beams on surrounding buildings to judge the commercial effect, but also down an open space opposite, where the intensity can be measured at considerable distances, which makes it possible to test with accuracy the intensity of powerful searchlight beams often exceeding 200 000 000 c.p.

Facilities are provided on the outside testing area which is adjacent to the road, for street lighting lanterns to be fixed on brackets at any desired height, thus enabling tests on these fittings to be carried out under practical conditions.

The main testing laboratory contains the fixed measuring instruments and standards, and it is here that the portable instruments used in the works for the manufacture of the Benjamin products are regularly tested and checked. Facilities are also provided for the production of working models.

The private laboratory contains the more delicate standard apparatus, such as measuring galvanometer, oscillograph, etc., also the electrical appliances and many other sundries necessary for the original research work which is carried out in this department.

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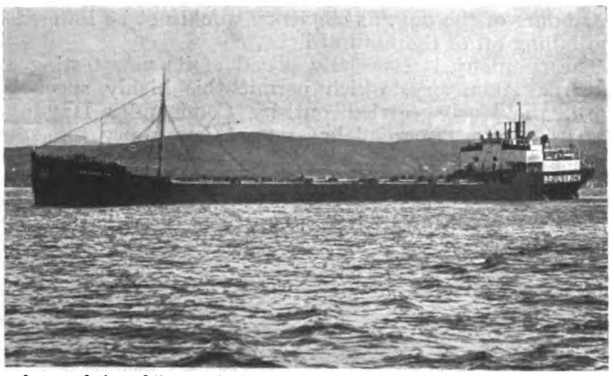
# A DIESEL-ELECTRIC SHIP.

## Novel Electrical Features on New British-built Oil Tanker—Electric Control by Varying Field Circuits Only—Flexibility for Manœuvring—Switchboard Features.

THE "Brunswick," the latest British-built oil tanker for the Atlantic Refining Co. of Philadelphia has just completed very successful trials, and is an interesting ship from an engineering point of view. Trials were carried out to a total displacement of 17 250 tons, and the mean speed obtained



A general view of the new 17 250 ton Diesel-electric oil tanker "Brunswick."

with this displacement was 11·48 knots. Built at Greenock by Scotts' Shipbuilding and Engineering Co., Ltd., this vessel is provided with electric propulsion equipment manufactured by the British Thomson-Houston Co., Ltd., Rugby, the auxiliary motors and control gear for all services also being of this company's manufacture.

The main propelling machinery comprises four generating sets arranged in an engine room aft, each unit consisting of a six-cylinder Ingersoll-Rand Diesel engine running at 225 revs. per min., and direct coupled to a 600 kW generator supplying continuous current for propulsion purposes at 250 V. Each engine also drives an auxiliary generator of 75 kW, 250 V, which is arranged in tandem with the main generator. These auxiliary generators supply power for the ship's auxiliaries and also for the excitation of the main generators and the propelling motor. The main generators are coupled in series, and although all four are in operation at full power, three, two, or only one sets may be used for reduced power, the combined voltages being 1 000, 750, 500 and 250 according to the number of sets on the propelling circuits.

The main propelling motor is rated 2 800 S.H.P. at 95 revs. per min. It comprises two units, each complete with a separate magnet frame, armature and commutator, the two armatures being connected in series and mounted on a common shaft supported between two pedestal bearings. As the propeller motor consists virtually of two motors in series it is possible to develop power for about three-quarter speed with only one-half of the motor in commission. All the propelling generator and motor fields are separately excited from one of the auxiliary generators. Starting, stopping and reversing of the propeller motor are effected entirely by varying the excitation of the main generators or generator, as the case may be.

### Control Arrangements.

The electrical control arrangements are such that the main propelling circuits are never interrupted, and all regulation and reversing is carried out by varying the field circuits only. Provision is, however, made for isolating any of the generating units as desired. The control is carried out by means of a lever attached to a small controller fixed to the front of a sheet steel panel carrying the necessary instruments, this lever being moved by the operator to either side of a central stop point, so that, when manœuvring, it is only necessary to move the lever on to the speed point required, either ahead or astern.

Actual variation of the propelling generator fields during manœuvring is effected by means of a reversing potentiometer rheostat common to each generator field circuit, the rheostat being operated through gearing by a small electric motor. Movement of the control lever merely switches this small motor into circuit, and, by means of follow-up gear, the small motor switches itself out, and stops when it has moved the field rheostat to a position where a field strength is obtained on the generators corresponding to the speed point where the lever is at rest on the controller. The speed at which the potentiometer rheostat increases the voltage on the generators is such that under normal conditions the power required to accelerate the ship does not exceed the full load capacity of the engines. This is taken care of automatically by the follow-up gear, regardless of the speed with which the controller on the bridge is operated. There is also a special type of overload current relay in the main circuit.

Main circuit breakers or main power interrupting devices are not provided in the propelling circuit, as it is considered preferable, on plants of this description, to leave the stressing of the equipment under abnormal conditions entirely at the discretion of the engineer.

In this connection it is as well to bear in mind that the motor is on a circuit entirely different from the usual power circuit on land. As this propeller motor is of a size which is equal in capacity to the generating plant, it is not so liable to prolonged overloads.

Normally the propelling system is connected through a circuit breaker and current limiting resistance to the ship's structure at the point between the two motor armatures, but should an accidental earth occur on any part of the main circuit sufficient to open this circuit breaker, a loud ringing bell in the engine room gives audible warning.

### Avoiding Stoppages.

Another feature of the equipment is the simple manner in which a generating set can be put into or taken out of service without entailing a stoppage of the propeller motor. Even if the set which it is desired to shut down is supplying the excitation, the operator at the control panel can, by means of a convenient handwheel, transfer the excitation to another auxiliary generator without leaving his post.

Each propelling generator is provided with a protected type of switch panel carrying four operating handles and suitable interlocking gear, which enables a generator to be put in the propelling circuit, or taken out, without damage by careless switching. These panels also allow any one of the propelling generators to be used for the auxiliary load.

In the event of failure of the excitation supply voltage the main potentiometer rheostat returns automatically to the "stop" point, recloses the field contactors, resets the overload relay (if tripped) and returns automatically to the previous setting (according to the position of the bridge controller) as soon as voltage is resumed.

To provide against such a contingency as failure of the small rheostat motor when the vessel is being manœuvred in narrow waters, a handwheel mounted on the motor panel enables the potentiometer rheostat to be manually operated. This handwheel is normally disengaged from the rheostat operating shaft, but is always ready for instant engagement should the propeller speed fail to respond to a movement of the control lever; and, when engaged, it automatically cuts the small rheostat motor out of circuit. The control lever is so arranged as to allow a complete full power reversal to be carried out in about 8 sec. The effort required to do this manually is too great to allow it to be done in this period, and the handwheel is geared so that it can be operated conveniently through a full power reversal in about 30 sec.

When bringing the propeller to rest prior to a reversal in its direction of rotation, the power returned to the electrical system due to the action of the water causing the propeller to keep rotating in a forward direction (and consequently to drive the propeller motor as a generator) is dissipated in "motoring" the propelling generators.

The propelling generators in turn partially or entirely supply the motive power to rotate the engines and auxiliary generators, and, due to the considerable amount of power required to overcome the friction load of a Diesel engine at full speed (about 33 per cent. of its normal output), this forms a very convenient means of dissipating the braking energy.

A feature of the electrical installation is the main switchboard, which has an overall length of 30 ft. and consists of 11 panels, as follows:—One propeller motor control panel. Four generator panels, each of which has "set-up" switches which can be mechanically operated from the front of the board. All live parts are at the back of the panels, and the fronts are "dead." The "set-up" switches are arranged to

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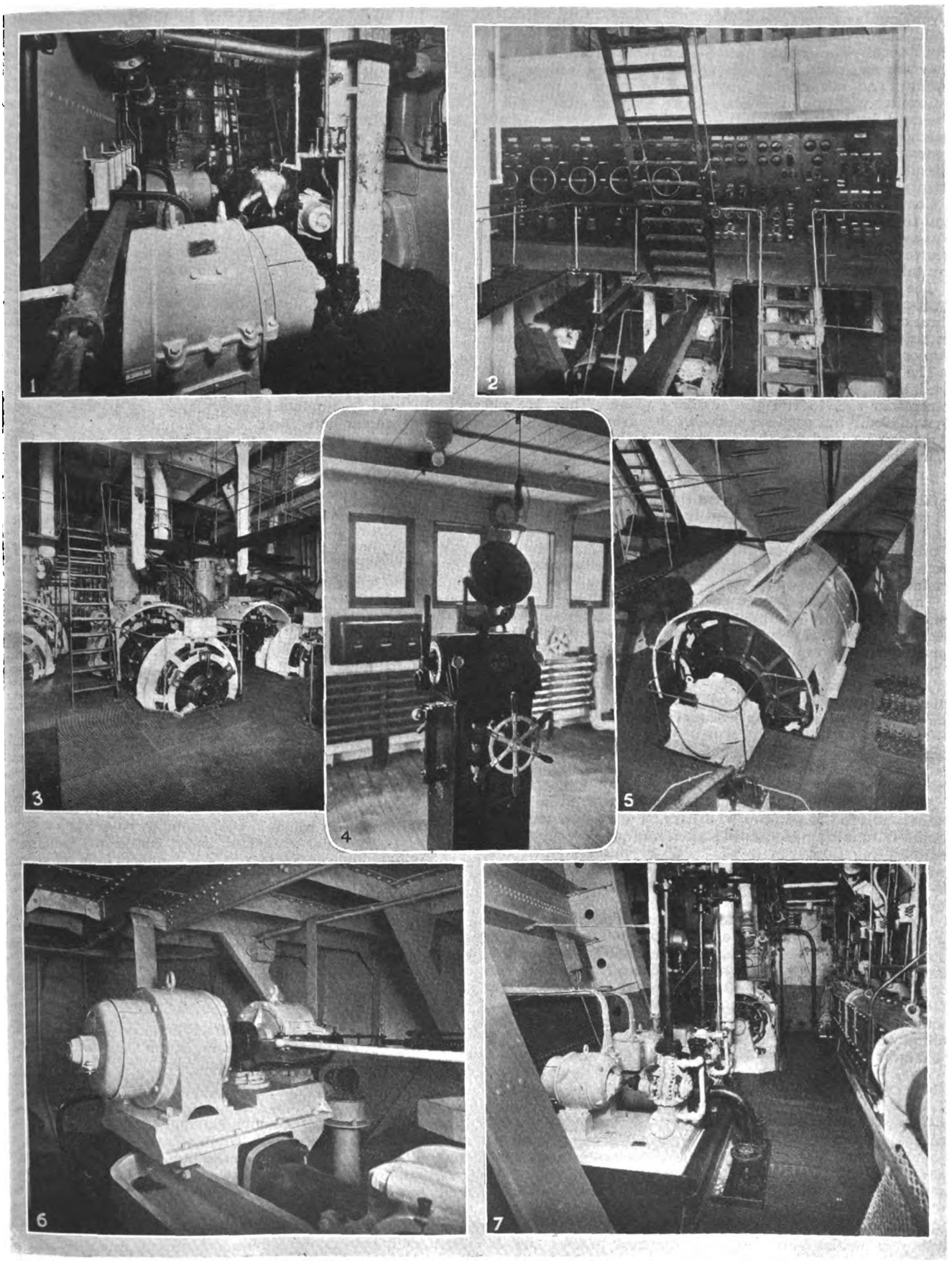

[By courtesy of the British Thomson-Houston Co.

## THE DIESEL-ELECTRIC OIL TANKER "BRUNSWICK."

THE accompanying views of electrical equipment on the latest Diesel-electric ship (see article on page 268) illustrate :—(1) Three 80 h.p. motors driving cargo pumps, also 3 h.p. motors driving fuel oil and lubricating oil centrifuges ; (2) the main switchboard controlling all the electrical equipment on the ship ; (3) the Diesel engine driven 600 kW 250 V generators (for supplying the propeller motor) and the 75 kW auxiliary generators ; (4) the master controller on the bridge, mounted on top of the "Sperry" gyro compass pedestal, indicating meter panel and steering wheel ; (5) the propeller motor (2 800 s.h.p. at 95 revs. per min.) seen from the top of the engines driving the main generators ; (6) a 15 h.p. motor driving the "Hastie" hydraulic steering gear ; (7) two motor-driven oil fuel pumps and engine-driven 35 kW auxiliary generator.

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give three positions, namely "off", "propulsion circuit" and "main power busbars." Four exciter panels of the dead front type. The exciter switch arrangements are such that they are mechanically interlocked to prevent paralleling the exciter, and electrically interlocked to prevent paralleling an exciter with the main generators. One balancer panel of the dead front type arranged so as to permit operation of the balancer from either the exciter circuit or from the auxiliary generator circuit. One distribution panel for auxiliary circuits, arranged so that it is possible to supply all auxiliaries from either the exciter busbars, or main power busbars.

Complete metering equipments are provided on all panels, and the entire switchboard has earth detector voltmeters and earth detector lights. Current detection apparatus is connected for each set of busbars and for each generator, motor, excitation, balancer circuit, etc.

The four main generators are connected in series, and "set-up" switches on the main switchboard enable one, two, three or four generators to be used. When it is desired to run at reduced speed it is more economical to shut down one, two or three engines according to the speed required.

The auxiliary generators or exciters are self-excited and are used to supply excitation to the propeller motor and main generators and to run the auxiliary plant. They are not "paralleled," but each supplies an independent circuit. Any three can be used for these purposes at the same time, the fourth being a standby.

### Avoidance of "Motoring."

The voltage of the exciters is utilised to energise potential or voltage relays which are used to trip out contactors in the field circuits of the main generators, when the latter are on "propulsion," so as to prevent the remaining generators from "motoring" an engine in the reverse direction should the engine cease to develop power.

Three sets of busbars are provided for auxiliary purposes, and interlocks prevent more than one generator being connected to the same set of busbars at one time. The three sets of busbars are (1) "excitation" (2) "auxiliary" (3) "main power."

The main generator "set-up" switches are mechanically interlocked to prevent "live switching": a lever which takes the field off a generator must be moved to the "off" position before the main switch can operate. These "set-up" switches are also mechanically interlocked to prevent more than one generator from being connected to the "main power" busbars at one time.

A busbar connecting switch connects the "auxiliary" busbars to the "excitation" busbars for use when only one engine is running. Mechanical interlocks prevent any other exciter being closed on to the auxiliary busbars when this switch is closed. The exciter switches are interlocked to prevent more than one being closed on to the same busbars at one time.

The equipment of the electrically-driven auxiliary machinery on the vessel is carried out on a very extensive scale, all engine room auxiliaries and deck machinery, including pumps, fans, compressors, winches, etc., being electrically driven. The total horse-power of the auxiliary motors is 550 and the size of the individual motors ranges from 1 to 80 H.P. All the motor starters are mounted on two auxiliary panels. The voltage of the power circuits is 250, while for lighting purposes a balancer set, 250 to 125 V, is provided.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Page Sizes of Technical Journals.

[To the Editor.]

Sir,—The recent research conducted by the Incorporated Society of British Advertisers on the nett printed size of various technical journals, has revealed a bewildering variety of spaces and proportions amongst them.

A table has been prepared showing the length and breadth of the printed area in 56 representative trade journals, together with a third column showing the relationship between the two. Perusal of this list reveals that, apart from the difference in the actual size of the pages themselves, there is, from the advertisers' point of view, a more serious variation in the proportions of length and breadth, this ratio varying from as low a figure as 1·03 in the case of the "British Industries Journal" to as much as 1·76 in that of the "Foundry Trades Journal."

A further examination of this table reveals the fact that there is a large and influential body of technical papers, of which The Electrician is one, whose dimensions approximate to the handy size of 10 in. by 7 in., or thereabouts. The most recent addition to this group of journals is the "Colliery Guardian," which has been cut down from the unwieldy size of 15 in. by 9 in. to the more standard one of 10 in. by 7¼ in.

The importance of a standardised page size in technical journals, or, at any rate, of a standard shape of page, lies in the fact that a single artist's drawing could be used without modification for the supply of all necessary blocks for illustrations. This means a lot to a firm advertising in, say, a dozen journals every week. In fact, one potential advertiser has complained that out of every £1 000 he spends in advertising, £300 is swallowed up in block making alone. This, of course, is an exceptionally high figure, and one which is not reached in many cases, but it is very evident that technical journals representing similar interests could benefit themselves very largely by standardising their page sizes.

For instance, out of the £300 mentioned above as being wasted on unproductive block making, £200 or more could be diverted to productive publicity if the papers concerned were of similar dimensions.

Publishing charges would presumably be reduced, paper costs lowered and the life of a standard-sized journal increased, owing to the tendency of the public to retain periodicals only when they store easily, and to discard them when they don't. —I am, etc.

W. McWilliam.

Hayes,
Middlesex.

### Advertising the National Register.

[To the Editor.]

Sir,—I was very glad to see in your current issue such an unequivocal expression of views on the publicity policy of the National Register of Electrical Installation Contractors, as that contained in your "Current Topic" dealing with the letter by "V. E. B."

Although I am myself an electrical contractor, and was among the first to qualify for admission to the roll of the National Register, I strongly deplore the efforts that are being made by certain contractors to influence, for their own advantage, the policy of the Register. Obviously, the value of registration will be largely discounted if it is felt that the registered contractors themselves have too big a say in the conduct of an organisation which is not meant to be a trade association, but an official qualifying body, whose first duty is to the general public in safeguarding its members from the shoddy workmanship which has so often been referred to in your columns.

While many people in the industry would like to see the Register embark on a publicity campaign which would instruct the architect and builder in the value of registration, it should be realised that this is not quite the same proposition as advertising on behalf of individual registered contractors in their own locality, a job which in my opinion, they should all be prepared to do for themselves.

If the Register can arrange for a little more *general* publicity I, for one, will gladly do my share, in the local newspapers.

I am, etc.,

"Registrician."

September 8th.

[To the Editor.]

Sir,—The answer to "V. E. B.'s" query in your issue of September 7th, as to whether the public is sufficiently aware of the necessity to employ reliable installation contractors who can be relied upon to use good materials, must surely depend upon the extent to which individual contractors employ the various phases of the publicity art in their own territory.

Apart from retail druggists and grocers, I can think of no other class of trader who is more "spoon fed" by manufacturers than is the electrical contractor of to-day. The electrical manufacturers of this country are not only producing a good article and selling it to the trade, but they are also selling it for the retail trade to the public. Being accustomed to such generous treatment many contractors expect the National Register to help them in as liberal a way.

I am, etc.

"Publicist."

September 10th.

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# THE VOLTA EFFECT.*

## Recent Developments Place Controversial Topic on New Footing—Lord Kelvin's Discovery—What Happens at the Zinc-Liquid Junction?—Difficulties of the Electronic Theory.

By Prof. ALFRED W. PORTER, D.Sc., F.R.S.

THE subject that I have chosen for this address is the Volta effect. Volta's discovery was made towards the end of the eighteenth century (1792). The subject from the beginning proved to be a very controversial one. The time was not ripe in Volta's day properly to discuss it. In its modern form discussion may be said to have begun soon after the acceptance of the two principles of thermodynamics in 1850. The principle of energy and that of entropy put an entirely new complexion upon it.

Early in the nineteenth century a second mode of obtaining a flow of electricity was discovered by Seebeck (1822) which depended on creating differences of temperature in a circuit of two metals. This was the discovery of the thermo-electric circuit. It was inevitable that the two discoveries should become associated with one another, for the thermo-electric electromotive force might be simply due to the temperature variations of the other. The Seebeck effect is very small. A hundred degrees difference of temperature provides an e.m.f. of the order of millivolts at most, while the Volta effect for copper and zinc is of the order of one volt.

The developments in our knowledge of the electron since 1895 have placed the subject on a new footing. When Sir William Thomson (Kelvin) first gave an explanation of thermo-electric phenomena he spoke of $\sigma$ as being the specific heat of electricity. There is no clear evidence that he used the term in anything but in an analogical way. To Maxwell the idea of the corporeality of electricity was exceedingly distasteful. He assumed that such a phrase as the specific heat of electricity " was not intended by Thomson, and must not be understood by us to imply that electricity, either positive or negative, is a fluid, which can be heated or cooled, and which has a definite specific heat." He shelved the question by talking of change of entropy instead. Maxwell's conceptions in regard to the non-corporeality of electricity almost won the day when Hertzian waves were found to be transmitted in free space where no electricity was.

But the bodily nature of electricity came to be a real thing in the years succeeding 1895. Negative electricity was isolated as electrons, while positive electricity has not yet been separated from the rest of the atom, and may consist of all of the atom which is not electrons. There is now no difficulty in thinking of electricity as a receptacle of energy which may be communicated to it in the form of heat ; that is, it has come within the thermodynamical scheme. The question is, which is the best picture that can be given of its position in that scheme?

### Behaviour of the Electrons.

Now, firstly, when an electric current passes across a junction between two metals, say copper and zinc, it is quite certain that no detectable amount of metal is carried by it across the junction. We are not concerned with the formation of brass (as probably Sir Oliver Lodge has already said). The only things that pass are the electrons which are responsible for conveying the current in each metal. These are tolerably free to move under the influence of an electric force. [They are not set free by the force, for otherwise Ohm's Law would not hold good.] The copper or zinc serves merely as a framework through which their motion occurs. The electrons can get across a boundary between the metals, but the fact that heat changes occur thereat is evidence that they may need to be helped over—there is a rise (or drop) of potential there, though not of an amount equal to the heat entry. It is convenient to think of this potential as a pressure arising from electrical forces, or more strictly, a pressure divided by the charge on the electron.

It is clear that thermodynamically we may regard the metal as a solution or binary system, the electrons being the solute. The boundary between the zinc and copper acts as a semi-permeable membrane, since the electrons, and nothing else, can get through it. FitzGerald spoke of the free surface of a solution as the most perfect semi-permeable membrane, but the boundary surface between two metals in regard to electrons runs it very close. There is a difference of pressure (or potential) between the two sides. This is an osmotic pressure. The electrons can also escape to some extent from the sides of the wire ; they have a vapour pressure. If the temperature is raised this becomes very conspicuous as thermionic emission. The copper also has a vapour pressure, but much smaller. We have then to deal with a volatile solute dissolved in a practically involatile solvent—at least at moderate temperatures.

This being so, and thermodynamics being superior to the idiosyncracies of individual mechanisms, we can at once transfer all that we know about the thermodynamics of solutions to the thermo-electric circuit.

Passing on to consider electrolytic regions, i.e., voltaic cells. Volta's own theory was that the driving force was situated at the metal-metal junction. His view was afterwards adopted by Lord Kelvin. This is a specially interesting fact because Kelvin was one of the first to show that the *energy* of the current was supplied by the chemical actions in the cell. This was afterwards slightly corrected by Helmholtz.

We can in fact no more ignore the heat taken in in this case than we had a right to ignore the internal work done when dealing with the thermo-electric circuit.

### Different Osmotic Conditions.

We must be prepared to find that the osmotic conditions in voltaic cells are different from those in metals. Consider the circuit of a Daniell cell: Zn—$ZnSo_4$sol$^n$—Membrane—$CuSo_4$sol$^n$—Cu—outside circuit—Zn.

The first difference is that it is not merely electrons that move. What happens at the zinc-liquid junction ? We are not certain. Physical chemists under the influence of Debye are revising their conceptions in regard to solutions. The old dissociation theory assumed that positive and negative ions moved about quite freely unless appropriate collisions occurred, when combination might take place, the amount of combination being calculable from the law of mass action, The theory was exceedingly useful, but there was an outstanding difficulty in regard to " strong " electrolytes. These do not follow the law of mass action. Debye assumes complete dissociation, but with electrical attractions between the ions due to their positive and negative charges. These forces give rise to what may be called potential combination, following, however, a different law from that of mass action and the difficulty in regard to " strong " electrolytes is removed, though only for dilute solutions. The important fact, however, is that some of the zinc goes into the solution, carrying positive charges with it. It goes in, not merely by evaporation, as in Nernst's theory, but it is in part pulled in by the $SO_4$-ions carrying negative charges. Again at the copper plate, copper is deposited, not freely as a vapour might condense, but is retarded by the attractions of the $SO_4$-ions in the solution. Both plates act as semi-permeable membranes, passing selected substances and stopping others. So far as we know, no electricity gets through either of these membranes except as a rider on an ion. . At any rate, this must be so as long as Faraday's laws of electrolysis hold good.

On the other hand, the membrane (porous pot, etc.) separating the two solutions acts as a membrane more nearly of the metallic kind. Electrons that were riding on $SO_4$-ions get through, leaving their mounts behind. Few membranes will act in precisely this way, and considerable variety may therefore exist in the voltage changes at this membrane. It is not unlikely that the voltage there may be of the same order as that at the outside copper-zinc junction, but of opposite sign ; for in both cases electrons alone are passing. If this is so, then the electromotive force of a circuit may, at least approximately, be the sum of those arising at the metal-liquid junctions.

From what I have said, it will be clear that my opinion is that it is still necessary to be cautious and to avoid dogmatism on this question. Much more detailed experimental knowledge is required before the electric circuit is really understood. The electronic theory in metals still has its difficulties, which it is useless to ignore. It is only by recognising the difficulties that advance is made. On the other hand, the experimental difficulties in connection with the

* Extracts from an Address to Section A of the British Association, delivered on Monday.

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direct measurement of Volta effect are also very great, as all who have made experiments on it must know.

Both the experiments and the theory are associated with great difficulties. My own opinion is that, though the voltage at the metal-metal junction is likely to be much larger than the chemical school demanded, there is nothing to justify one in going to the opposite extreme and expecting that the *whole* of the electromotive of a circuit is located at that junction. Opposing schools may both take comfort in the thought that in some respects they are both right.

# AUSTRALIAN LETTER.

## Rapid Development of Electrical Appliance Business.

By W. DAVEY (Managing Editor, "The Australian Electrical Times").

MELBOURNE, August 1st, 1928.

A PROFOUND impression has been made in Australian engineering circles by the sentence of six months' imprisonment with hard labour and a fine of £500 passed upon S. Y. Maling for having corruptly received a sum of £10 600 as a reward for having recommended the acceptance of a certain tender by the Sydney City Council. The stipendiary magistrate, in passing sentence, said that Maling was convicted of a gross offence calculated to shock the moral sense of every right-thinking person in the community, and that offences of such a nature must inevitably destroy commercial morality. Maling has given notice of appeal. For many years past there have been rumours of corruption in connection with the dealings of the Sydney City Council, and there is a general feeling that the present drastic methods will bring about a much needed improvement.

* * *

The tram-'bus controversy continues unabated in the Commonwealth. In Sydney the 'buses are making headway to the detriment of the electric trams, but in Melbourne State action has almost stamped out the road transport services for the time being. An interesting suggestion made by the Melbourne Tramways Board, but apparently shelved for the present, is that instead of extending railways into certain outer suburban areas, trams run on open ballast should be substituted and used for the conveyance of goods as well as of passengers.

* * *

The electrification of the Sydney suburban railway system is now taking definite shape, and a schedule announced by the Minister for Railways this month shows that the whole system should be running with a complete electric service by October next year.

* * *

In the wireless world, the principal topic of conversation this month is the expressed intention of the Federal Government to assume control of "A" class broadcasting, calling tenders periodically for the provision of programmes. There are two classes of broadcasting station in Australia. The "A" class, which receive their revenue out of listeners' licence fees and are not permitted to broadcast advertising matter; and the "B" class stations, which receive the whole of their revenue from advertising.

There is much curiosity as to the effect which the announced wireless and cable merger will have upon Australian services, for Australia's wireless services are controlled by Amalgamated Wireless (Australasia), Ltd., formerly a subsidiary of the Marconi interests, but now controlled by the Federal Government, which holds a majority of the shares.

Australians, by the way, are led to expect that within the next year or two the beam stations of Amalgamated Wireless (Australasia), Ltd., will be giving telephone as well as telegraph communication with the Motherland.

* * *

An interesting piece of work which has just been commenced is the provision and electric lighting of aeroplane landing ports between Western Australia and Melbourne in preparation for the inauguration of an aeroplane mail service between the East and West of Australia. Mr. H. P. Moss, chief electrical engineer of the Commonwealth Department of Works and Railways, is looking into the lighting of these proposed landing places. The East-West mail service, when in operation, will enable us to communicate with London by letter more quickly than in the past.

* * *

Australian trade (electrical and other) shows some slight signs of revival after the dullest period that has been experienced since the war. Unemployment is still high throughout Australia, but a good season is expected for primary products, and it is hoped that before the end of the year the country will be in a position to employ most of those willing to work, and to spend money more freely.

One very noticeable trend of the electrical business is that wholesalers are reaching out towards the consumer. One large American company's local house now has branches in six provincial towns and cities, as well as in the State capitals. Another aspect of trade which is causing concern among retailers is the increasing tendency of department stores to sell domestic electric appliances at cut prices as "specials" to atttract the public to their stores.

The development of the domestic appliance business in Australia is accelerating rapidly. As an instance of this, it may be said that a few years ago practically the whole of the current consumed in small provincial towns which have no local industries was used for lighting. To-day it is no very uncommon thing to find that a country town which has doubled its consumption of electricity in the last few years is employing 25 per cent. of the current for light and 75 per cent. for heating, cooking, cleaning, and other purposes. From 1922 to 1926 the annual Australian consumption of electrical energy increased from 801 650 705 kWh to 1 729 936 637 kWh, or by more than 115 per cent. The current five-year period will witness a still more rapid increase.

# LOOKING BACKWARD.

FIFTY years ago it stated in THE ELECTRICIAN, dated September 14th, 1878, that :—

M. de Parvelle suggested the use of the telephone for determining the position of the magnetic meridian.

The postal authorities decided to introduce the sounders designed by Mr. Elisha Gray into the English offices.

The Chemical Society made a grant of £30 from its Research Fund to Dr. W. Ramsay, for determining the electrical conductivity and resistance of solutions of salts at different temperatures.

* * *

Twenty-five years ago, according to THE ELECTRICIAN, dated September 18th, 1903 :—

The North Eastern Railway installed the "Crewe" system of electric signalling in its York goods yard.

A "one-man" tramcar, designed by Mr. J. S. Raworth, had successfully completed its trial runs in Southport.

The capital of the Sir Hiram Maxim Electrical and Engineering Co., Ltd., was increased by £15 000 to £190 000.

Negotiations for the formation of a Continental incandescent electric lamp combine was about to be concluded.

Mr. A. Blackman was selected from 70 applicants to succeed Mr. R. A. Chattock as borough electrical engineer of Bradford.

In a British Association paper, Col. R. E. Crompton gave suggestions for dealing with the traffic chaos in London streets.

Mr. Sydney Baynes, borough electrical engineer of St. Pancras, was involved in a dispute with the C.M.A. following his insistence, in a call for tenders, on conditions which the English tendering firms deemed to be unfair.

# POINTS OF VIEW.

Business can be very interesting if taken seriously and in the right spirit.—*Sir Sydney Skinner.*

* * *

Never before have there been such opportunities for progress and resultant achievement.—*Mr. F. W. F. Matthew.*

* * *

Business men to-day constitute the army in the field; men of science are the army in reserve.—*Sir Arthur Keith.*

* * *

The working class wife ought to have a house electrically equipped.—*Miss F. A. Underwood, Secretary, Women's Freedom League.*

* * *

There is going to be more and more capital employed in the hire-purchase business, and any amount of capital could be used in it.—*Mr. A. Noel Mobbs.*

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# NEWS IN BRIEF.

## Objection to Sunday Shop-Window Lighting—Morecambe and Blackpool Illuminations—Electrical Apparatus for Wakefield Schools—Stretford and Glasgow Electricity Showrooms—Forthcoming Exhibitions.

JUNIOR assistants are required at the National Physical Laboratory, Teddington.

A Business Efficiency Exhibition is being held in St. Andrews Halls, Glasgow, until September 20th.

An assistant lecturer and demonstrator in electrical engineering is required at the University of Sheffield.

The practice of illuminating windows of business premises after dusk on Sundays has raised a strong protest from the Waterfoot (Lancs) Tradesmen's Association.

Readers desirous of providing exhibits for display at the Conversazione of the Overhead Lines Association on October 10th, are invited to apply within the next few days, as the space available is limited.

Morecambe's promenade illuminations, which are now in progress, are estimated to cost £1 468, including £100 which is to be awarded in prizes for the best displays by entertainment halls, hotels, business premises and boarding houses.

The Irish Electricity Supply Board has acquired showroom premises in Main Street, Wexford, and at 37, Main Street, Maryborough. The district headquarters of the operating staffs of the Shannon networks will also be at the addresses mentioned.

An electrically-blown travelling organ has been installed in Hereford Cathedral for use during choral festivals. Designed by the cathedral organist, Dr. Percy C. Hull, it is self-contained, can be moved into any desired position at will, and is believed to be the only organ of its kind existing.

A feature of the Home and Industries Exhibition to be held at Birkenhead, from October 24th to November 23rd, will be an all-electric house.

Halifax Electricity Committee is to appoint a generating engineer at a commencing salary of £400 per annum, rising by £25 a year to a maximum of £500.

Wakefield Electricity Committee has arranged to supply the Education Committee with electrical apparatus on hire for teaching and demonstrating purposes at the Manygates School. The Electricity Committee will also instal an electrical cooker for demonstration purposes at the Newstead Road Cookery School.

A report by the "Financial Times" correspondent on trade in the Sheffield district states that the electrical engineering shops are working day and night, and are sufficiently well booked to ensure this satisfactory state of affairs being maintained for very many months. It is the most satisfactory of the newer industries of Sheffield.

Chorley Board of Guardians has considered the question whether the steam engine used to drive the dynamo supplying heating and lighting at the institution should be repaired at a cost of £200, or whether an offer of the Lancashire Electric Power Co. to supply and fix a motor at a cost of £180, and supply current for £159 a year should be accepted. The question was referred to the next meeting.

The Postal Telegraph Co. put into commercial operation last week a new "photogram" service for the transmission of facsimile messages between certain towns in the United States, at a charge of 1½ times the ordinary rate for pictures, messages in Chinese or Hebrew, etc., the charges vary according to the size of the photographic plate and the distance of transmission. For a plate 5 in. by 7 in. sent from New York to Boston or Cleveland the charge is $15.

Hackney (London) Borough Council require a district engineer (mains) and a junior assistant engineer (mains).

Sheffield Electricity Committee has decided to arrange for a stand at the "Better Housing and Housekeeping" Exhibition to be held at the Norfolk Drill Hall, from October 2nd to 13th.

### *A NOTABLE TRANSPORT FEAT.*

*PART of a train load of electric propulsion equipment for the new P. & O. liner "Viceroy of India," is seen above, leaving the Rugby works of the B.T.-H. Co. The two leading forty-ton well trucks were used for the rotors for the two propelling motors, the size of the rotors rendering the load considerably out of gauge. Special arrangements were made to work the train to Glasgow, but although the train left Rugby one Sunday, all trucks were ready for unloading on Tuesday. The trucks were loaded to the maximum height of 13 ft. above rail level, and the extreme width of 11 ft. 5 in. occurred about 7 ft. 3 in. above rail level. In all, there were fourteen trucks of electrical equipment, weighing 152 tons, in this consignment. A further 250 tons of electrical machinery is being supplied from the Rugby works for this vessel, which is due to be launched to-morrow (Saturday).*

Contributions to the Royal Berkshire Hospital, Reading, for the past quarter, include: Great Western Railway telegraph maintenance, £7 14s.; Post Office telephones, £4 10s. 10d.; and the Pulsometer Engineering Co., £40 19s. 7d.

The Lancashire County Valuation Committee has announced that the Minister of Health has consented to the publication of the joint opinion of counsel (Mr. H. P. Macmillan, K.C., and Mr. Rowland Harker, K.C.) with regard to the rating of electric motors.

Glasgow Electricity Committee has approved of the establishment of showrooms in Waterloo Street, Glasgow, at an estimated cost of £8 000, and the Committee recommends the selection of a number of architects to prepare plans for the conversion of the premises.

Birkenhead Watch Committee has had an interview with the Home Office relative to the installation of automatic traffic controls for certain street junctions, and has authorised the chief constable to instal an experimental set of automatic traffic controls at an estimated cost of £220.

Glasgow Magistrates Committee has been in communication with the Forest City Electrical Co., in connection with a proposal to instal automatic traffic control signals in the city, and have authorised the master of works and the chief constable to visit and inspect automatic control apparatus in that firm's premises in Manchester.

In the Indian Legislative Assembly last week a resolution was passed that the correspondence with the Secretary of State relating to the cable-wireless merger scheme should be placed on the table. Mr. McWatters, secretary of the Industries and Labour Department, said the Government of India was still not committed to the final arrangements.

A notable feature of Blackpool's autumn illuminations is the lighting of the open-air bathing pool. The reflection of over 8 000 electric lights of all colours is cast upon 1 700 000 gallons of water in the bath. This year's illuminations are very ambitious. Over 1 000 more lights have been installed than last year. and many new features have been introduced.

The s.s. "Highland Chieftain," which is being completed at Messrs. Harland and Wolff's, Belfast, has an electrical installation consisting of four Diesel-driven generators, each having an output of 200 kW at 220 V. These dynamos run in parallel, and supply current to a large switchboard, from which it is distributed throughout the vessel. All the auxiliary machinery is electrically driven.

Stretford Electricity Committee has decided to limit the purchase of appliances from three approved manufacturers, subject to the usual guarantees.—The chairman of the Electricity Committee has invited suggestions from members as to a suitable site for a showroom in the Old Trafford area. The surveyor has been requested to prepare a plan of a suitable building adjacent to the Council's property at Trafford Bar. The chairman has undertaken to obtain a suitable place in the Stretford area for a showroom.

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# PERSONAL.

The late Mr. George Gordon Peter Brodie, chairman of Parker, Winder and Achurch, left unsettled property valued at £176 998; net £167 515.

Mr. William George Pitt, has, on the occasion of his marriage, been presented with a clock by the staff of Stretford Urban Council electricity department.

On the occasion of his marriage. Mr. Thomas S. Micklethwaite, of the staff of the Yorkshire Electric Power Co., was presented with a case of fish knives and forks by the staff of the testing department.

Hamilton T.C. has granted an honorarium of 100 guineas to Mr. W. D. Brassington, electrical engineer, for special services rendered in connection with the change-over from steam generation to bulk supply.

At Mount Pleasant Baptist Chapel, Burnley, last Saturday, Miss Ada Butterworth was married to Mr. James H. Whittam. The couple were the recipients of handsome presents, including a clock from the employees of Burnley Components, Ltd., by whom Mr. Whittam is employed.

Leeds Tramway Committee on Tuesday recommended the appointment of Mr. R. L. Horsfield, manager of the Cardiff tramways, as tramways and transport general manager, at a salary of £1 500, in succession to Mr. W. Chamberlain, who was recently appointed manager of the Belfast tramways.

Mr. Arnold P. Hill, formerly an engineer with the British Broadcasting Co., and now with the British Thomson-Houston Co., Ltd., who was married last Saturday to Miss K. M. Johnson, has been presented with a case of cutlery by the fitting department at the B.T.-H. works, and the bride received a dinner service from the company's export department.

A sub-committee of the Guildford Electricity Committee has appointed Mr. H. R. Billing as installation superintendent and Mr. W. F. May as assistant mains superintendent, each at £200 per annum, rising by annual increments of £12 10s. to £250. The Committee will meet again this week to interview candidates for the post of deputy borough electrical engineer, for which there were 170 applicants.

Results of the City and Guilds of London examinations at Preston include: National Certificates and Diplomas in Electrical Engineering: Messrs. R. Baines, B. T. Cooke, J. Curwen, F. Dakin (distinction in practical mathematics), W. H. Duckworth, V. G. Heyes, G. E. Holden, H. Jones (distinction in practical mathematics), R. N. Mace, W. Nelson, J. G. Parry, E. B. Thredder, E. Watkinson, J. Woods.

Hull Electricity Committee on Tuesday interviewed eight of the 56 applicants for the post of electrical engineer, which became vacant in consequence of Major H. Bell's appointment to a similar position at Glasgow. The salary offered is £1 300 per annum, rising to £1 500. The Committee decided to recommend three names to the Council on October 11th in the following order: Mr. E. Morgan, chief engineer and general manager, Wolverhampton Electricity Department; Mr. J. N. Waite, deputy electrical engineer, Bradford; Mr. R. Lee, borough electrical engineer, St. Helens. The other candidates interviewed were Mr. P. G. Campling (Great Yarmouth); Mr. H. C. Fraser (Yorkshire Electric Power Co.); Mr. W. S. Johnston (Dumfries); Mr. W. A. Royal (Sunderland); and Mr. J. R. Struthers (Belfast).

## Obituary.

Mr. Alfred Wood, on September 4th. He was chairman of Scupham and Wood, Ltd.

Mr. S. M. Gluckstein, on August 30th, aged 43 years. He was head of the electrical engineering department of J. Lyons and Co., Ltd.

Mr. J. M. Cole, secretary to the Paignton Electric Light Co., on August 29th. Mr. Cole's death was due to injuries resulting from his being knocked down by a motor car.

Mrs. John W. Mackay, mother of Mr. Clarence Mackay, president of the Commercial Cable Co., and widow of the once famous "Bonanza King," on Wednesday last, at the age of 85.

The Hon. George Swinburne, on September 4th, aged 65 years. He was a member of the Victorian Electricity Commission and a director of the Electrolytic Zinc Co., of Australasia.

Mr. John Laurence Smith, August 26th, at the age of 48 years. He had for 12 years been superintendent of the electricity generating station of the Walthamstow U.D.C., and was previously chief charge engineer at Stepney.

Dr. Fernand Ducretet, aged 50 years. He was an X-ray pioneer and had undergone forty-four operations. In 1896 he demonstrated to the Academy of Sciences, Paris, the possibilities of Roentgen rays. In 1917, after he had worked twenty-seven years with X-rays and had undergone seventeen operations, he became blind.

Mr. J. G. A. Hart, recently, at his residence at Edinburgh. He served his apprenticeship in engineering at Woolwich, and specialised in electrical work. After service with other important firms, he was appointed, 25 years ago, as works manager to Messrs. Bruce Peebles and Co., Ltd. Later, he started business on his own account in Leith.

# LEGAL INTELLIGENCE.

## Fraudulent Bankruptcy.

In sentencing a commission agent named Louis Samuel to six months' imprisonment in the second division, Sir H. F. Dickens, Common Serjeant, said: This kind of bankruptcy offence is a serious one and far too prevalent. We have to stamp this kind of offence down. It is impossible for me to pass this over, and although it is your first offence, I have got to deter others. The case was heard at the Central Criminal Court last week, when Mr. P. Clarke, for the prosecution, said that the accused had pleaded guilty to disposing of assets within twelve months of the presentation of a bankruptcy petition. The goods were disposed of other than in the ordinary course of business, with intent to defraud creditors. In one case the defendant was charged with disposing of property which he had obtained on credit through Louis Samuel, Ltd., and in another case through Delporte, Ltd. On October, 1926, the prisoner purchased from a relative a business known as Smarts Stores, dealing in wireless accessories, and for which he paid £200. He purchased stock from a firm known as Radio-Land, Ltd., and promised to pay cash. About £300 worth of goods were supplied. He paid for a small part of the goods, and was owing a considerable amount more, and when asked for payment gave excuses in order to delay settling the amount. He also obtained goods from another firm called Ewart Evans, Ltd., to the extent of about £100. Both of these firms sued for their money and obtained judgment. Before they brought their action, the defendant had registered himself as Louis Samuel, Ltd., the nominal capital of the company being £500, but the real capital was only £2, because there were only two shareholders, the prisoner and his father. A debenture was issued to defendant's father to secure £100 to him, and it was covered by a charge on the whole of the assets. On March 3rd last year a receiver was appointed. the estate was realised, and there was nothing for the creditors, On February 28th, 1927, accused took over a shop and house in Camden Road and started to sell gowns and mantles, That business was called Delporte, and he ordered goods to the value of £420 on credit. On April 16th, 1927, the busines. was registered as a company with a nominal capital of £500s and only two shares were issued. It was agreed that the company would purchase the goodwill of Delporte for £1 500, to be satisfied by the issue of debentures to that amount. At the time that resolution was passed the business was in debt to the tune of £1 300. Delporte, Ltd., was subsequently wound up in compulsory liquidation, and there was a petition in bankruptcy in July, 1927, against defendant, when there was a deficiency of £1 300.

# INDIVIDUALIST LUNCHEONS.

The programme arranged by the Individualists for their monthly luncheons for the coming season is even stronger than in the previous two years during which this movement has made such a mark in the world of politics. The speakers, who include Lord Birkenhead, Sir Robert Horne, Sir Charles Grant Robertson, Miss Clemence Dane, the Hon. R. H. Brand, Sir William Bragg, Prof. Seligman, of Columbia University, Mr. Beaumont Pease, and Mr. Gordon Selfridge, make perhaps the most impressive list of distinguished experts in various fields that has ever been secured by any society, and they will be supported by an equally distinguished list of chairmen in Lord Hugh Cecil, The Rt. Hon. H. A. L. Fisher, Lord Leverhulme, Sir William Plender, Lord Ullswater, and Sir Ernest Benn. The first luncheon will be held on October 24th at the First Avenue Hotel, and full particulars of the series can be obtained from the manager of the Individualist Bookshop, 84, Charing Cross Road, London.

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# MINERS' LAMPS.

## Combining Gas-Detecting Qualities with Safety of Electric Lamp.

THE seventh annual report of the Secretary for Mines shows that, although the total number of miners' safety lamps in use has decreased owing to the depression in the industries, the number of electric lamps has definitely increased, showing a widening appreciation of the advantages of electric safety lamps over the flame type.

The electric safety lamp gives a better light than the oil lamp, it is more reliable, and the cost of upkeep is less, but, quite apart from the question of illumination, the oil lamp possesses an undoubted advantage as a gas-detector.

There have been many attempts to produce an efficient electric gas-detector, but although many of these devices are theoretically excellent, not one has been adapted for continued service in the mine, and the oil lamp still stands as the accepted medium for the detection of firedamp. Its operation requires some degree of skill, but generations of use in the mine make the estimation almost second nature to the miner. The lamp flame is reduced until only a small blue line appears. If gas is present it burns over the flame, giving it the appearance of being surmounted by a ghostly cap, a light blue cone, the height of which shows the percentage of gas present. Over a certain percentage the flame is extinguished.

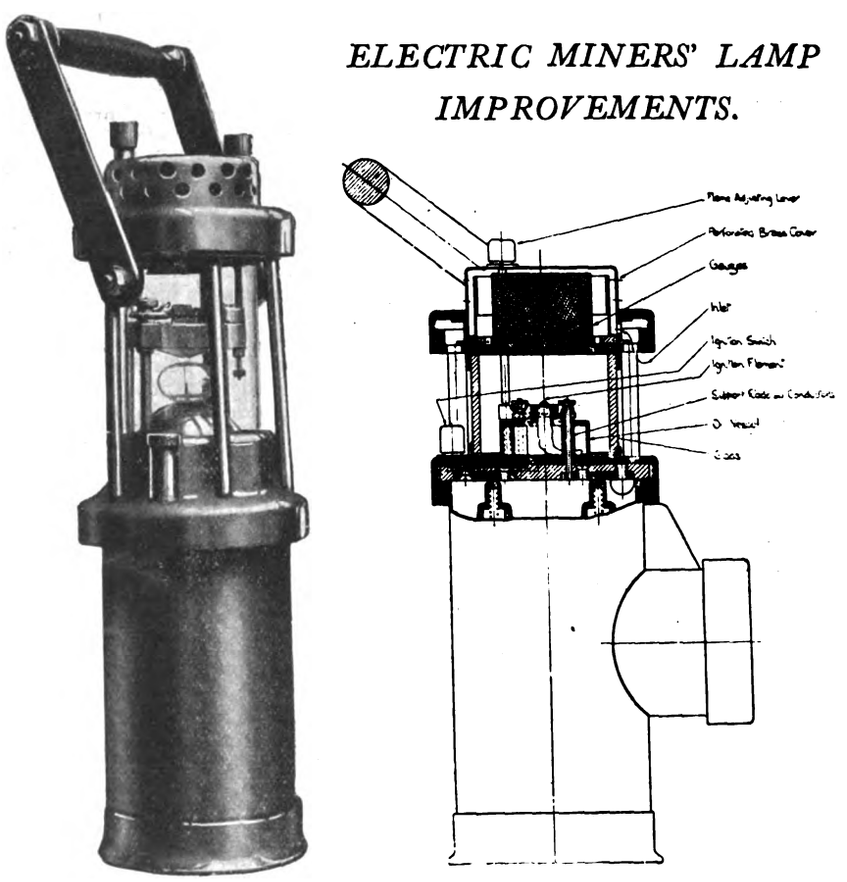
A new gas-detecting lamp, introduced by Ceag, Ltd., makers of miners' electric safety lamps, combines the gas-detecting properties of the oil lamp, and the illuminating power of the electric lamp in an ingenious manner.

A small oil vessel is carried above the electric lamp, and a platinum wire is so arranged that it can be heated by the lighting battery current to light the oil flame. The flame, which is protected in the usual manner by gauzes, and so is perfectly safe, is controlled by a knurled head in the top of the lamp.

To make a test the electric light is switched off, so that it is easier to see the rather illusive cap in the flame, and the switch is pressed to connect the platinum relighter and light the oil flame.

The flame is lowered, the test made, and the electric light is switched on again. The danger of the light going completely out, and leaving the tester in darkness is overcome, as the electric light is always available. What is more, the oil lamp can be relit and the test continued. The deputy can have the powerful electric lamp to assist him, and can test for gas with the same lamp, and need not be afraid of losing his light. This lamp, which is a British patent, has passed all the tests of the Mines Department, and is now, after three years of experimental development, available for service underground.

*ELECTRIC MINERS' LAMP IMPROVEMENTS.*




*ABOVE is seen the standard type new electric and gas-detecting miners' lamp described on this page. To the right is a sectional view of the gas-detector fitted to a bull's eye type of lamp.*

# BUSINESS ITEMS.

THE executive offices of the Mackay Companies, the Postal Telegraph Cable Co., the Commercial Cable Co., and the Commercial Pacific Cable Co., have been removed from 253, Broadway, to the International Telephone Building, 67, Broad Street, New York City.

The International Combustion Engineering Corporation of America, which is associated with International Combustion, Ltd., has completed negotiations for the acquisition of the entire business and assets of the Hedges-Walsh-Weidner Co. of Tennessee.

Bury (Lancs.) Lighting and Heating Co., Ltd., electrical engineers and contractors, of 9, Crostons Road, have opened additional premises at 47, Stanley Street, Bury.

Messrs. Ernest L. Tappin and Sons, electrical engineers, of Lewes, are shortly removing to new premises at 20, Fisher Street, Lewes.

With a view to encouraging still further the use of Hart batteries for wireless valve receiving sets, and other purposes, the Hart Accumulator Co., Ltd., announces important reductions in the prices of its celluloid and glass box types of l.t. accumulators, particulars of which—operating from September 1st, 1928—will be furnished, upon request, to traders and others interested.

The British Hanovia Quartz Lamp Co., Slough, held their social club annual outing last week. The party travelled to Bognor by motor coaches, stopping at Guildford on the return journey for a meal and a dance. The success of the outing was largely due to the organiser, Mr. Fillimere.

It is reported that negotiations will take place at Belgrade between the Yugoslavian Government and representatives of Siemens Brothers and other cable companies concerning the supply of cable to the Yugoslavian Postal Department.

Mr. W. A. Gazard, late of Victoria Road, Erdington, has opened an electrical and wireless showroom in Stechford Lane, Birmingham, under the name of the Stechford Electrical Depot. Manufacturers desiring representation are invited to communicate their requirements.

Amongst the tenderers for the construction of a new telephone exchange for the Egyptian Post and Telegraph Dept., are Ericsson Telephones, Ltd., Ericsson Telephones (Stockholm), General Electric Co., Ltd., Siemens Bros. and Co., Ltd., Automatic Telephone Mfg. Co., Ltd., and Siemens and Halske.

The telephone number of the British Electrical Development Association is now Temple Bar 4570, instead of Regent 4570.

Messrs. Lewenz and Wilkinson, Ltd., engineers, 25, Victoria Street, London, S.W.1, advise us that Mr. E. R. Wynne has resigned his seat on the board, and that Mr. Cyril W. Davson joined the board in February last.

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# FIRE PUBLICITY.

## Showing Effects rather than the Product.

IN appealing to the public to buy domestic electrical appliances, the electrical industry is apt to overlook the psychological factor recognised by most people selling a popular article—that the public does not react sufficiently to bare illustrations of an article, but that when a picture is presented of that article as it would appear in actual use, the buyer is at once more receptive to the idea.

Reproduced from a striking illustration in a Metro-Vick electric fire brochure.

In much of the publicity literature supplied to retailers for distribution to the general public such articles as electric fires are depicted in just the same way as they would quite rightly appear in a trade catalogue. Every detail of the metal framework is clearly brought out; but the elements are "dead" and the general effect is one of coldness.

In striking contrast to this is an attractive coloured booklet entitled "A Little Book About Fires," which forms part of the new season's publicity literature which Metro-Vick Supplies, Ltd., have available for over-printing with retailers' names. The charm of the cover design reproduced below, and

Cover design of "A Little Book About Fires," issued by Metro-Vick Supplies, Ltd.

of the picture of the slippers in the fender shown at the top of the column are not fully apparent in our black-and-white illustrations, but the actual coloured pictures in the brochure certainly convey an unmistakable sensation of cosy warmth which cannot fail to create a favourable impression in the mind of the reader.

Another point about the booklet is the informal little introductory chat reminding readers of the advantages of electric fires. Manufacturers are too often inclined to assume that people are well acquainted with these points: the majority have never considered them, and to the few who have, concise repetition can do no harm.

The following extract gives an idea of the kind of thing we should say in publications of this kind:—". . .With the old-fashioned fires the comfort was purchased at some cost. The coal and ashes and cleaning. Horrid work for the maid—no wonder it's difficult to keep servants in old-fashioned houses—and that's not the end of it; there is the dilapidation of the papers and ceilings. The daily dusting; oh, yes, in a hundred-and-one ways you paid for the comfort of coal. How different with the electric fire; its just as warm and absolutely clean. You can't poke it, but who wants to when its always rosy and red; it was only the sulky coal fire there was a vicious pleasure in poking."

As for the fires themselves, this year's Met-Vick range includes a complete range of flat bar fires, finished either in oxidised copper or stove black enamel, which has been specially designed primarily to meet the needs of supply authorities who require a robust type of fire at a reasonable price for their hiring-out schemes. The white enamel chromium-plated model, which proved popular last year, still remains a feature of the programme.

# WIRELESS NOTES.

## Marconi's Appeal against Royalty Decisions.

MARCONI'S Wireless Telegraph Co., Ltd., announce the intention to appeal from the two recent decisions given by the Comptroller-General of Patents upon application for compulsory licences made by the Loewe Radio Co., Ltd., and the Brownie Wireless Co., of Great Britain, Ltd. With a view to clarifying the position, and assisting manufacturers of broadcast receiving apparatus, the Marconi Co. wishes it to be known that, if the Comptroller's decision in the case of the Loewe Radio Co.'s application is affirmed so that a licence is directed to be granted to the Loewe Co., other manufacturers who desire to manufacture the same apparatus as the Loewe Co. (which apparatus is protected by a number of Loewe patents) will, so far as the Marconi Co.'s patents are concerned, be given licences, upon application to the Marconi Co., as from the date of such affirmation, on the same terms as those which the Judge grants to the Loewe Co. Similarly, if the Comptroller's decision in the Brownie case is affirmed, so that a licence is directed to be granted to the Brownie Co., it is the intention of the Marconi Co. to grant to existing licencees, on request, new licences, as from the date of such affirmation, on the same terms as those which the Judge grants to the Brownie Wireless Co., of Great Britain, Ltd.

### Manufacturers' Demand for New Licence.

A meeting of radio manufacturers, convened by the Radio Manufacturers' Association, was held at the Hotel Cecil, London, on Wednesday, to receive a report from the chairman of the R.M.A. on the situation created by the Brownie case, and subsequent abortive negotiations with the Marconi Co., and to consider a resolution that the meeting, having considered the effect of the decision of the Comptroller-General of Patents in the Brownie case, and having received counsel's opinion thereon, resolve to act in accordance with counsel's advice and apply to the Marconi Co. for a licence, on the terms and conditions set out in the Comptroller-General's decision in the case, and, in the meantime, to operate under such terms and conditions, notifying the Marconi Co. accordingly. The resolution was carried unanimously.

### The Belfast Wireless Exhibition.

The Ulster Wireless Traders' Association (which has now a membership of 90 per cent. of all appropriate traders in Northern Ireland, will this year open its fourth wireless exhibition in the Ulster Hall on October 4th.

### Wireless Engineering Courses.

The School of Electrical Engineering (Wireless and High Frequency Section) will open on September 24th, when a series of special courses on Radio Engineering will be given by Messrs. R. S. Elven, J. A. Gracie, A. Serner, S. T. Short, H. A. Thomas, A. C. Warren, and W. West. The courses are spread over a period of five years, and cover mathematics in addition to theoretical and practical codsiderations of the subject.

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# THE DESIGN OF LIGHTING FITTINGS.

## Choosing Units to Harmonise with Decorative Schemes—Suggestions for Period Styles of Illumination—What the Electrical Fittings Designers can Offer.

By "LUMAX"

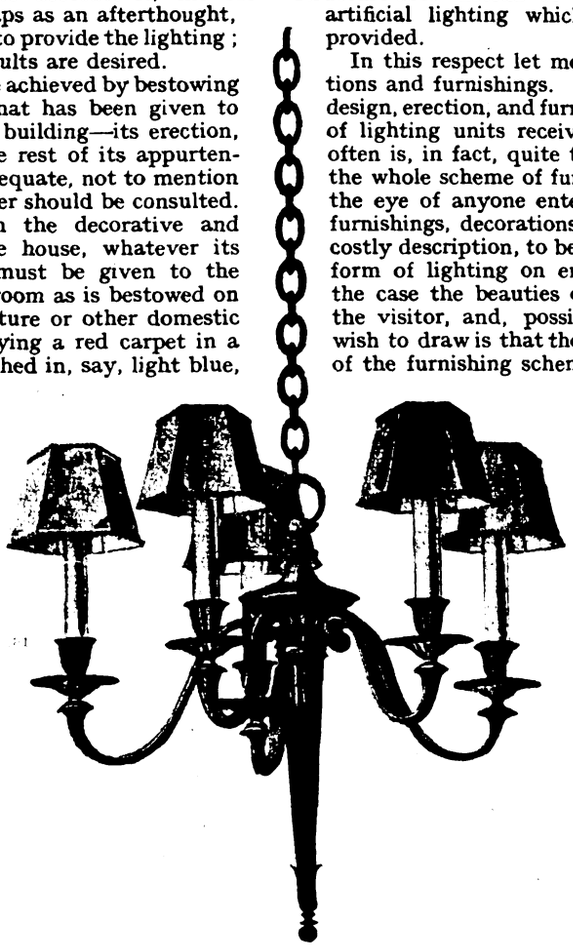
IN the designing of a building in these days the practice is usually for the architect to design the building, the builder to erect it, the decorator to decorate it, the furnisher to furnish it, and then, perhaps as an afterthought, the illuminating engineer is called in to provide the lighting; or he should be, if the very best results are desired.

Good results in lighting can only be achieved by bestowing on it the same careful attention that has been given to other features in the design of the building—its erection, its drainage, its furnishing, and the rest of its appurtenances, and if the lighting is to be adequate, not to mention perfect, a competent lighting engineer should be consulted.

Lighting should harmonise with the decorative and furnishing scheme adopted for the house, whatever its period or style. The same care must be given to the selection of lighting units for each room as is bestowed on the selection of carpets, rugs, furniture or other domestic items. No one would dream of laying a red carpet in a room that was decorated and furnished in, say, light blue, and no one should dream of installing polished brass modern type lighting fittings in a room furnished, say, in Jacobean or Queen Anne style.

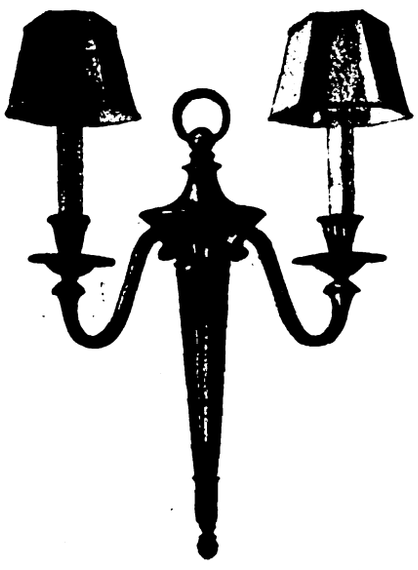
The selection of electric lighting fittings should, therefore, merit the very careful attention of the home lover, as nothing is more grotesque than unsuitable lighting units in a home which, in every other respect, has been furnished on carefully considered lines.

In many places abroad it is the practice nowadays when considering the erection of a new building or mansion to consult an illuminating engineer before even the architect is consulted. The reason for this is that good artificial lighting is now looked upon as being just as important as the provision of suitable windows through which natural daylight may enter.



A five-light Queen Anne style pendant fitting.

It is not difficult to reason why this should be so. In most European countries there are as many hours throughout the year when artificial lighting is necessary, as there are hours when natural daylight operates. But there is another factor. The pursuit of most forms of recreation cannot be followed, except within very small limits, after daylight has ceased, and therefore artificial lighting is called upon, not only to provide illumination, but also to compensate for this loss by revealing beauties of the decorative and furnishing scheme just as truthfully after nightfall as during the ordinary hours of daylight.



A two-light Queen Anne wall bracket fitting.

It is impossible in a short article of this nature to treat the question of illumination as it should be treated, but it is hoped to give some indication of how to make a selection of suitable fittings to meet the requirements of certain forms of architectural layout, since in this country at the present time it is usual for the architect to design the structure first instead of building his structure around the artificial lighting which the illuminating engineer has provided.

In this respect let me stress a point concerning decorations and furnishings. Much money is often spent on the design, erection, and furnishing of a house, but the selection of lighting units receives considerably less thought, and often is, in fact, quite the smallest item of expenditure in the whole scheme of furnishing. Is it right, therefore, for the eye of anyone entering a well-appointed house with furnishings, decorations, carpets, and the like of the most costly description, to be involuntarily drawn to a grotesque form of lighting on entering the house? When this is the case the beauties of the house remain unrevealed to the visitor, and, possibly, the occupant. The moral I wish to draw is that the lighting should be part and parcel of the furnishing scheme—that it should harmonise with, and emphasise the beauty of, the whole layout, be it hall or room.

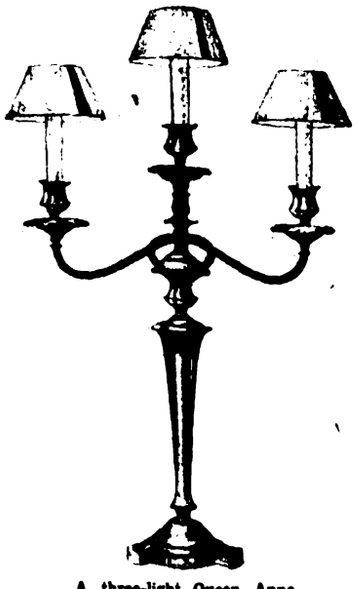
The style of furnishing that enjoys considerable vogue to-day, and for which the electrical trader must therefore cater, is that of Jacobean, Queen Anne, and other "period" styles, and while there is a certain affinity between these styles, there are also a number of additional features which make one style run more or less into another.

For this reason designers of electric lighting units have evolved fittings that will harmonise pretty well with all or any of these "period" styles, and which will blend with popular furnishing schemes. In this respect one point emerges, and that is that in schemes of period design intrinsic brilliancy should be absolutely unknown; bright, glaring light sources being distinctly out of place. The lighting for the period style of decoration should be after the style of the mellow light of the fireside, and should in no sense partake of the bright and glaring.

The types of lighting units recommended for the "period" styles should generally have outlines of wrought metal supporting light sources reminiscent of the early forms of horn light shades, whose opacity gave out a light of softened amber hue.

This effect of mellowed light can be of much higher intrinsic brilliance to-day, thanks to the high light emission of modern electric lamps, and vellum shades of either plain, hand-painted or printed decorated patterns, which are available to meet practically all requirements, and which effectively subdue the light and protect the eyes from glare. Flame or orange coloured lamps can also be used.

Multiple light pendant fittings for suspension from the ceiling, bracket fittings for the walls, and the neatest of wrought and beaten metal fittings to act



A three-light Queen Anne pattern candelabra fitting.

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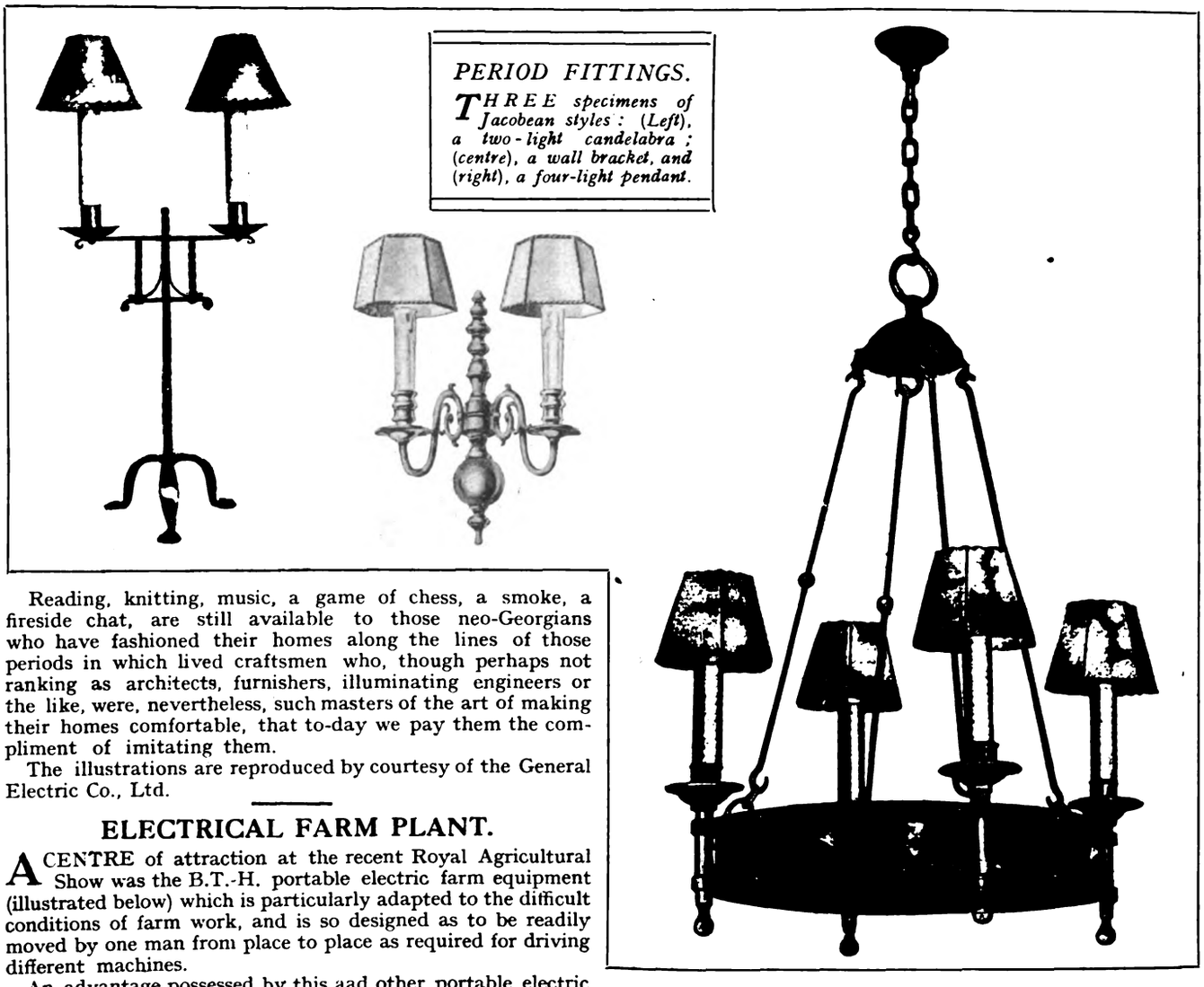
as candelabra on mantel-piece, bookcase, or corner bracket, provide a homelike feeling of comfort in every part of the room without a discordant note to upset a harmonious scheme of furnishing, or a painful, piercing, irritating glare that banishes comfort.



*PERIOD FITTINGS.*

*THREE specimens of Jacobean styles: (Left), a two-light candelabra; (centre), a wall bracket, and (right), a four-light pendant.*

Reading, knitting, music, a game of chess, a smoke, a fireside chat, are still available to those neo-Georgians who have fashioned their homes along the lines of those periods in which lived craftsmen who, though perhaps not ranking as architects, furnishers, illuminating engineers or the like, were, nevertheless, such masters of the art of making their homes comfortable, that to-day we pay them the compliment of imitating them.

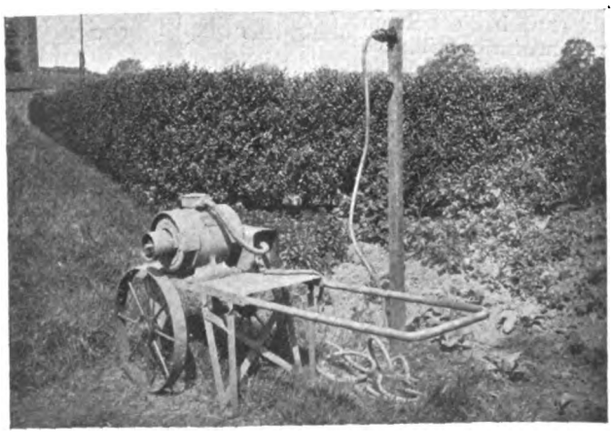
The illustrations are reproduced by courtesy of the General Electric Co., Ltd.

## ELECTRICAL FARM PLANT.

A CENTRE of attraction at the recent Royal Agricultural Show was the B.T.-H. portable electric farm equipment (illustrated below) which is particularly adapted to the difficult conditions of farm work, and is so designed as to be readily moved by one man from place to place as required for driving different machines.

An advantage possessed by this aad other portable electric farm equipments manufactured by the British Thomson-Houston Co., Ltd., is that the drive may be taken from the motor in either direction, although, if the duty be heavy, it is better for the pull on the belt to cause the feet of the truck to bed more firmly in the ground with increased load.

The equipment illustrated is that which best meets most requirements: the electric motor is of the drip-proof type, rated at 5 H.P. 400/440 V, three-phase, 50 cycles, and is fitted with a pulley 5½ in. dia. by 4 in. face. Starting is effected by a robust Y-delta starter housed under a protecting cover, and connection is made to a water-tight socket by a 4-pin plug at the end of a 40 ft. length of 3-core 0·01 sq. in. C.T.S. cable with earth core.



**A B.T.-H. portable farm equipment.**

For farms taking a d.c. supply the equipment can be provided with a d.c. motor and starter, and although motors of 5 H.P. are most generally suitable, three-phase or d.c. motors of 2, 3 or 7½ H.P. can be fitted, while should the electrical supply be single-phase, repulsion-induction type motors can be substituted, and, of course, pulleys other than of the size mentioned can be supplied.

## E.D.A. CONFERENCES.

### Preliminary Programme for London Area's Forthcoming Session.

Preliminary particulars are now available concerning the E.D.A. Conferences in the London area for the coming session. The Conferences will be held at the Royal Society of Arts, John Street, Adelphi (7.30 to 9.30 p.m.) and, as in former years, will be open to any persons engaged upon electrical work.

The programme opens on October 19th with a talk on "Organising for Better Selling in Electrical Showrooms," by Mr. W. Millner (Chairman, Mr. C. H. Cox). At the next meeting, on November 16th, Mr. H. T. Young will deal with "Modern Lighting Designs for Domestic and Business Interiors" (Chairman, Mr. J. W. Beauchamp); while on December 21st, the subject of "Hire and Hire-Purchase in Electrical Development Schemes" will be introduced by Mr. J. E. Tapper (Chairman, Mr. A. F. Harrison).

The names of chairmen and speakers for the Conferences between January and March, 1929 are not yet available, but the dates and provisional subjects are as follows: January 18th, "Electric Heating and Cooking Development"; February 15th, "Organising for Increased Sales—Spring Cleaning Season, 1929"; March 15th, "Water Heating Development."

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# SELLING LINES.

## Novel Electric Lighting Fittings, Reflectors and Wall and Table Brackets.

FOLLOWING upon the launching of the various domestic lighting campaigns by the lamp manufacturers, it is only natural that attention is also turned towards electrical lighting fittings. Even at this early date, particulars of a few of the latest designs have come to hand, and among these may be mentioned the "Sidlow" colour-cased bowl of Metro-Vick Supplies, Ltd. This fitting has a bowl 16 in. in diameter, with a depth of 4½ in. and a ceiling plate of 4 in.; the overall dimension is 40 in. Another fitting of interest is the "Salkeld," made with bowls of two sizes—namely, 12 in. diameter and 3½ in. depth, and 14 in. diameter with a depth of 3¾ in. A special fittings catalogue running into nearly 300 pages of photogravure, showing the latest additions to the Metro-Vick selection, is now in course of preparation, in addition to folders relating to the same subject. The number of glassware fittings falling under the name Silvertown is large, and the varieties are many. This particular class of glassware is, we understand, a three-ply glass consisting of a thin inside layer of crystal glass, a centre layer of special Cryolith opal glass and a further layer of crystal glass with a fine satin finish. Colours include rose, champagne, cream, plate blue and green, biscuit shades, etc. Appropriate fittings for each of the types offered are obtainable.

The Credenda Conduits Co., Ltd., has added an additional range of industrial reflectors to its already extensive selection. Semi-dispersive types are offered in sizes with 10 in. and 12 in. diameter, with heights of 6 in. and 8 in. respectively, recommended for use with lamps ranging from 40 W to 150 W. Dispersive reflectors are offered with diameters from 10 in. to 14 in., while a special weather-proof dispersive type is available in diameters up to 18 in. These latter are made in heavy gauge steel, vitreous enamelled in green outside and white inside. A special feature of the design is the method of attachment and location of reflection to canopy, permitting the former to be removed for cleaning and replaced with minimum loss of time. Special attention has also been given to the question of ventilation of these units. In addition to the range of reflectors there is also available a series of lighting accessories, such as lamp holders, pendant hooks and back plates, suspensions, etc.

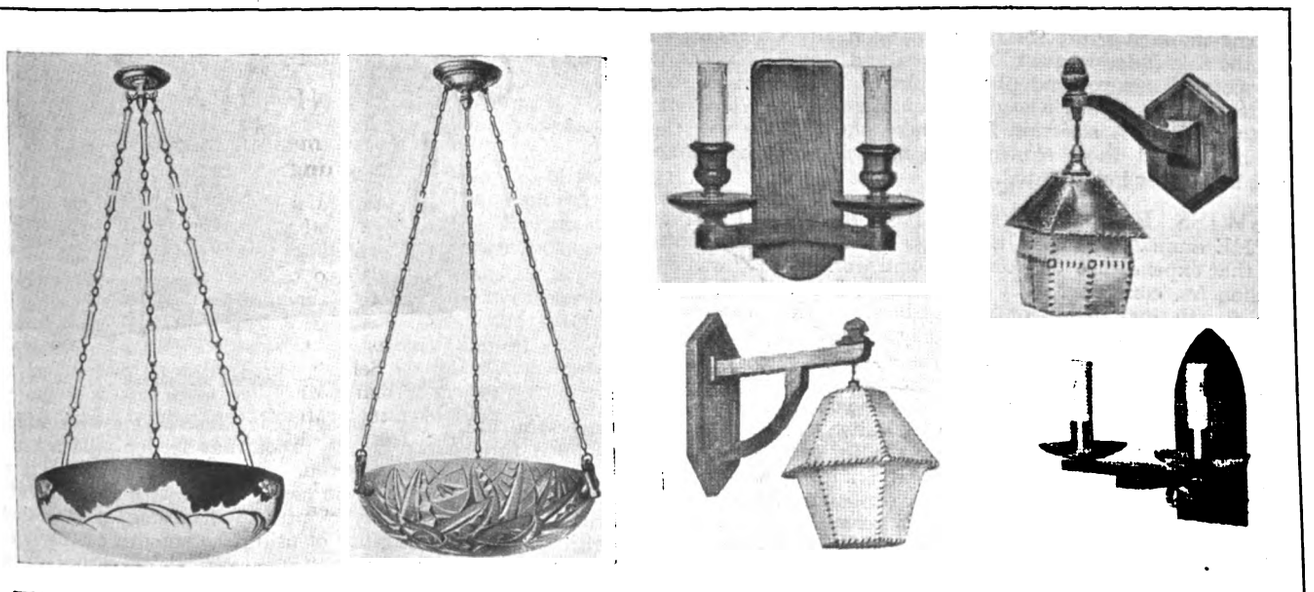
The Victoria Electric Plant Co., Ltd., has sent us particulars of what is claimed to be a unique and outstanding system of scientific lighting. The arrangement bears the name "Lycettee," and an efficiency of 87 per cent. is claimed. The fittings are totally enclosed, ventilation being given by means of the specially designed glass shade. There are twenty different combinations of glassware obtainable in Verico glass, producing a light resembling daylight.

The Edison Swan Electric Co., Ltd., has introduced a number of new bracket fittings of attractive design, suitable for walls, dressing tables, etc. Included in the range are Sheraton, Adam, Georgian and other well-known designs, carried out in oxidised silver, lacquer gilt, brass, etc. A number of attractive wood brackets have been added to the series, a few of which are illustrated on this page. The range of floor and table standards, ceiling and other fittings has also been considerably extended, while the accessory list has also been added to. On the industrial side here, again, many new designs have been brought out, including office desk lamps, shop window reflectors, show case fittings, spot lights, etc.

# ELECTRICAL WOMEN.

AT the Industrial Welfare Conference at Balliol College, Oxford, on Tuesday, Miss C. Haslett, director of the Electrical Association for Women, said: "The woman technician has not found her road an easy one, and in many cases she has realised that her only chance of success is to form companies of her own, raising the necessary capital and striking out in a direction where initiative and the pioneer spirit are needed. Recently, a group of women engineers have realised that the great problem of rural electrification offers possibilities for the employment and training of women. Already a number of small villages have been wired, the necessary plant and mains installed, churches and small factories provided with electric power. A significant fact is that these companies have taken on a number of industrial apprentices, this being almost the first chance for a girl with an engineering bent to become properly apprenticed in the same way as her brother. Another existing tendency with regard to women in industry, is shown by the fact that fathers are beginning to take their daughters into the family business. Nowadays, the sons may become doctors or lawyers, or may choose any other of the professions, and the modern father pays little heed to this one-time handicap, as he has a daughter who shows much ability in the business and who has proved herself to be equal in responsibility and perhaps more easily adaptable to up-to-date methods than her brother. So, in a number of cases, we find that the father wisely moves with the times, and finds a partner of much promise and with great energy and application. Some of the keenest women I know are in advertising and publicity work. This is not a job for the dilettante, but for the highly trained. Industry is looking more and more to advertising as a very real factor in salesmanship.

In the discussion that followed, Mr. J. B. Longmuir, Glasgow, stressed the advantages which accrued from firms inviting suggestions from their employees. It was wrong, he said, for foremen to tell workpeople under them "your job is to work, not think." His own firm had paid out large sums of money for ideas submitted by their workers. Fifteen office boys alone had submitted 150 suggestions in a year.



*THE above illustrations show (left) two bowl lighting fittings which are amongst the new lines produced by Metro-Vick Supplies, Ltd., and (right) some of the new wall and table bracket fittings recently put on the market by The Edison Swan Electric Co., Ltd.*

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# "EVER READY" PUBLICITY.

## Details of Extensive Campaign to Increase Sales.

WITH a view to assist in stimulating interest in "Ever Ready" productions, and in order to bring such goods more prominently before the public, the Ever Ready Company (Great Britain), Ltd., has decided to initiate a selling week, which will be held from October 1st to 6th.

Some of the special display material available for the "Ever Ready" window dressing competition.

This campaign will take the form of window displays throughout the country, and in order to encourage the trade to support the scheme a prize of £300 is offered for the best dressed window, while six consolation prizes of £50 each will be offered to the next six in order of merit. A wide selection of display material has been prepared for the week, and these special showcards, boxes, etc., will be dispatched to those requiring them on receipt of formal notification of entry. Apart from these special display materials, there is no limit imposed on the window-dresser desirous of rendering the display more attractive at his own expense. The window must, however, be devoted exclusively to "Ever Ready" manufactures.

It is, further, the intention of the company to advertise in the local press the names and addresses of competitors, so that the general public may be acquainted with the positions of windows giving special displays. This form of advertising will serve the double purpose of bringing before the public not only the name of "Ever Ready" but also that of the retailer, with the result that extra business in both "Ever Ready" and other lines is almost sure to follow. Of the display material which will be sent to competitors, any or all may be used at the discretion of the window-dresser, and some idea of the wide range from which a choice may be made will be gathered from the photograph reproduced above. The display as arranged measures about 70 in. long by 36 in. high, and is 15 in. deep.

The managing director of the Ever Ready Company will be the sole judge in awarding prizes, and it will be necessary for competitors to send photographs of their displays so as to reach the company's head offices notl ater than Wednesday, October 3rd. A selection from these photographs will then be made, and those showing the most likely prize-winners will be further investigated.

# SWISS RAILWAYS ELECTRIFICATION.

THE annual report on the Swiss Federal Railways states that expenditure on constructional work in 1927 was 86·4 million frs. compared with 104·8 million frs. in 1926. With the fourth instalment of the Federal subsidy the actual expenditure for electrification in 1927 totalled 50·3 million frs. At the end of the year the Federal Railways operated 1 435 km. of electrified lines, six new sections, totalling 435 km., having been opened in the course of the year. At the beginning of the present year the Federal Railways had in service 323 main-line electric locomotives, 39 motor coaches, 17 accumulator locomotives and four electric shunting locomotives. From May 15th, 1927, onwards 30 electric locomotives equipped for one-man driving were in regular service for slow trains and goods trains on lines where the maximum gradient does not exceed 1 in 66. This system is proving very satisfactory. The production of the power stations owned by the Federal Railways amounted to 414 917 000 kWh, of which 299 132 000 kWh were used for traction and 115 785 000 were sold to industrial consumers. Another 18 406 000 kWh were obtained by the railways from private power stations and used for traction purposes.

# TRADE PUBLICATIONS.

THE "Reliability Wireless Guide," No. T99, containing an electrical supplement, has been issued by J. H. Taylor and Co.

The Type AVDN open squirrel cage motor is the subject dealt with in a recent publication by the A.E.G. Electric Co., Ltd.,

Venner Time Switches, Ltd., have sent us list No. 47, dealing with the Venner C and S remote water level indicator for boilers, etc.

The third issue of the "Kandean Quarterly Review" has been received, the chief feature being "Lighting for Games and Sports."

The Sun Electrical Co., Ltd., has issued list No. 489, dealing with water boilers, and list No. 488 describing the Premier Junior vacuum cleaner.

Lacy-Hulbert and Co., Ltd., have published list C.1, which deals with the company's automatic electrically-driven air compressor, size ELVO2.

We have received from Automatic and Electric Furnaces, Ltd., a copy of Bulletin No. 40, which deals with high speed steel. The author is Mr. A. R. Page.

The Brush Electrical Engineering Co., Ltd., have issued a new brochure dealing with core type oil-immersed self-cooled transformers. The brochure is fully illustrated.

A special booklet dealing with the Lustralex portable X-ray outfit has been published by Philips Lamps, Ltd. A number of striking reproductions of X-ray photographs are included.

An announcement on the cover of the August issue of "Houghtons Radio News" reads "Radio News to be weekly." Details are given of the McMichael hire purchase scheme available through Houghton's.

Two recent publications by British Brown Boveri, Ltd., deal with thermal circuit breakers for a.c. motors and a.c. motors with built-in centrifugal starters. The references are 1052 E (L) and 1 045E (L), respectively.

"Unit Pillars at Home and Overseas" is the title of an interesting new Henley Engineering Department publication, which shows how wide-spread is the use of Henley unit pillars, and indicates the varying conditions in which they are in

The polyglot Henley book on unit pillars.

successful use. The photographic illustrations with which it is filled furnish convincing proof that feeder pillars are not necessarily so obstructive or so unsightly as some people imagine, and engineers who have to deal with such objections will find this book very helpful in disposing of this sort of criticism. The possibility of using the smooth casings of the pillars to further the cause of electrical development with some suitable slogan is also worth considering. The book is well printed and attractively produced, and its sphere of utility is increased by reason of the fact that it is printed in four languages. The accompanying illustration hardly does justice to the attractive two-colour cover.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

WAVERTON PRESBYTERIAN CHURCH.—Electric light installation in the church and manse. Specification can be seen at W. Dean's, Brown Heath Road, Waverton.

CHARD CORPORATION, September 17th.—Motor and pump houses, electric motors and other works in connection with water scheme. Details from the engineer, Mr. Sydney R. Lowcock, 6, Queen Anne's Gate, London, S.W.1, or from the Town Clerk, until September 17th.

EDMONTON GUARDIANS, September 17th.—Six months' supply of electric lamps. Forms of tender, etc., from the clerk, Mr. E. Ridley, 77, Bridport Road, Edmonton, London, N.18. Stamped, addressed envelope to be sent.

WIGAN GUARDIANS, September 17th.—Supply of electrical sundries for six months. Particulars from the clerk, Mr. J. S. Liptrot, 10, Victoria Buildings, Wigan.

BOOTLE CORPORATION, September 18th.—Electrician's work in connection with erection of 100 houses at Linacre Park. Specification, etc., from the Borough Engineer, Town Hall, Bootle; deposit £2 2s.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 18th.—Renewal of battery plates at the National Physical Laboratory, Teddington. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

ROTHERHAM GUARDIANS, September 18th.—Supply of electrical sundries for six months. Particulars from the clerk, Mr. W. C. Harrison, 26, Moorgate Street, Rotherham.

WARRINGTON CORPORATION, September 18th.—Twelve months' supply of earthenware conduits. Specification and form of tender from Mr. F. V. L. Mathias, borough electrical and tramways engineer; deposit £1 1s.

WARRINGTON GUARDIANS, September 18th.—Electrical supplies for six months. Forms of tender from the clerk, Mr. Arthur Bottomley, Museum Street, Warrington.

WEST RIDING EDUCATION COMMITTEE, September 18th.—Electric light installation at Rossington New Middle School. Specification, etc., from the Education Department, County Hall, Wakefield.

HORNSEA URBAN DISTRICT COUNCIL, September 19th.—Electric lighting of Floral Hall and grounds. Specification, etc., from the Collector; deposit £1 1s.

SOUTHWELL GUARDIANS, September 20th.—Electric light wiring and supply and fixing of distribution boards, switches, pendants and fittings, at the Institution, Upton Road, Southwell. Specifications from Messrs. Sands and Walker, Milton Chambers, Milton Street, Nottingham.

MERSEY RAILWAY CO., September 21st.—Supply of metallic and carbon filament lamps and fittings, etc. Tender form (No. 10) from the Manager and Secretary, Central Station, Birkenhead.

REMENHAM (BERKS) PAROCHIAL CHURCH COUNCIL, September 21st.—Electric lighting installation in the church and parish hall. Specifications from the Rector.

GRIMSBY CORPORATION, September 22nd.—Supply of paper insulated, lead covered, low pressure cables required by Electricity Department during one year. Specification (No. 253) from Mr. S. R. Windle, borough electrical engineer.

BEDWAS AND MACHEN URBAN DISTRICT COUNCIL, September 24th.—Supply, erection and laying of overhead and underground mains. Specification, etc., from the Electrical Engineer, Council Offices, Bedwas, Mon.; deposit £2 2s.

HALIFAX GUARDIANS, September 24th.—Supply of electrical fittings for six months. Forms of tender from the clerk, Mr. Arthur Longbotham, Carlton Street, Halifax.

TAUNTON CORPORATION, September 27th.—Manufacture, supply and erection of 2 000/3 000 kW steam turbine generating plant, with condensing plant, auxiliaries and accessories. Specification from Mr. A. J. Howard, borough electrical engineer.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, September 28th.—Supply of electrical fittings. Forms of tender, etc., from the Clerk, 22, Lombard Street, West Bromwich.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

LEEDS CORPORATION, September 29th.—Supply and erection of three phase switchgear, for Kirkstall generating station. Specification, etc., from Mr. C. N. Hefford, Electricity Dept., 1, Whitehall Road, Leeds; deposit £2 2s.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 29th.—Six months' supply of electrical fittings, etc. Forms of tender from the Clerk and Treasurer, 19, Heriot Row, Edinburgh.

*A NEW showcard which has been issued by Philips Lamps, Ltd., in connection with the lighting campaign now in progress.*

DEVON MENTAL HOSPITAL, October 2nd.—Six months' supply of electric lamps, etc. Tender forms from the clerk, Mr. Cecil Masters, Exminster.

METROPOLITAN ASYLUMS BOARD, October 3rd.—Installation of automatic telephones at Princess Mary's Hospital, Cliftonville, Margate (specification G); and wiring for outside supply of electricity at Colindale Hospital (specification H). Specifications, etc., from the Board's office, Victoria Embankment, London, E.C.4; deposit £1 for each.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2; deposit £2 2s.

EDINBURGH CORPORATION, October 15th.—Coal and ash plant, for Portobello generating station, including weighbridge, truck tippler, three electric capstans, belt conveyors and elevators and two ash telpher hoists. Specification, etc from Mr. E. Seddon, city electrical engineer and manager; deposit 10s. 6d.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

CAPE TOWN ELECTRICITY DEPARTMENT, September 14th.—Supply of a.c. meters. (Reference B.X. 4 648.)

WATERFORD CORPORATION, September 14th.—Supply of single-phase and three-phase house service and other meters. Specifications, etc., from Messrs. Macentee and O'Kelly, 23 Upper O'Connell Street, Dublin; deposit £2 2s.

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 17th.—Supply and delivery of 4 500 metres of paper insulated, lead-covered and steel tape armoured cable, together with junction and terminal boxes. (Reference B.X. 4 608.)

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INDIA STORE DEPT., September 18th.—Supply of 187 miles D2 and D8 electric cable. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

ELECTRICITY SUPPLY WORKS, MONTEVIDEO, September 19th.—Supply and delivery of 250 V lead-covered conductors. (Reference B.X. 4 607.)

INDIAN STORES DEPARTMENT, September 19th.—Supply of oil driven generating set and pumping plant. (Reference A.X. 6 776.)

INDIAN STORES DEPARTMENT, September 20th.—Supply of seven oil-immersed, self-cooled, indoor type step-down transformers, 65 kVA, 3 300/420 V (order No. N8 729/1), for Ahmednagar. (Reference B.X. 4 712.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 20th.—Supply and delivery of one electrically-driven heavy duty double face-plate wheel lathe for Germiston wagon repair shops. (Reference A.X. 6 660.*)

WATERFORD CORPORATION, September 21st.—Supply of materials required for consumers' overhead services; and erection of consumers' overhead services. Specifications, etc., from Messrs. Macentee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £3 3s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 25th.—Testing equipment. (Reference B.X. 4 570.)

ANTWERP PORT AUTHORITY, September 27th.—Supply and erection of 32 electric travelling cranes. (Reference A.X. 6 712.)

BRUSSELS MUNICIPALITY, September 27th.—Transformer plant, at central power station. Further details from the Hotel de Ville, Brussels.

JOHANNESBURG MUNICIPALITY, September 27th.—Supply of steel tubular poles. (Reference A.X. 6 813.)

JOHANNESBURG MUNICIPALITY, September 27th.—Supply of 750 kW rotary converter, etc. (contract 35). (Reference B.X. 4 688.)

JOHANNESBURG TOWN COUNCIL, September 27th.—Supply and delivery of 6 600 V switchgear. (Reference B.X. 4 668.)

PORT ELIZABETH MUNICIPALITY, September 27th.— Supply of mild steel bases for lattice towers. (Reference A.X. 6 814.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, September 27th.—Supply of bare copper wire.

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 27th.—Supply and delivery of arc welding sets. (Reference B.X. 4 647.)

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th.—Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

CAROLINA (SOUTH AFRICA) MUNICIPALITY, October 1st.—Supply of plant for the electric lighting of the town; and supply of electrically driven pump.

CONSTANTZA (ROUMANIA) PORT AUTHORITIES, October 1st.—Supply of one electric portal crane and two goods lifts. (Reference A.X. 6 797.)

IRISH FREE STATE ELECTRICITY BOARD, October 1st.—Supply and erection of complete electrical equipment, including switchgear and three transformers, each 12 000 kVA (38 000/5 000 V), for Shannon transformer station at Fleet Street, Dublin. Specification, etc., from the Secretary to the Board, 60-62, Upper Mount Street, Dublin; deposit £5, returnable.

SALISBURY (RHODESIA) MUNICIPALITY, October 1st.—Supply and erection of h.t. transmission lines and transformers. (Reference B.X. 4 669.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st—Supply of porcelain insulators. (Reference B.X. 4 643.)

TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—For the supply and delivery of 250 ornamental electric lamps standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

ANGORA POSTS AND TELEGRAPHS, October 3rd.—Copper wire. (Reference A.X. 6 761.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

INDIA STORE DEPT., October 4th.—Supply of 24 electric ceiling fans. Form of tender (5s.) from Director General, Belvedere Road, London, S.E.1.

ROYAL SCHOOL OF ENGINEERING, GIZA, EGYPT, October 4th.—Electrical plant, etc. (Reference B.X. 4 703.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, October 4th.—Supply of telegraph line material. (Reference B.X. 4 655.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, October 4th.—Supply of electric cables and wires.

SOUTH AFRICAN POSTS AND TELEGRAPHS, October 4th.—Supply of copper wire and lead-covered cable. (Reference B.X. 4 657.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

ARGENTINE DEPARTMENT OF NAVIGATION AND PORTS, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 694.*)

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, October 5th.—Supply of lead fuse wire, silver fuse wire, copper wire for bell installation, insulating tape, porcelain counterweights, quick-break lever switches (single pole, double pole and triple pole), tumbler switches (single pole), switches (single pole and double pole), rotary combination switches for staircases (3-way and 4-way), rotary switches for indoor use (single pole and double pole), switches (double pole) for flush mounting, rotary combination switches (3-way) for flush mounting, rotary switches (single pole) for flush mounting, normal Edison screw lampholders, without key switch, enamelled lampshades, porcelains for sockets and plugs for double pole fittings, insulating compound, transformers for bell installations, hard vulcanised rubber tubing, cast-iron cable boxes, glass globes for arc lamps, etc.

ANGORA POSTS AND TELEGRAPHS, October 6th.—Bronze wire and sleeves. (Reference A.X. 6 754).

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, October 10th.—Ironclad switchgear for Sefton sub-station. Specification (2s. 6d.) from Chief Electrical Engineer.

SASKATOON (CANADA) MUNICIPALITY, October 10th.—Supply of 10 000 kW steam turbo-alternator, condenser and auxiliary equipment, or, alternatively, a 7 500 kW unit. (Reference B.X. 4 721).

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 11th.—Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 15th.—Electricians' pliers, wire-drawing machines, etc. (Reference, B.X. 4 702.)

INDIAN STORES DEPARTMENT, October 16th.—Supply of oil engine driven alternator sets, and switchgear (order No. N.8 729), for Ahmednagar. (Reference B.X. 4 714.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 17th.—Automatic voltage regulator. (Reference B.X. 4 699.)

RANGOON MUNICIPALITY, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on close circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

POSTMASTER-GENERAL'S DEPT., MELBOURNE, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

MELBOURNE CITY COUNCIL, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944.) (Reference B.X. 4 698.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

POSTMASTER-GENERAL'S DEPT., MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th —Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353.) (Reference B.X. 4 638.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically driven overhead cranes (tender No. 1317). (Reference A.X. 6815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

VICTORIAN ELECTRICITY COMMISSION, November 12th. Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

POSTMASTER-GENERAL'S DEPT., MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362.) (Reference B.X. 4 396.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.), from Chief Electrical Engineer.

NEW ZEALAND PUBLIC WORKS DEPT., November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

## Tenders Accepted.

MAIDSTONE CORPORATION.—British Thomson-Houston Co., Ltd., switchboard panel, £75 15s.

SPENBOROUGH URBAN DISTRICT COUNCIL.—F. W. Birkett and Sons, Ltd., re-wiring town hall.

BATH GUARDIANS.—A. Marshall Hunt and Co., installation of electric passenger lift, at infirmary, £408.

STOCKPORT CORPORATION.—W. T. Glover and Co., Ltd., cable for new purifier house at gasworks, £129.

SOUTHERN RAILWAY.—Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of electric lamps.

SHEFFIELD CORPORATION.—Park Royal Engineering Co., Ltd., main l.t. switchboard at abbatoir, £644 10s.

SYDNEY MUNICIPALITY.—Pirelli-General Cable Works, Ltd., supertension cable for power transmission, £171 000.

WHEATLEY URBAN DISTRICT COUNCIL.—Western Electricity Supply Co., street lighting, £3 5s. per annum per lamp.

BOLTON CORPORATION.—Thomas Mitchell and Sons, Ltd., supply of electrically-driven lathe and screwing machine.

GENERAL POST OFFICE.—Pirelli-General Cable Works, Ltd., telephone cable between London and Maidenhead, £70 000.

GLASGOW CORPORATION.—Babcock and Wilcox, Ltd., supply of boiler drum, for Pinkston power station; General Electric Co., Ltd., d.c.c. wire.

LIVERPOOL CORPORATION.—Drysdale and Co., Ltd., supply two 9 in. and one 3 in. electrically-driven centrifugal pumps for Lister Drive power station, £918.

NORTHAMPTON CORPORATION.—F. Wells, reconstruction of the main switches and fuses controlling lighting, heating and power circuits in Council Chamber and other works, £254 10s. 6d.

LEEDS CORPORATION.—Cables: Macintosh Cable Co., Ltd. £1 810; Greenwich Cable Works, Ltd., £2 550 1s. 6d.; F. Smith and Co., two miles of trolley wire; W. H. Allen, Sons and Co., Ltd., for circulating water pumps at Kirkstall power station, £5 044.

BUXTON CORPORATION.—Mather and Platt, Ltd., h.t. switch panels and switchgear, 500 kW motor converter with accessories and d.c. switchgear; Hewittic Electric Co., Ltd., 230 kW mercury arc rectifier for sub-station No. 1, and 58 kW mercury arc rectifier for sub-station No. 2; Callender's Cable and Construction Co., Ltd., h.t. feeder cables.

METROPOLITAN ASYLUMS BOARD.—G. E. Wallis and Sons, Ltd., electric light installation in shore and pier buildings at Long Reach Hospital, £884 10s.; Telephone and Electrical Maintenance Co., re-wiring fire alarm system at Caterham Mental Hospital, £220; Hart Accumulator Co., Ltd., renewal of storage batteries at King George sanatorium, £496 5s. 2d. (All recommended.)

BIRKENHEAD CORPORATION.—Ferguson, Pailin, Ltd., supply of pole mounting transformers as and when required, in connection with the Wirral scheme; Hackbridge Cable Co., Ltd., l.t. cable, £1 084; W. T. Henley's Telegraph Works Co., Ltd., supply of 11 000 V branch overhead line from Thornton Hough to "Rocklands," with a 30 kVA transformer, at schedule rates.

BURTON-ON-TRENT CORPORATION.—General Electric Co., Ltd., switchgear for the Pirelli Works, £582 10s.; Johnson and Phillips, Ltd., supply of switchgear in connection with supply of electricity to Granville Colliery; Pirelli-General Cable Works, Ltd., supply and laying of cables to premises of Pirelli, Ltd., on Derby Road, £6 566 3s. 2d.; G. and J. Weir, Ltd., for de-gassing and evaporating plant at Electricity Works, £2 750.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., electric light wiring and fitting of Radford and Hartnall houses, on Ring Cross estate, Islington, £1 023. Also tendered: "Rhymos" Electrical Engineers, £1 045; Barlow Bros. and Co., £1 111; Electrical Installations, Ltd., £1 133; A. Hawkins and Sons, £1 157; Anderson, Angell and Co., £1 244; A. Higginbotham and Sons, £1 245; Smethurst and Co. (London), Ltd., £1 320; W. Davey, £2 538.

GLASGOW CORPORATION.—Horstmann Gear Co., Ltd., 100 time switches; Venner Time Switches, Ltd., 54 ditto; Falkirk Iron Co., 50 large cookers; Bulpitt and Sons, Ltd., 500 electric kettles; Belling and Co., 2 700 electric fires; William C. Yuile Co., 250 ditto; British Insulated Cables Ltd., and General Electric Co., Ltd., supply of d.c.c. wire; Babcock and Wilcox, Ltd., supply of boiler drum; Mersey Cable Works, Ltd., supply of overhead cable, £271 1s. (all recommended.)

LONDON COUNTY COUNCIL.—Alpha Mfg. and Electrical Co., Ltd., wiring and fittings for electric lighting, etc., at new weights and measures office, Euston Road, £429. Also tendered: G. P. Cosway, £435; A. Hawkins and Son, £449; A. Higginbotham and Sons, £479; Stegman and Co., £490; Anderson, Angell and Co., £496; Smethurst and Co. (London), Ltd., £550; E. G. Hill, £553; H. C. Robinson, £561; E. Rivers Smith, Ltd., £615; J. Vigon, £617; Hewson and Lown, £680; the Globe Electrical Co., £696; W. Davey, £1 052.

ANTRIM LIGHT AND POWER CO., LTD.—Electrical equipment for lighting the town and adjacent area: Dromore Electric Light and Power Co., Ltd., overhead line and switchgear. Also tendered: Overhead line—Macintosh Cable Co., W. T. Henley's Telegraph Works Co., Ltd.; T. May; D. S. Electrical Co.; D. A. Gamble and Co.; H. G. Scott and Co. (Belfast), Ltd. Switchgear—Metropolitan-Vickers Electrical Co., Ltd.; English Electric Co., Ltd.; Mudies Electrical Co.; General Electric Co., Ltd.; H. G. Scott and Co. (Belfast), Ltd.; Drake and Gorham (Wholesale), Ltd.; D. S. Electrical Co.

SALFORD CORPORATION.—John Thompson Water Tube Boilers, Ltd., supply and erection at Agecroft power station, of two water tube boilers, each having normal evaporative capacity of 100 000 lbs. per hour, economisers, super-heaters, stokers, fans, chimneys, steam feed pump, steam and feed piping and air pre-heaters, £61 473, including £2 500 for contingencies and £1 560 for class L underfeed stokers; Metropolitan-Vickers Electrical Co., Ltd., supply, erection, testing, etc., at Agecroft power station, of one 16 000-20 000 kW turbo alternator set, with condensing plant, £50 841, including £3 000 for contingencies. (Both recommended.)

MANCHESTER CORPORATION.—Indiarubber goods, etc., for electricity department, C. Macintosh and Co., Ltd., L. Andrew and Co., G. MacLellan and Co., Ltd., D. Moseley and Sons, Ltd., Mica Mfg. Co., Ltd., R. Whiffen, Ltd., Dacier, Ltd., J. Walker and Co., Ltd., Clayton Rubber Co., Ltd., Liverpool Rubber Co., Ltd., and Mica Products, Ltd. Tapes: W. T. Henley's Telegraph Works Co., Ltd., Callender's Cable and Construction Co., Ltd., Johnson and Phillips, Ltd., J. Bonas and Son, Siemens Bros. and Co., Ltd., and Mitcham Waterproofing Co., Ltd. Wires (cotton and silk covered): London Electric Co. and Smiths, Ltd. Wire (tinned steel binding): Bruntons.

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# ELECTRICITY SUPPLY.

## Leeds Borrowing for Assisted Wiring—Hexham Public Lighting—Electricity Supply Scheme for Barnard Castle—Hydro-Electric Project in Westmorland—Waterford's New Electricity Undertaking—Liverpool and Central Board's Scheme.

LEEDS Electricity Committee seeks sanction to borrow £35 000 for assisted wiring and £110 000 for services.

The Steyning Electric Light Co. is applying for powers to supply electricity within the area of Thakeham R.D.C.

A cable is to be laid alongside the canal to supply the premises of Messrs. Stanton in Boundary Road, Woking.

Doncaster T.C. has adopted a scheme submitted by the electricity department for public lighting on the Intake housing site with 31 lamps, at a cost of £5 10s. per lamp per annum.

Halifax T.C. has applied for a loan of £159 028 for the installation of two water-tube boilers and a 6 500 kW turbo-alternator and condenser.

Burton-on-Trent Electricity Committee has offered to supply electricity to Swadlincote U.D.C. for lighting ten public lamps at £4 per lamp per annum.

The town of Lisbellaw (co. Fermanagh) is interested in a lighting scheme, and it is likely that an inquiry will be held for the purpose of giving it urban powers.

An application for sanction to borrow £25 000 is to be made by Birkenhead Electricity Committee in respect of prospective unspecified works on mains and services for the Wirral scheme.

Ormskirk Urban Council is going into the question of the purchase of the undertaking of the Ormskirk Electricity Co., and has decided to appoint Mr. Arthur Collins as its financial adviser.

Hexham U.D.C. Lighting Committee is to enter into an agreement with the Hexham Electric Light Co., Ltd., for the public lighting of the town for three years, with a price reduction of 10 per cent.

It is stated that a company, which has acquired the rights to supply electricity in Barnard Castle, proposes to erect a power station, and that a supply of electricity will probably be available by Christmas.

### SCOTTISH SCHEME PROGRESS.

*AFTER many months of preliminary investigation on the part of the Electricity Commissioners and the Central Electricity Board, the first of the great schemes for unification and co-ordination of electric power on a national basis is at present being carried out. The Central Scotland Electricity Scheme aims at linking up the main generating stations in the important industrial area lying round the valleys of the Clyde, Forth and Tay, and including the principal shipbuilding, engineering, colliery and general manufacturing areas of Scotland, from Kilmarnock to Dundee; the population of which area is roughly three-quarters of that of the whole country. British Insulated Cables Ltd., who were given the contract, were fortunately able to start the work immediately, owing to the fact that they were already carrying out a scheme on somewhat similar lines in the Far East. The accompanying picture shows one of the first six towers to be erected under this scheme. It is understood that engineers of Scottish stations affected by the scheme have been invited to-day (Friday) to view the work so far completed.*

The Great Asby Electric Light Co. has been formed with a capital of £2 000 to supply electricity to the village of Asby (Appleby), and the scheme will be commenced forthwith. Power will be obtained from the Rutter waterfalls.

Accrington electricity department proposes to change over 3-core d.c. mains in Burnley Road to 4-core a.c., and to provide duct line for Huncoat at an estimated cost of £1 181.—Electricity sold during July showed an increase of 10 per cent. on the corresponding month last year.

Dr. M. Laughlin, of the Irish Free State Electricity Supply Board, is expected to be present at the banquet on November 1st which is to mark the opening of the new Waterford electric lighting undertaking. It is expected that on that date, power will be available from the Pigeon House Fort station, Dublin.

A report by Mr. H. Hassall on a proposed electricity scheme to cost about £5 000, has been discussed by Buglawton U.D.C. The report deals with lighting only. The Clerk expressed the opinion that the Council's chance of obtaining an Order to supply electricity was a remote one. The matter is to be discussed at a special meeting.

Mr. C. M. Shaw, city electrical engineer of Worcester, recommends the City Council to adopt a system of deferred payments for the hire and hire purchase of wiring in small houses, and to apply for loans of £4 000 each for the purchase of cookers to be let out on hire and for assisted wiring installations and the appointment of a demonstrator and a showroom attendant.

Sheffield Electricity Committee is applying to the Electricity Commissioners for consent to the payment out of the net surplus of a sum not exceeding £33 750 on the undermentioned distribution works for next year:—Motor and cooker hire, £5 000; wiring for cookers, £1 250; meters and current transformers, £25 000; lands for substations, £2 000, and rental wiring installations, £500. The committee has authorised mains extensions at a cost of £7 877.

During the past year 249 tenement dwellings in Aberdeen have been wired under the council's assisted wiring scheme. Coun. MacGregor, in moving the adoption of the electricity accounts at the Council meeting last week, said the Corporation's electricity system now operated as far as Dyce in the north, Culter in the west and Cove in the south. Sales exceeded 32 000 000 kWh per annum, or 192·6 kWh per head of population, compared with 172 kWh in the previous year.

A resolution has been passed by the Liverpool Chamber of Commerce expressing the opinion that the proposals of the Central Electricity Board concerning the generation and supply of electricity under the North West England and North Wales electricity scheme of 1928 particularly in the proposed application of the scheme to Liverpool's electricity requirements, are detrimental to the efficient, safe, and economical working of the port, and inimical to the best interests of the city. The Chamber is prepared to support Liverpool Corporation's objections by evidence before the Commissioners or otherwise. Mr. Walter Moon, town clerk of Liverpool, said the Corporation had arranged to construct a super-station at Clarence Dock on the understanding that it and Lister Drive station would supply the requirements of Liverpool.

Bolton Lighting Committee has decided that quotations be obtained from the electricity and gas departments for the lighting of Salthills Dean Road by means of electricity and gas, respectively.—The borough electrical engineer has reported the terms upon which various landowners are prepared to grant wayleaves for the placing of poles and overhead equipment on or over lands belonging to them, in connection with the proposed supply in the Breightmet Hill district, and such terms have been approved by the Electricity Committee.

Bermondsey Electricity Committee has been informed by the Electricity Commissioners that they will be prepared to approve of the Borough Council and the London Electric Supply Corporation entering into a supplemental agreement with regard to bulk supply, and the committee has decided to conclude an arrangement with the company for the laying of the necessary feeder cable to the Almond Road sub-station on a time and material basis, the work to be done as far as possible by direct labour.—The offer by Messrs. Crompton Parkinson, Ltd., to supply a new 12-way public lighting switchboard free of expense to the Council, in exchange for the Council's 25-year-old 8-way board, has been accepted with thanks.

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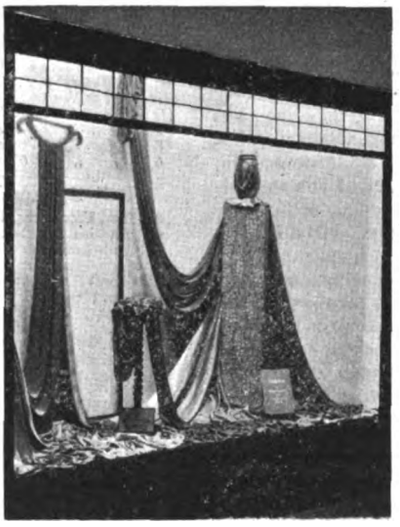
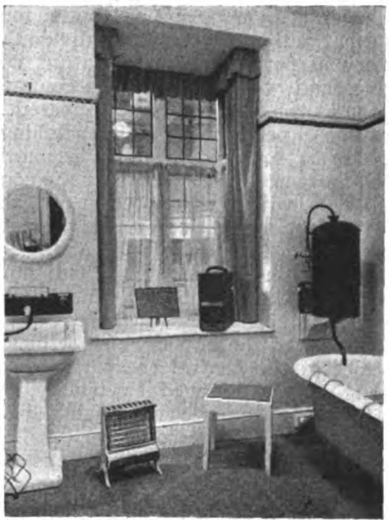
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

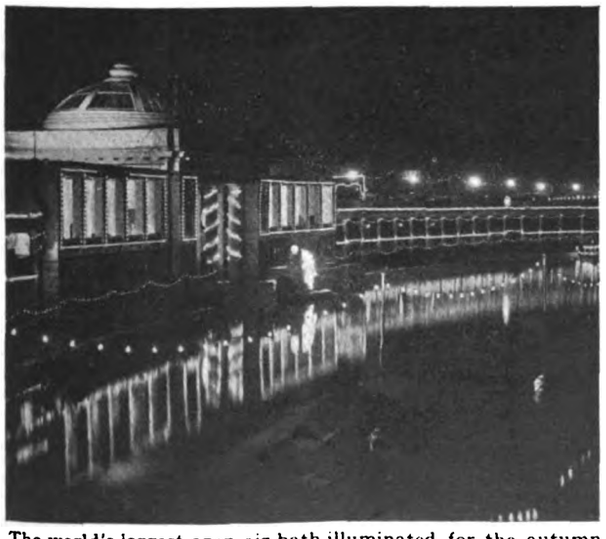
Left.—The illustration shows M. Mihaly, the Hungarian inventor, and his television apparatus exhibited at the Fifth Annual Wireless Exhibition at Berlin.

Right.—A section of the pipe line which is being laid in connection with the Grampians hydro-electric project.

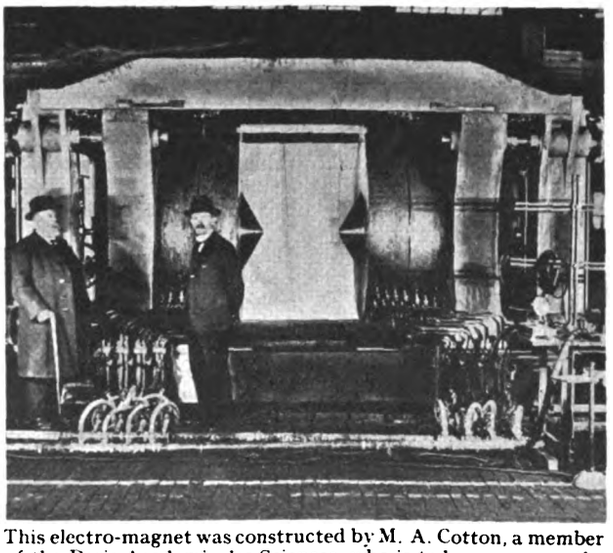




Amongst the sections included in Bristol Corporation's exhibit at Bristol's annual exhibition, which concluded on Wednesday, were the electrically-equipped dining room, shown above on the left, artistic shop window lighting schemes, one of which is to be seen in the middle picture, and a luxurious electrically-equipped bathroom, which appears on the right. These formed parts of a model electric house which contained, in addition to two window displays on the ground floor, seven rooms on the first floor. The Corporation also had an exhibit in another part of the hall where demonstrations were given of all the appliances shown in the electric house.



The world's largest open-air bath illuminated for the autumn season at Blackpool. Thousands visited the bath on the opening night, and it is a forerunner of the general scheme of illuminations which will extend along five miles of sea front.



This electro-magnet was constructed by M. A. Cotton, a member of the Paris Academie des Sciences, who is to be seen near the centre of the picture. It is said to be the largest in the world, and has been installed at the National Office des Recherches.

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# ELECTRIC TRACTION.

## A Battery-Oil-Electric Locomotive on the New York Central Railroad.

ACCORDING to "The Times" Trade and Engineering Supplement, the New York Central Railroad recently tested in New York City a new battery-oil-electric locomotive. This engine, the first of its kind ever built, was constructed for service in freight yards which are not completely electrified, over tracks which are electrified, and through city streets. The new locomotive, which weighs 128 tons in working order, has four methods of operation—from storage batteries alone, from the storage batteries and the engine generator in combination from the third rail, and from an overhead collector. As the change from external to internal power supply, or vice versa, occurs automatically, indicating lights are provided in the cab to show under which operating condition the equipment is running. In designing the locomotive, the New York Central's electrical engineering department collaborated with the American General Electric and the Electric Storage Battery Companies; the actual construction was carried out by the American Locomotive Company. When the locomotive is moving in non-electrified sections, the power is furnished by a 218-cell storage-battery, one of the largest ever used for locomotive service and weighing 17 tons. The battery is charged by a 200 kW generator directly connected to a 300 H.P. oil engine. If the generator is being operated at the same time as power is being supplied to the four 600 V single-geared 415 H.P. traction motors, it will divide the load with the storage battery in periods of heavy output without overloading the engine, and will automatically resume charging the battery as soon as the load has been decreased. The battery supplies the surge of power required in switching service, when a quick response is required from a locomotive. The locomotive, which measures 46 ft. 8 in. over the couplers, is of the swivel-truck type, with a three-section cab, the batteries, which are arranged in tiers, being placed in the end sections. In addition to containing the power-plant and the control apparatus, the central section of the cab has two small operating compartments for the enginemen. Each operating compartment has doors giving access to the power-plant and providing an entrance from the outside. Directly above the oil engine, in the roof of the central compartment, is a hatch permitting the engine to be removed if necessary. The control of the motor is of the non-automatic type, with individual electro-pneumatic contactors, and the locomotive can be operated from either end. The engine is run at constant speed under the control of a governor. The fuel oil tanks have a capacity of 200 gallons, sufficient to operate the engine at full load for about ten hours.

The net surplus on the working of the Edinburgh tramway cars during the year ended May 15th last was £4 027, and on the buses £4 576. The revenue of the whole undertaking was £880 788, an increase of £3 733.

On the Paris Underground Electric Railways during April, May and June of this year 73 500 000 tickets were issued, including 40 000 000 return tickets, the total increase over the corresponding quarter of 1927 being 5 000 000.

# I.E.E. INFORMAL MEETINGS.

## Programme of Papers for the Coming Session.

The programme of informal meetings for the session 1928–29 has now been issued by the Institution of Electrical Engineers. The meetings are held at the Institution building, and commence in each case at 7 p.m.

The dates and subjects for discussion are as follows:—

October 29th.—Discussion on "Our Profession from a Manufacturer's Point of View." (Opened by the President, Lieut.-Colonel K. Edgcumbe.)

November 12th.—Discussion on "Engineering Requirements of a Modern Office Building." (Opened by J. Coxon.)

November 26th.—Discussion on "Picture Telegraphy," (Opened by Mr. E. S. Ritter.)

December 10th.—Discussion on "Power Factor Tariffs and Methods of Metering." (Opened by Mr. E. W. Dorey.)

January 14th.—Discussion on "Electric Trolley Omnibuses." (Opened by Major A. Jenkin.)

January 28th.—Discussion on "Mains Testing." (Opened by Mr. F. C. Raphael.)

February 4th.—Discussion on "Earthing and the Safety of the Public." (Opened by Mr. W. R. Rawlings.)

February 18th.—Discussion on "Modern High-Power Rectifier—their Development and Use." (Opened by Mr. R. L. Morrison.)

# COMPANY NEWS.

## Easy Market in Electrical Securities.

ELECTRICAL shares continue in no great demand, and except for several small advances in the supply group, prices have tended to sag. Johnson and Phillips are 2s. 6d. lower at 37s. 6d., and British Insulated and Callender's have each eased 1s. 3d. Ericsson preference have given way from £1 to 19s. 6d., and General Electrics have lost 6d. Crompton Parkinson preference have risen from 17s. 6d. to 18s., and Ever Readies have touched 30s. Eastern Telegraph stock and Marconi's shares have both weakened. Metropolitan Railway ordinary stock is 1½ points up. London Electric Supply shares are 1s. up, and smaller rises are shown by Metropolitan Electric, Newcastle, and Yorkshire ordinaries.

| Last Annl. Divd. % | Description | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | " " " 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | " " " 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 40/6 | 40/6 | 68/6 | 14/6 |
| 6 | " " 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) .. .. | 28/6 | 27/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48/9 | 48/1½ | 43/- | 8/- |
| 4½ | " " " 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 27/6 | 22/6 | 7/9 |
| 6 | " Elec. Sup. Ord. .. | 26/3 | 25/7½ | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (c) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs & Staffs Power B. Ord. | 33/- | 33/- | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | " " 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 36/6 | 36/- | 32/9 | 12/6 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | " " " 6% Pf. Stk. .. | 126 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72* | 72½ | 89½ | 40½ |
| 4 | " 4% Deb. .. .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | " " " 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | " " 4% Deb. .. | 80 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | " " " 5% Deb. .. | 66½ | 66½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 68 | 66½ | 84½ | 19 |
| 3½ | " " 3½% Pf Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | " " 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79½ | 79½ | 66½ | 12½ |
| 4½ | " " 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | " " 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 62 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/6 | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | " " " 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 85/- | 86/3 | 26/6 |
| 6 | " " " 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/3 | 23/3 | 24/6 | 19/7 |
| 7 | " " " 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 81/3 | 82/6 | 86/- | 22/- |
| 6½ | " " 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | " " 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 18/- | 17/6 | 18/- | 8/- |
| 7 | " " 8% Cum. Pf. | 20/3 | 20/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | " " 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | " " 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | " " 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/6 | 20/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 30/- | 29/9 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | " 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 41/- | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 110/- | 110/- | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 37/6 | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 33/1½ | 33/9 | 37/- | 13/1 |
| 8 | " " 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 28/9 | 28/9 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 62½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 247½ | 250 | 213½ | 113/2/6 |
| 3½ | " " 3½% Pref. Stk. .. | 69½ | 69½ | 84/17/6 | 49 |
| 4 | " " 4% Deb. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25 | 25 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 39 | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 46½ | 46½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 68/9 | 70/- | 9/16/3 | 20/9 |
| 12½ | " Int. Mar. .. .. | 51/- | 50/6 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24½ | 24½ | 23 | 11/3/6 |

(a) 1s. 7 5/6d. per share. (b) £8 8s. 6·66d. per cent. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. ·912d. (g) 1s. 7·223d.

* Ex-dividend. ‡ Including 1s. bonus.

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## Reports and Dividends.

ASSOCIATED FIRE ALARMS, LTD.—Div. of 8 p.c., less tax (agst. 6 p.c. last year) on the ord. shs. will be payable on Oct. 10.

PRITCHETT AND GOLD AND E.P.S. CO., LTD.—Intm. div. at rate of 10 p.c. p.a., tax free, on ord. shs. for half year, will be payable on Sept. 28.

SOCIETE INTERNATIONALE D' ENERGIE HYDRO-ELECTRIQUE (S.I.D.R.O.).—Div. of 47 fr. on pfd. and ord. shs., and 171.83 fr. on founders' shs. are proposed. An amt. of 29 700 000 fr. will be added to res.

JUTLAND TELEPHONE CO., LTD. —Coupons on 5½ p.c. bds. of 1922 and 1923, fallg. due on Sept. 15, 1928, may be presented for paymt. at Hambro's Bank, Ltd., 41, Bishopsgate, London, E.C.2, where lists can be obtained.

WESTERN TELEGRAPH CO., LTD.—The register of members and the transfer books are closed from Sept. 14 to 20 inclusive, preparatory to paymt. on Sept. 29 of a div. of 5s. p.sh., tax free, in respect of qtr. ended June 30, 1928.

WIRELESS PICTURES (1928), LTD.—Underwriting arrangements have been completed in connection with an issue which will be made shortly. The board includes Sir Charles Bright, F.R.S.E., Lt.-Col. A. F. H. S. Simpson, and Mr. W. H. Lynas.

ALTRINCHAM ELECTRIC SUPPLY, LTD.—Pft. for 1927, £25 208, agst. £27 567, plus £1 758 brt. in. Deductg. directors' fees, divs. on pref. shs. to Sept. 1, 1927, and divs. on ord. and dfd. shs. paid March, 1928, leaves £3 758. Fin. divs. for 1927 on ord. shs. required £1 000 and on dfd. shs., £1 000. Fwd., subject to directors' fees, £1 758.

BURNDEPT WIRELESS, LTD.—The scheme for the reconstructn. of Burndept Wireless having been approved, and a new co., Burndept Wireless (1928), havg. been incorporated, letters of right are being sent to shhldrs. in the old co., enabling them to become shhlds. of the new co. The purchase will be completed when the moneys due on allotment and call are available, and until completn. the Burndept business will continue to be carried on by Mr. Charles W. Rooke, receiver and manager.

SIEMENS BROTHERS AND CO., LTD.—In view of certain misleading statements which have appeared in the German press in the course of last week with regard to the relations of Siemens Brothers and Co., Ltd., London, whose works are situated at Woolwich, and Siemens and Halske, of Berlin, and which have been re-echoed in a leading London paper, we are officially advised by Siemens Brothers and Co., Ltd., that the facts underlying these rumours are as follows: It is becoming more and more obvious that rapid development in every field of industry necessitates not only an ever-increasing application of research and development, but collaboration with leading manufacturers engaged in the same business. This especially applies to the electrical industry. With this end in view, Siemens Brothers have entered into discussions with Siemens and Halske, Berlin, for the purpose of attaining the above objects, and for providing for an interchange of patent rights, thereby avoiding the risk of patent litigation between firms of similar names and which formerly had been closely connected. The question of a limited mutual financial interest has also been discussed, on the fundamental basis that the identity and control of each of the firms shall remain undisturbed. Foreign control of Siemens Brothers is precluded by virtue of their articles of association, which provide that no bearer shares can be issued and no foreigners or foreign corporations or British corporations controlled by foreigners, or nominees of foreigners or foreign corporations, can obtain, directly or indirectly, a voting power exceeding *in toto* 25 per cent. of the total shares vote in Siemens Brothers. No changes in the articles of association in this respect are, therefore, necessary. No agreements have yet been concluded.

## Company Meeting.

GENERAL ELECTRIC CO., LTD.—At an extraordinary general meeting last Friday, resolutions were passed unanimously altering the articles of association (1) by inserting a new article providing that no vote shall be given at any general meeting of the company by a foreigner or foreign corporation or corporation under foreign control, or by any person who holds the shares in respect of which he proposes to vote, directly or indirectly, for a foreigner or a foreign corporation or a corporation under foreign control. In any case of doubt as to whether a vote has been validly given or is validly tendered the directors shall be entitled to call on the person giving or tendering such vote to prove to their satisfaction that the shares in respect of which such vote is given or tendered are not so held. A majority of the directors may also at any time certify that there is in their opinion reason to believe that any share in the company is held by, or in trust for, or is under the control of a foreigner or foreign corporation or corporation under foreign control, and thereupon the directors shall call on the holder of such share to prove to their satisfaction that the share in question is not so held; and (2) by adding to article 87 the words "provided that a majority of the directors shall be British subjects." Mr. Ernest G. Byng, vice-chairman of the company, presiding at the meeting, said Sir Hugo Hirst, who was at present on the steamer "Mooltan" on his way to Australia, wished him (Mr. Byng) to express his regret at his unavoidable absence. In his speech to the shareholders on July 3rd, Sir Hugo referred to the favour which their shares at present enjoyed in foreign markets. He pointed out that, whilst they welcomed shareholders of any nationality and appreciated the trust which they placed in them, he thought it undesirable that too great a voting power should be vested in non-British hands, bearing in mind the aims of that important company. Sir Hugo said on that occasion: "We believe the electrical industry is destined to play a most important part in the development of the Empire. We believe our company holds a marked and leading position in British electrical industry, and it might cause great embarrassment some day if it were found out that too big a proportion of shares is held in non-British hands. I am speaking not from the personal but from the entirely national point of view. We therefore propose to watch, so far as we can, the progress of this movement, and, should we find that an undue proportion of our shares wanders into foreign possession, it may be necessary to introduce measures which keep that movement in check within certain proportions, so that the control at all times should remain with British shareholders residing within the Empire." Since making this statement, the number of shares held by banks in favour of shareholders not disclosed, had considerably increased, and they had good reason to believe that a large proportion were held for non-British interests. In consequence, the foregoing resolutions were approved by the Board, and they had also found the approval of the Stock Exchange Committee. They were most happy in the business and trading agreements which they had with electrical friends in almost every country. It would be their endeavour to strengthen these agreements whenever an opportunity arose. They were most anxious to help in the removal of insane and uneconomic competition in the world's markets; yet, in spite of these ideals, they felt that their proposals were necessary in the national interests, as well as those of their great Company.

## New Companies.

ATO CLOCK CO., LTD.—Cap., £500. To carry on the business of manufacturers of and agents for clocks, electric and otherwise, etc. Reg. Office: 90, Hatton Garden, E.C.1.

FIELDING AND CATCHPOLE, LTD.—Cap., £2 000. Manufacturers of and dealers in electrical goods and sundries, etc. Solicitors: Soames, Edwards and Jones, Lennox House, Norfolk Street, Strand, London, W.C.2.

OLDHILL MANUFACTURING CO., LTD.—Cap., £500. Manufacturers of and dealers in wireless apparatus, parts, fittings and accessories, wireless cabinets, etc. Reg. Office: 6/7, The Mews, Oldhill Street, Clapton Common, N.16.

EVER-LITE CHANGEABLE SIGNS, LTD.—Cap., £1 000. Factors, erectors and repairers of, agents for and dealers in interchangeable daylight, nightlight or illuminated signs, etc. Reg. office: 10, Aitken Chambers, Cannon Street, Birmingham.

AUTO-DISTRIBUTORS, LTD.—Cap., £1 000. To transact agency business, to carry on business of mechanical, electrical and general engineers, etc. Reg. office: 1, Church Court, Old Jewry, London, E.C.

ANTI-WASTE APPLIANCES, LTD.—Cap., £15 000. Manufacturers of and dealers in oil, electrical, gas and other appliances, whether for domestic, manufacturing, transport or other purposes, etc. Solicitors: Mayo, Elder and Co., 10, Drapers Gardens, E.C.

GORDON WHITE AND CO., LTD.—Cap., £1 000. To adopt an agreement with Philip M. White and Gordon G. Bloxam, and to carry on business of motor, electrical, telephonic, wireless and general engineers, electricians, etc. Reg. office: Gold Hill Lane, Chalfont St. Peter, Bucks.

GUY AND CO., LTD.—Cap., £1 000. To acquire the business of steel and ironwork contractor now carried on by J. E. Guy at Tempest Hey, Liverpool, as "Guy and Co." and to carry on business of electrical and mechanical engineers, etc. Reg. office: 21, Tempest Hey, Liverpool.

MACINLOP (IRELAND), LTD.—Cap., £100. To carry on in Northern Ireland and the Irish Free State or elsewhere the business of electrical wire and cable manufacturers, manufacturers of and dealers in indiarubber, gutta percha, etc. Solicitors: Clifford-Turner and Co., 81-7, Gresham Street, London, E.C.2.

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# MUNICIPAL FINANCE.

## Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1927-8 of the 64 undertakings included in the following table and the 61 in the table which appeared in our issue of August 17th was £21 854 074. The gross profit on the year's working of the 125 undertakings was £10 144 197, and the aggregate sales of electricity amounted to 3 610 459 193 kWh, while 58 undertakings out of the total number have contributed an aggregate of £381 684 to the relief of rates.

| Authority. | Total Revenue. £ | Gross Profit. £ | Net Profit or deficit. £ | (a) Working Costs per kWh sold. | Total Cost per kWh (inc. capital charges). | Electricity sold (kWh). | Increase (+) (or) Decrease (−) in kWh sold. | Maximum Simultaneous Load in kW. | (h) Load Factor. | Radiators and Cookers Connected (total) in kW except where otherwise stated. | Other Domestic Appliances connected (total) kW. | Contributed in Aid of Rates. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aylesbury T.C. | 38 822 | 17 763 | + 1 256 | 1·393d. | 2·636d. | 3 249 828 | + 1 025 023 | 1 410 | 26·20 | 3,540 | 863 | — |
| Batley T.C. | 31 381 | 13 388 | + 6 553 | 1·225d. | 1·720d. | 3 499 888 | + 334 884 | 1 943 | 26·47 | 820 | — | 800 |
| Bo'ness T.C. | 15 072 | 6 137 | + 295 | 1·463d. | 2·419d. | 1 405 775 | + 180 069 | 556 | 30·00 | See footnote (c) | See footnote (c) | — |
| Bradford C.C. | 556 338 | 239 154 | + 31 229 | 0·544d. | 1·405d. | 86 758 306 | + 9 296 648 | 41 700 | 23·69 | 38 704 | See footnote (c) | 20 000 |
| Bristol C.C. | 536 910 | 275 744 | + 117 991 | 0·668d. | 1·138d. | 84 123 978 | +16,527 785 | 33 032 | 28·98 | See footnote (c) | See footnote (c) | 17 500 |
| Chester C.C. | 83 276 | 40 887 | + 15 726 | 1·047d. | 1·839d. | 7 675 768 | + 817 808 | 4 764 | 18·38 | 1 795 | 342 | 1 500 |
| Colne T.C. | 36 081 | 14 611 | + 3 271 | 1·360d. | 2·040d. | 3 770 782 | + 350 618 | 1 988 | 25·80 | 1 828 | 691 | 1 235 |
| Doncaster T.C. | 71 395 | 36 865 | + 9 927 | 0·950d. | (d)1·840d. | 8 037 733 | + 1 356 000 | 4 400 | 22·00 | See footnote (c) | See footnote (c) | 2 500 |
| Douglas T.C. | 31 371 | 16 368 | + 1 994 | 1·890d. | 4·081d. | 1 616 864 | + 431 080 | 973 | 23·38 | — | — | — |
| Erith U.D.C. | 69 818 | 20 048 | (q) +4 228 | 0·959d. | (r)1·263d. | 12 452 618 | — | 1 900 | 74·81 | — | — | 970 |
| Fulham (London) B.C. | 143 544 | 71 146 | + 30 563 | 0.970d. | 1·500d. | 18 026 684 | + 1 952 299 | 8 200 | 25·08 | See footnote (c) | See footnote (c) | 5 400 |
| Gillingham T.C. | 37 114 | 16 738 | + 6 306 | 1·500d. | 2·440d. | 2,881,557 | + 589 215 | 1 390 | 26·80 | (e) 590 | (e) 91 | 800 |
| (h) Glasgow C.C. | 1 440 697 | 606 972 | + 27 246 | 0·646d. | 1·539d. | 220 247 598 | +28 457 910 | 107 220 | 28·42 | 47 084 | 76 356 | — |
| Grays U.D.C. | 20 608 | 5 482 | (i) +2 678 | 2·000d. | 2·390d. | 1 708 082 | + 479 404 | 725 | 26·80 | 1 000 | 224 | — |
| Great Yarmouth | 81 860 | 47 960 | + 8 773 | 1·000d. | 1·460d. | 5 673 627 | + 1 069 923 | 3 850 | 23·30 | 7 844 | 1 899 | — |
| Grimsby T.C. | 100 701 | 47·364 | 19 277 | 0·869d. | 1 342d. | 14,620,593 | + 2 453 250 | 6 230 | 20 71 | 447 | 192 | — |
| Guildford T.C. | 39 646 | 23 341 | + 9 785 | 1·700d. | 3·117d. | 2 295 262 | + 239 710 | 1 940 | 18·16 | — | — | — |
| Hackney (London) B.C. | 239 998 | 125 014 | + 22 214 | 0·760d. | 1·420d. | 34 378 953 | + 5 035 785 | 19 300 | 20·28 | — | — | 8 145 |
| (h) Hamilton T.C. | 27 683 | 12 927 | + 3 033 | 1·250d. | 2·110d. | 2 769 459 | + 716 548 | 1 349 | 23·40 | 320 | 90 | — |
| Hampstead (London) B.C. | 162 170 | 54 518 | + 44 905 | 1·480d. | 1·610d. | 17 487 668 | + 1 710 397 | 10 700 | 18·61 | — | — | — |
| Haslingden T.C. | 21 244 | 6 165 | + 1 665 | 1·148d. | 1 510d. | 3 153 009 | + 408 214 | 1 282 | 28·02 | 1 670 | 1 491 | 630 |
| Hazel Grove and Bramhall U.D.C. | 11 662 | 6 480 | + 3 113 | 1·704d. | 1·813d. | 590 471 | + 105 029 | 392 | 19·88 | — | — | — |
| Holmfirth U.D.C. | 13 568 | 5 304 | — 400 | 1·390d. | 1·870d. | 1 785 925 | + 57 558 | 850 | 26·20 | 544 | 471 | — |
| Honley U.D.C. | 6 089 | 2 732 | + 1 164 | 1·540d. | 2·150d. | 617 261 | + 81 950 | 242 | 29·00 | 215 | 100 | — |
| (g) Huddersfield T.C. | 210 853 | 91 861 | + 39 927 | 0·821d. | 1·187d. | 33 778 027 | + 4 988 277 | 15 600 | 24·72 | (f)10 000 | (f) 2 000 | — |
| Inverness T.C. | 27 333 | 17 630 | + 8 814 | 1·830d. | 3·500d. | 1 264 270 | — | 952 | 15·10 | — | — | — |
| Islington (London) B.C. | 238 293 | 118 052 | + 51 715 | 1·110d. | 1·740d. | 25 173 471 | + 3 802 780 | 18 711 | 15·32 | 1 380 | — | 8 500 |
| Kettering U.D.C. | 73 800 | 30 434 | (k) +3 480 | 1·440d. | 2·400d. | 7 202 836 | + 1 006 008 | 3 559 | — | (b) 6,659 | See footnote (b) | 1 150 |
| Leigh T.C. | 51 485 | 21 925 | + 9 447 | 0·770d. | 1·124d. | 8 454 911 | + 1 224 316 | 4 476 | 25·00 | — | — | — |
| Liverpool C.C. | 1 288 038 | 473 883 | + 75 184 | 0·787d. | 1·300d. | 223 641 672 | +36 876 525 | 89 600 | 28·42 | (l) (No.) 3 200 | See footnote (c) | 35 000 |
| Loughborough T.C. | 47 934 | 20 022 | + 2 528 | 1·130d. | 1·840d. | 5 703 263 | + 872 864 | 3 250 | 20·00 | (b) 1 788 | See footnote (b) | 2 410 |
| Lytham St. Annes T.C. | 61 267 | 21 187 | + 1 197 | 1·510d. | 2·280d. | 6 354 933 | + 966 173 | 3 560 | 20·91 | 13 250 | 3 650 | — |
| Malvern U.D.C. | 14 508 | 5 518 | + 2 290 | 3·700d. | 5·050d. | 583 307 | + 17 333 | 450 | 14·80d. | See footnote (c) | See footnote (c) | — |
| Mansfield T.C. | 52 694 | 19 942 | + 4 029 | 1·537d. | 2·293d. | 5 047 965 | + 1 025 458 | 2 453 | 23·43 | (b) 2 302 | See footnote (b) | — |
| Marylebone (London) B.C. | 470 357 | 240 264 | + 52 310 | 0·706d. | 1·282d. | 78 264 859 | +12 784 845 | 43 167 | 20·60 | (b) 34 880 | See footnote (b) | — |
| Morley T.C. | 11 536 | 5 677 | + 3 956 | 1·840d. | 2·411d. | 752 986 | + 133 471 | 460 | 22·10 | — | — | — |
| Newcastle-under-Lyme T.C. | 13 387 | 6 586 | + 198 | 2·140d. | 4·160d. | 760 709 | + 105 757 | 607 | 14·26 | (n) 30 | See footnote (n) | — |
| Newport T.C. | 191 111 | 88 533 | + 29 050 | 3·865d. | 1·366d. | 28 461 013 | + 375 584 | 11 350 | 28·55 | (l) 10 535 | See footnote (c) | 7 440 |
| Oldham T.C. | 244 535 | 139 429 | + 2 9570 | 0·531d. | 1·000d. | 47 480 355 | + 1 613 713 | 24 800 | 25·49 | See footnote (m) | See footnote (m) | — |
| Paisley T.C. | 97 706 | 48 524 | + 2 939 | 1·110d. | 1·940d. | 11 711 791 | + 1 230 133 | 5 400 | 29·18 | 4 111 | 1 615 | — |
| Penmaenmawr U.D.C. | 3 087 | 1 648 | + 408 | 2·526d. | 4·504d. | 143 149 | + 36 642 | 100 | 18·10 | (b) (e) 467 | See footnotes (b) (e) | — |
| St. Pancras (London) B.C. | 282 205 | 161 177 | + 47 348 | 0·930d. | 1·880d. | 29 614 829 | + 4 496 883 | 19 200 | 17·68 | See footnote (c) | See footnote (c) | — |
| Sheffield C.C. | 995 767 | 557 627 | + 243 376 | 0·371d. | 0·839d. | 198 228 994 | +28 015 581 | 88 724 | 29·46 | — | — | 8 978 |
| Stalybridge &c. Elect. Bd. | 120 245 | 54 588 | + 567 | 0·427d. | 0·651d. | 40 028 624 | + 6 057 228 | 17 100 | 26·70 | (b) 1 096 | See footnote (b) | — |
| Stoke Newington (London) B.C. | 47 160 | 14 952 | + 2 631 | 2·177d. | 3·181d. | 3 359 552 | + 280 942 | 2 470 | 20·44 | — | — | — |
| Stretford U.D.C. | 213 568 | 77 988 | + 24 082 | 0·599d. | 0·837d. | 54 341 792 | + 6 172 825 | 18 040 | 34·38 | — | — | — |
| Sutton Coldfield T.C. | 32 620 | 13 328 | + 5 169 | 1·770d. | 2·716d. | 2 122 291 | + 270 805 | 1 494 | 22·14 | 2 120 | — | — |
| Swansea T.C. | 219 533 | 106 788 | + 36 472 | 0·730d. | 1·210d. | 35 205 047 | + 5 025 533 | 12 660 | 35·49 | — | — | 9 525 |
| Swindon T.C. | 73 618 | 36 184 | + 18 945 | 0·960d. | 1·430d. | 9 383 208 | + 2 168 247 | 4 384 | 28·57 | — | — | 2 000 |
| Wakefield T.C. | 78 759 | 37 848 | + 5 487 | 0·970d. | 1·740d. | 10 130 903 | + 2 179 427 | 5 288 | 29·14 | — | — | — |
| Wallasey T.C. | 149 230 | 74 286 | + 36 202 | 0·571d. | 0·861d. | 31 508 691 | + 3 929 574 | 12 990 | 27·60 | 7 557 | 1 594 | 5 000 |
| Walsall T.C. | 121 920 | 51 922 | + 15 476 | 0·970d. | 1·480d. | 17 193 725 | + 858 980 | 7 300 | 33·20 | 4 758 | 732 | 41 900 |
| Watford | 110 207 | 34 302 | + 17 486 | 0·930d. | 1·560d. | 14 332 027 | + 3 103 504 | 7 200 | 22·66 | See footnote (c) | See footnote (c) | 1 500 |
| West Ham T.C. | 409 114 | 177 619 | + 50 430 | 0·580d. | 0·940d. | 82 810 561 | + 8 712 627 | 29 215 | 32·35 | (b) 5 422 | See footnote (b) | 11 960 |
| West Hartlepool T.C. | 70 631 | 26 317 | + 9 238 | 0·894d. | 1·240d. | 11 892 285 | + 4 558 948 | 4 500 | 30·16 | 2 322 | 480 | 1 900 |
| Weymouth T.C. | 30 344 | 12 708 | + 4 978 | 1·920d. | 2·850d. | 2 193 475 | + 298 949 | 1 268 | 25·50 | (b) 1 312 | See footnote (b) | 300 |
| Willesden U.D.C. | 191 563 | 66 308 | + 19 472 | 1·701d. | (o)2·262d. | 22 018 436 | + 2 783 781 | 12 270 | 20·43 | 10 260 | 870 | — |
| Wimbledon T.C. | 155 697 | 80 216 | + 33 090 | 0·982d. | 1·596d. | 18 411 699 | + 2 900 261 | 9 650 | 21·78 | (b) (p) (No) 9 143 | See footnotes (b)(p) | — |
| Wolverhampton T.C. | 270 041 | 125 518 | + 24 362 | 0·509d. | 0·700d. | 68 083 829 | +14 401 070 | 24 800 | 31·00 | (b) 18 812 | See footnote (b) | 10 000 |
| Worcester C.C. | 77 300 | 40 892 | + 12 329 | 0·710d. | 1·260d. | 11 647 783 | + 2 424 999 | 6 652 | 24·22 | 5 420 | 468 | 3 000 |
| Workington T.C. | 5 110 | 2 502 | + 1 278 | 1·310d. | 2·310d. | 270 059 | + 79 765 | 250 | 14·50 | 187 | See footnote (c) | — |
| Worthing T.C. | 55 929 | 29 488 | + 7 442 | 1·600d. | 2·980d. | 3 946 617 | + 890 346 | 2 521 | 17·82 | (b) 3 899 | See footnote (b) | 723 |
| Wrexham T.C. | 27 881 | 7 666 | + 3 385 | 1·050d. | 1·650d. | 3 564 029 | — 311 963 | 1 080 | 21·50 | (l) 298 | — | 546 |
| York C.C. | 118 623 | 63 419 | + 30 077 | 0·570d. | 0·910d. | 23 183 658 | + 4 313 417 | 9 249 | 33·99 | — | — | 3 245 |

(a) Usually includes management, repairs and maintenance, rates and taxes and special charges. (b) Including other domestic electrical appliances. (c) Not available. (d) Including capital expenditure out of revenue. (e) Approximate. (f) Estimated, on December 31st, 1927. (g) Year ended December 31st, 1927. (h) Year ended May, 1928. (i) After taking into account £856 expenditure of a capital nature out of revenue. (k) Before taking account of capital expenditure out of revenue, rate contribution, etc. (l) Cookers only. (m) Hiring scheme about to be launched. (n) Cookers only. Information regarding radiators and other appliances not available. (o) Include £3 902 for meters and £1 335 for transformer sub-station buildings. (p) On hire. (q) After payment of £6 107 out of revenue for capital works and devoting £970 to relief of rates. (r) Including £6 107 for capital works and £970 applied to relief of rates.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts, they may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within* 21 *days.*]

AYLING, Mr. E. C., 13, Vansittart Road, Windsor, wireless agent. £10 10s. 5d. August 2nd.

DUDLEY, C. AND CO., Empire Buildings, Carlton Street, Blyth, electrical engineers. £12 10s. 9d. August 1st.

EATON, Mr. S. (the younger), 58, Lambert Street, Kendray Estate, Ardsley, Barnsley, wireless dealer. £30 4s. 7d. July 23rd.

EDWARDS, G. J., 236, Central Market, Cardiff, wireless factor. £17 17s. 4d. July 25th.

PARKINSON, William, 1, Brooklyn Avenue, Blackpool, wireless engineer. £21 3s., July 25th, and £47 10s. 7d., July 25th.

ROBERTS, Mr. R. C., 29, Jewry Street, Winchester, radio engineer. £42 14s. 5d. July 24th.

TAYLOR, F. A. (trading as KINGSTON RADIO SUPPLIES), 2, Station Approach, Kingston, wireless dealer. £47 8s. 2d. July 31st.

WIRELESS AND FANCY GOODS SUPPLIES CO., 2, Litchfield Street, Charing Cross Road, W.C., wireless dealers. £10 11s. 11d August 7th.

## Deed of Arrangement.

JONES, William, trading as RADIO AND ELECTRICAL SUPPLIES, 37, Lakefield Road, Llanelly, wireless dealer. Dated September 6th, filed September 8th. Trustee, A. Collins, 28, Baldwin Street, Bristol, C.A. Secured creditors, £369; liabilities unsecured, £631; assets, less secured claims, £192.

## Receiverships.

KINGSMILL ART METAL AND ELECTRICAL CO., LTD. W. H. Dunn, of 57, Lodge Road, Croydon, was appointed receiver and manager on August 28th, 1928, under powers contained in instrument dated November 13th, 1924.

LLANRWST ELECTRICITY SUPPLY CO., LTD. H. S. Baker, C.A., of 4, Broad Street Place, E.C. was appointed by Order of Court dated July 16th and sealed August 10th, 1928, receiver of the undertaking of the company and the net earnings of the statutory undertakings of which the company are the undertakers under the Provisional Orders relating to the Llanrwst Electricity Lighting Order 1920 and the Trefriw Electric Lighting Order 1902, in substitution for the late W. J. Parry.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BURNDEPT WIRELESS, LTD., Blackheath, S.E., and Bedford Street, Strand, W.C. In pursuance of the provisions of the companies (Consolidation) Act, a meeting of the creditors of the above was held on September 7th at the offices of Binder, Hamlyn and Co., 80, Bishopsgate, London, E.C. The proceedings were formal, the company having gone into liquidation with a view to a reconstruction taking place, and a new company having been formed under the style of Burndept Wireless (1928), Ltd. The new company has a capital of £200 000, divided into 800 000 ordinary shares of 5s. each, and it acquired all the assets of the old concern which at March 31st last were valued at £193 928, and consisted of patents, drawings, designs and goodwill £17 520, freehold and leasehold property £52 082, plant, fittings, etc., £11 321, stock and work in progress £42 571, sundry debtors £33 846, and cash in hand £36 588. The new company agreed to issue ten-year notes to the nominal amount of approximately £20 273, payable half-yearly, which were to be allotted amongst the creditors of the old company who were interested for amounts in excess of £10 each. The old creditors received ten-year notes equal in nominal amount to 50 per cent. of the amount due to them. The holders of the preferred ordinary shares of £1 each in the old company were entitled to claim the allotment of two ordinary shares of 5s. each in the new company, with the sum of 1s. 9d. credited as paid up on each share. The holders of the deferred ordinary shares of 1s. each in the old company were entitled in respect of every twenty such shares to the allotment of one ordinary share in the new company with the sum of 1s. 9d. credited as paid. The smaller creditors in the old company were entitled to a cash payment of 7s. 6d. in the £ in satisfaction of their claims. It was further proposed under the scheme that there should be an issue of 600 014 ordinary shares of 5s. in the new company, and the issue had been under-written. The liquidator reported that the scheme had been approved by the creditors and shareholders. A resolution was passed confirming the voluntary liquidation of the old company with Mr. R. A. Hamlyn as liquidator.

KINGSMILL ART METAL AND ELECTRICAL CO., LTD. The business of manufacturers of metal work in iron and bronze, carried on by John Boswell King, under the name of the Kingsmill Art Metal and Electrical Co., at 142B, Fulham Road, S.W., was converted into a limited liability undertaking in October 1924, with an authorised capital of £5 000, in £1 shares. The purchase consideration consisted of 4 500 shares, which were allotted to King (2 000); Sidney Walter Elmes, described as ornamental plaster manufacturer and decorative artist, Lillie Yard, Lillie Road, Fulham (2 000); and George Albert Knight, china and glass merchant, Little Earl Street, W. (500). Two shares were issued for cash, one each to a solicitor and an accountant, and the undertaking and property was, three weeks after the registration of the company, mortgaged for £515 to the solicitor, who has now appointed a receiver.

MANCHESTER MAGNETO CO., LTD., Manchester. The statutory meeting of the creditors in the voluntary winding-up of this company was held on September 5th at the offices of A. L. Price and Co., 8, Exchange Street, Manchester. Mr. A. L. Price, the liquidator, stated that the usual resolution had been passed by the shareholders for the voluntary liquidation of the company, but in the time at his disposal, he had not been able to prepare a detailed statement of affairs. It was decided that the meeting should be adjourned in order that the liquidator might submit a statement of affairs, and report on the position.

The company was formed at the beginning of September, 1925, with an authorised capital of £1 000 in £1 shares, of which 400 shares have been issued, all for cash, 200 each to the two directors, Frank Edgar Waring and Harry Varley Barker. The office of the company was changed at the beginning of May, 1927, from 29, Liverpool Road to 277, Deansgate, and in June last to 51, Hardman Street, Deansgate. On August 16th it resolved upon voluntary liquidation, by reason of its liabilities. The company has no debentures.

## London Gazette, etc.

### Company Winding-up Voluntarily.

WOODHALL AND PARTNERS, LTD. By reason of its liabilities, August 29th. D. C. Evans, F.S.A.A., incorporated accountant, 18, Ironmonger Lane, London, appointed as liquidator. Meeting of creditors at the offices of the Society of Incorporated Accountants, 50, Gresham Street, London, E.C.2, on Friday September 14th, at 3 p.m.

### Bankruptcy Information.

WELBERRY, Frederick John, The Beeches, Seathorn Estate, Skegness, in the county of Lincoln, electrician. First meeting September 20th, 12.30 p.m., Official Receiver's Office, 10, Bank Street, Lincoln. Public examination, October 18th, 12 noon, Municipal Buildings, Boston.

### Notices of Intended Dividends.

GORDON, John Henry, 21, Leeds Road, Ilkley, Yorks, electrical engineer, trading as J. H. GORDON. Last day for receiving proofs, September 21st. Trustee, H. C. Bowling, Official Receiver, 24, Lower Bond Street, Leeds.

NUTTALL, Harry, 1073, Chester Road, Stretford, trading as J. A. HARTLEY AND CO., electrical agent and factor. Last day for receiving proofs, September 26th. Trustee, F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver.

### Application for Discharge.

HYDE, Hubert Algernon, 148, Weston Park, Crouch End, North London, lately at 2, East Street, Bromley, Kent, wireless dealer. Hearing, October 18th, 10.30 a.m., County Court, Scarbrook Road, Croydon.

### Partnerships Dissolved.

WHITLAM AND PEARTREE (Maurice Edward PEARTREE and Walter Stanley WHITLAM), radio and electrical engineers and dealers, 2, Bank Street, Castleford, Yorks, by mutual consent as from August 25th, 1928. Debts received and paid by M. E. Peartree.

WILLIAM HARPER AND CO. (William HARPER and Patrick Frank CUNNINGHAM), wholesale wireless factors, 93, Holm Street, Glasgow, of mutual consent, June 30th, 1928, by the retiral of P. F. Cunningham. The business is being continued by W. Harper on his own account, under the old firm name.

## Bankruptcy Proceedings.

DAWSON, Joseph Edward, wireless engineer, High Street, Boston, Lincs. The statement of affairs shows gross liabilities £4 180, of which £3 009 is expected to rank, against assets of £1 133, a deficiency of £1 876. There was a large attendance of creditors at the first meeting of the creditors on September 10th, and they appointed Mr. Cyril Glover Compton, of 5, Church Close, Boston, I.A., as trustee of the estate, with a committee of inspection. Debtor attributed his failure to illness of self and wife, and depreciation of stock. It appeared debtor commenced business as a manufacturing electrician in West Street, with £60 capital, money he had saved. In 1924 he purchased a plot of land in High Street and erected his present house and shop at a cost of approximately £1,800, the shop being opened in April, 1925.

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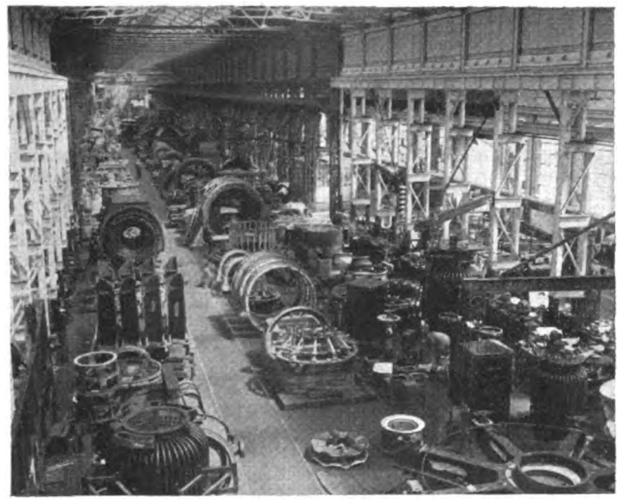
# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed replies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### August 27th.

24 547 M. A. Crosby. Fire alarms.
24 642 E. W. Dorey. Alternating current motors.
24 543 J. and L. E. Gaunt. Telephone number indicator.
24 639 H. Hautman. Incandescent electric tube. (26/8/27, Germany).
24 561 London Radio Manufacturing Co., Ltd., and E. Redpath. Devices for reproducing sound.
24 589 Maschinenfabrik Oerlikon. Turbo-generator plant. (15/9/27, Switzerland).
24 560 W. L. Russell. Time controlled electric switch.



*A GENERAL view of the heavy machinery department of the English Electric Co.'s works at Stafford.*

24 628 C. Schapringer. Electric switches. (2/11/27, Austria).
24 663 Siemens-Schuckertwerke A.G. Submersible electric machines. (20/10/27, Germany).
24 596 Siemens und Halske A.G. Treatment of living cells with light rays. (16/2/18, Germany).
24 633 Siemens und Halske A.G. Discharge lamps, etc. (27/8/27, Germany).
24 577 F. A. Thomassin. Electrical sound reproducers.

### August 28th.

24 768 Akt.-Ges Brown, Boveri et Cie. Transformers. (12/9/27, Germany).
24 739 Allegemeine Elektricitats Ges. High speed synchronous motor. (23/9/27, Germany).
24 750 C. H. Archer, and Automatic Telephone Manufacturing Co., Ltd. Electric heating elements.
24 698 W. Brown. Fluid cooled electric cables.
24 711 L. E. and L. W. Fillmore and Jackson Bros. Electrical tuning apparatus.
24 718 L. D. Holdsworth. Protective arrangement for electric circuits. (21/10/27, South Africa).
24 770 Ideal Werke Akt.-Ges fur Drahtlose Telephonie. Loud speakers. (5/4/28, Germany).
24 749 S. Lightfoot and A. Whittingham. Alarm fuses for telephone apparatus, etc.
24 757 L. M. Myers, and Universal and General Radio Co., Ltd. Television.
24 743 J. F. Ovenden and F. Thompson. Devices for controlling electric circuits.
24 686 J. S. Shinton. Television apparatus.
24 754 Siemens-Schuckert Akt.-Ges. Change-over winding for a.c. machine. (8/10/27, Germany).
24 709 F. A. Thomassin. Means for synchronous operation of machines.

### August 29th.

24 816 M. von Ardenne. Connection of electron tubes. (31/8/27, Germany).
24 823 J. H. E. Baker, A. H. Cameron, Standard Telephones and Cables, Ltd., and E. P. G. Wright. Call finders for telephone systems.
24 819 W. E. Beatty (Bell Telephone Laboratories, Inc.). Reproduction of sound.
24 853 L. G. Brazier and Callender's Cable and Construction Co., Ltd. Measurement of cables, etc.
24 833 British Thomson-Houston Co., Ltd., and T. H. Kinman. Radio receiving circuits.
24 849 E. Fritschi. Ignition devices.
24 871 J. Y. Jackson (I.G. Farbenindustrie Akt.-Ges.). Treatment of gases with electric currents.
24 818 Patent Treuhand fur Elektrische Gluhlampen. Electric rectifying devices. (30/9/27, Germany).
24 850 S. L. Price. Telephone apparatus.
24 824 Standard Telephones and Cables, Ltd. Loud speakers.
24 825 Standard Telephones and Cables, Ltd (Western Electric Co., Inc.). Retardation coils for telegraphic circuits, etc.

### August 30th.

24 942 British Thomson-Houston Co., Ltd. Electron discharge devices. (31/8/27, U.S.).
24 943 British Thomson-Houston Co., Ltd. Transformers. (2/9/27, U.S.)
24 944 British Thomson-Houston Co., Ltd. Electric condensers. (2/9/27, U.S.)
24 984 F. Z. Chalmers. Control of electric lighting systems.
24 933 E. S. Ali-Cohen. Construction of h.t. cables. (8/9/27, Holland.)
24 911 L. E. and L. W. Fillmore and Jackson Bros. Electrical tuning apparatus.
24 904 Loewe-Audion Ges. and B. Wienecke. Arrangements of live wire leads through glass parts. (30/8/27, Germany).
24 922 Loewe-Audion Ges. and E. Roemhild. Electron valve. (31/8/27, Germany.)
24 958 Sir G. C. Marks (Hart Manufacturing Co.) Apparatus for controlling electric circuits, etc.
25 064 Siemens-Schuckertwerke A. G. Slot windings for electrical machines. (10/10/27, Germany.)
25 111 S. B. Smith and G. M. Wright. Photoelectric cells, etc.
25 095 A. E. White (Rockbestos Products Corporation). Insulated conductors.
25 072 H. C. Willson. Actuating mechanism for electrical tuning apparatus.
24 903 T. R. Martin. Heating elements of electric ovens, etc.
24 929 J. J. Royce. Electric kiln.
24 963 Siemens-Schuckertwerke A.G. Electric switchboards. (5/11/27, Germany.)
24 918 Westinghouse Brake and Saxby Signal Co., Ltd. Railway switch operating apparatus. (3/3/28, U.S.)

### August 31st.

25 079 Akt.-Ges. Brown, Boveri et Cie. Turbines. (2/1/28, Germany.)
25 035 M. von Ardenne. Electric amplifying arrangement. (31/8/27, Germany.)
25 005 Chesterton Jones and Co., Ltd., and F. F. D. Davidson. Electric irons.
25 087 H. E. Clarke and Oldham and Son, Ltd. Devices for charging galvanic batteries, etc.
25 036 A. C. Gunstone and E. J. W. Watkinson. X-ray apparatus.
25 088 Igranic Electric Co., Ltd. Turntables.
25 034 S. Loewe and E. Roemhild. Electron valve. (31/8/27, Germany.)
25 075 S. L. Price. Loud speakers, etc.
25 041 A. E. and H. O. Short. Electric wiring for metal vehicles.
25 060 Siemens-Schuckertwerke A. G. Vacuum cleaner. (16/9/27, Germany.)

### September 1st.

25 155 W. A. Coates and Metropolitan-Vickers' Electrical Co., Ltd. Electric switches, etc.
25 150 General Electric Co., Ltd., and E. P. L. Westell. Thermionic valve circuits.
25 169 J. Y. Johnson (I. G. Farbenindustrie A. G.). Production of cable papers etc.
25 158 London Electric Railway Co. Vehicle wheels.
25 144 W. R. Miller. Portable electric lampholders.
25 160 S. Randell. Means for detachably connecting electric motors to household machines.
25 172 S. Ruppel. Quenching sparks in spark gaps of electric switches, etc.
25 147 H. S. Ryland. Selenium cells.

# ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* Gee and Co., *Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

*Opposition to the registration of the following trade marks can be lodged up to October 5th.*

Anti-Mobo. 491 077. Class 8. Wireless telephonic and telegraphic apparatus and parts thereof. R. I. and Varley, Ltd., Kingsway House, 103, Kingsway, London, W.C.2; manufacturers. May 3rd, 1928.

Tungsram. 491 218. Class 8. Thermionic valves for use in telegraphy and telephony. Egyesult Izzolampa es Villamossagi Rezvenytarsasag (a joint stock company organised under the laws of Hungary), Vaczi-ut 77, Ujpest, near Budapest, Hungary; manufacturers. May 8th, 1928.

Cliftex. 489 691. Class 50. Electrical insulating materials, electrical insulating tape made of a textile material impregnated with india-rubber, vulcanised fibre sold in rods, tubes and sheets for industrial purposes; and jointing, valves (not parts of machinery), washers, discs, packing, brake blocks, brake linings, ferrules, rings, rollers (not parts of machinery), wedges, handles, friction strips, friction blocks, fricton shoes, baskets, switch bars, adjusters for electric lamps and electrical and mechanical bases, all being goods made of vulcanised fibre. Mosses and Mitchell, Ltd., 122 and 124, Golden Lane, London, E.C.1; manufacturers. March 20th, 1928.

# METAL AND CHEMICAL PRICES.

Tuesday, September 11th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £65 5 0 | — | — |
| Electro Wirebars | ,, | £69 5 0 | — | — |
| H.C. Wires, basis | per lb. | 9⅝d. | — | — |
| Sheet | ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 0⅛d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8¼d. | — | — |
| Sheet ,, | ,, | 9⅜d. | — | — |
| Wire ,, | ,, | 9⅜d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 10 0 | — | 5s. 0d. |
| Foreign or Colonial | ,, | £22 2 6 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £210 0 0 | — | £3 10 0 |
| Wire, basis | per lb. | 2s. 9d. | — | ¼d |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 15 0 | — | — |
| *Mercury* | per bottle | £23 15 0 | 10s. 0d. | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2¾d.
,, Roll, ,, £10 15 ro
*Sulphuric Acid* (Pyrites, 168°) pe ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3½d.
*Rubber*—Para fine, 10¼d.; plantation 1st latex, 8¼d.

. . The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

## LEAD MARKET REPORT.

Closing prices yesterday were at £21 18s. 9d. for September and £21 13s. 9d. for December, a fall of 6s. 3d. and 5s. per ton, respectively, from the corresponding position at the end of last week. On Monday a rise of 1s. 3d. per ton was marked on the previous day's close, August selling at £22 6s. 3d. and November at £21 1s. 3d. A very large business was done on Tuesday's market, the total quantity changing hands amounting to about 3,750 tons, chiefly for October shipment, although values were practically unchanged on the day, early lead being actually 1s. 3d. dearer. Wednesday, Thursday and Friday saw lower prices each day, September lead falling from £22 6s. 3d. to £21 18s. 9d. and December £22 to £21 13s. 9d., the close being flat with sellers over. The shipment from Australia in August of 14,531 tons, against 7,100 tons in July, will make the position in October more normal, but continued short supplies are expected this month. The smaller arrivals in August have been set off by declarations of several hundred tons of wharf lead this week, which has made the spot position more comfortable. Consumers are continuing to buy from hand to mouth.

# Coming Events.

**Wednesday, September 19th.**

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary Meeting.

**Friday, September 21st.**

Machine Tool Exhibition.—Olympia.

**Saturday, September 22nd.**

Machine Tool Exhibition.—Olympia.

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Education and Industry.

So successful has been the Metropolitan-Vickers Electrical Co.'s Summer School for Professors and Lecturers in Engineering that, though the school closed on Friday last, many of the members stayed at Trafford Park over the week-end in order to make further examination of the processes adopted in modern electrical manufacture. At the dinner which terminated the proceedings of the school, Sir Philip A. M. NASH, who presided, very wisely directed the attention of the Universities to the electricity supply industry as a "consumer of their products," pointing out that such industry held opportunities no less bright than those in the manufacturing world. With these views there can be little room for argument, for, as Sir Philip also explained, in such an industry as that of electricity supply the salesman who knows what he is selling, both from technical and utility standpoints, is, with very few exceptions, a salesman with conviction. With such men "on the road" the selling of electricity would become less and less a question of service to the customer, and more and more a matter of coping with the desire to possess, with the result that the opportunities for service would increase. A salesman selling a product which he knows from generation to consuming unit is not unknown in the supply industry by a very long way, but notwithstanding this fact, there is plenty of room for improvement. The lesson learnt from the school is that universities are not only doing all they can to produce young engineers for all branches of the industry, but will in future do more. They will, in fact, as a result of their intensive week's training, introduce into their curricula more practical application of theory and mathematics. The point of view with which the professors have returned to their colleges is that the young engineer of the future must not only be an engineer but a commercial engineer. Judging from the remarks which were made during the week, members of the school found much that was interesting and instructive, while their appreciation of where their teaching broke away from commercial value was shown by the questions asked during the discussions. The idea of such a Summer School is indeed an excellent one, and though we cannot, unfortunately, confine such schools to the electrical industry, we sincerely hope that such a gathering may become one of the annual events of the already crowded electrical programme. With the number of big manufacturers in this country, concerned with electricity the opportunities for finding suitable works and courses are many and varied, while the universities have already shown their desire to co-operate.

## Training for "Management."

APART from the Summer School it is interesting to note that other of our educational institutions are also alive to the necessity of making more effective contact between education and industry in order that the fullest value may be obtained from the educational resources of the country in the development of national industry and commerce. For four years past the Polytechnic, Regent Street, which was represented at the Summer School, has, in an experimental way, provided courses of instruction with this aim in view, and we understand that during the coming session a big step forward is to be made by the co-ordination and correlation, for the first time, of the scattered knowledge that has had to do duty in this field of education in the past. The course is designed to help those ambitious men and women who have the personal qualities of leadership, but who require, in addition, a sufficient training in the technique of industrial administration to fit them to undertake the management of business organisations. For the session beginning next month the course will include such subjects as economics, industrial history, industrial psychology, personnel, administration and welfare, costing, management and statistics. Students of industrial administration may also be interested in a related course of lectures on "The Effect of Government on the Economic Structure of the United Kingdom."

## Marine Electricity.

AFTER a period of comparative somnolence, electricity for ship propulsion again shows signs of activity. Only last week we described the great new Diesel-electric oil tanker, "Brunswick," which has just been built for the Atlantic Refining Co., of Philadelphia. This week we are able to give some details of the electrical equipment of the "Viceroy of India," the first large passenger steamer to be fitted with high-pressure steam and turbo-electric drive. Both these vessels are of considerable interest as reflecting the trend in modern ship construction, and it is gratifying to record that both have been built and equipped in this country. But while the owners of the "Brunswick" have merely added to a fleet of similar vessels, of the satisfactory performance of which they have ample experience, the new P. and O. steamer marks an entirely new

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departure for British shipping lines, and the behaviour of the "Viceroy of India" will for some time be the cynosure of all eyes in the shipping world, and will doubtless influence the plans of those who have further large vessels to build. There is, for instance, the new 60 000 tonner which is building at Belfast for the White Star Line, about the propelling machinery of which many speculations have already been made. The possibility that the turbo-electric drive would be adopted for this mammoth vessel has frequently been discussed, and in view of the many advantages which this system provides for ships of this kind, the chances of an early imitator of the latest P. and O. vessel would appear to be bright. With the tremendous growth that has taken place in the power required for auxiliaries, the part has been in danger of becoming greater than the whole. The sensible employment of one of the electrical methods of propulsion, either Diesel-electric or turbo-electric, provides a way out of such difficulties.

## Electrical Overseas Trade.

ACCORDING to the Board of Trade Returns, British exports have increased each month of this year from and including April, and during August the total exports of goods manufactured or produced in the United Kingdom were valued at £62 216 978, showing increases of £1 331 881 over the preceding month and £2 806 646 over August, 1927. Very exceptionally, however, the electrical figures do not exhibit such satisfactory features, for, as will be seen from the details given on another page of this issue, our exports of electrical apparatus, machinery, and material show decreases of £86 042 for the month of August, 1928, compared with August, 1927, and £61 326 for the eight months ended August, compared with the figures for the corresponding months of 1927. On the other hand, it may be noted that the decline for the eight months is more than accounted for by the decrease in August alone. The total figures up to the end of July showed an increase of £24 636 over the corresponding seven months of last year, and it is permissible to view the present position as a temporary falling off due to slackness usually noticeable during the summer season. The most encouraging feature of this year's overseas trade, so far as the electrical industry is concerned, is the fact that the electrical exports, amounting to £12 224 888, exceed the electrical imports for the same period by £8 197 895, the exports, therefore, being in the ratio of more than three to one to imports. While this proportion is maintained there appears to be little to fear from foreign competition.

## The National Radio Exhibition.

TO-MORROW will see the opening of still another all-British wireless exhibition at Olympia, London, and, judging from the advance information which has reached us, the majority of the exhibits are either entirely new or else have been so greatly improved as to be almost so. Two important additions to this year's show are to be found in the television receivers which, as announced in the daily Press some weeks ago, are now available to the public, and in the picture reception equipment which is being manufactured for purposes of receiving the picture transmission programmes of the B B C. The keynote of this year's exhibition is quality. Quality of material, design and reproduction go hand in hand, and the reproduction of which modern radio is capable will be a revelation to many who attend the demonstrations arranged by the exhibitors to take place in adjoining premises. The simplicity of the latest designs of receivers is even more pronounced than heretofore, and the number of sets dispensing with batteries seems to proclaim that the "all-mains" receiver has definitely come into its own. Collaboration with the valve manufacturers has developed a set which claims to be free from a.c. hum, and special valves with filaments which can be heated by the supply mains through a transformer are also the vogue. So far as valves as a whole are concerned one of the outstanding features of the exhibition is the new Pentode or five-electrode valve. Experiments lasting over a long period have been carried out with the valve, though its characteristics have only recently been made known. In brief, the advantages claimed are that the valve gives a large output for a comparatively small input, one stage being nearly equal to two amplifying stages incorporating three-electrode valves, and that a comparatively low anode voltage is sufficient to give super-power valve results. In consequence of these characteristics many manufacturers are incorporating these valves in their latest receivers, and in some cases they are used in portable sets, where obviously every saving in weight and space is of importance.

## Receiver Cabinet Design.

ON the whole the complete receiver exhibits at Olympia, in so far as we have seen them, still possess an American appearance. The general practice when endeavouring to make a wireless set look less like a piece of electrical apparatus and more like something else is to adopt an upright cabinet design with long thin legs and to hide the set panel by means of a drop front. Unless we are very much mistaken, such designs for radio sets hailed originally from America in 1924-5, and though in British sets the cabinet work is a little less decorative the general appearance is the same. The idea of disguising a receiver to look like a cabinet, or dressing a loud speaker to look like a Chinese idol, is interesting, perhaps, as an indication of what can be done in that direction, but as a general practice it seems hardly necessary. Were all the thought given to cabinet design, and all the labour expended in the manufacture of such designs, devoted to even further development of new circuits, improved reproduction and the general advancement of the science, then we think that such thought and labour would have been better spent. Good cabinet work is essential, of course, and has always been a feature of British craftsmanship. For this reason, then, let us remain British and not ape the American. In radio technique we can teach the world, and to belittle our apparatus by housing it in cabinets of American appearance is unnecessary. Rather let us advance even further in manufacturing technique and faithful reproduction, leaving the matter of housing the apparatus to those best suited to the work, namely, the cabinet makers.

## Wireless Pictures.

CONTRARY to the general practice of new flotations for the exploitation of inventions the commercial success of which cannot be gauged, the company which is to acquire the "Fultograph" system for electrically reproducing broadcast pictures, photographs, etc., wisely refrained from giving in its prospectus any definite estimate of the probable profits. The system, some reference to which has previously been made in these pages, is to be used by the British Broadcasting Corporation for the daily transmission of pictures, beginning some time next month, and this alone constitutes a very favourable commendation of a new invention. It is noteworthy that existing communication interests are strongly represented on the board in the person of Sir CHARLES BRIGHT, Lieut.-Colonel A. F. H. S. SIMPSON and Mr. W. H. LYNAS.

## Cable Subways.

THE extensive damage done to telegraph and telephone cables by the recent fire in the cable subway on the Victoria Embankment, London, and the serious interruptions of vital communications come as a shock to those who thought that with cables you could "bury and forget." Unfortunately the fire destroyed any evidence which might have afforded a clue to the cause, but it is evident that serious consideration will have to be given to the problem of preventing further interruptions by fire. The task of separating, in severely restricted space, the multitudinous cables laid in these subways is no easy one, and it is probable that the introduction of any corrective means will prove to be a costly business.

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# THE HIGH-SPEED CIRCUIT BREAKER.

## A Short Study on the Theory and Design—The Most Important Time Periods—Contact Density and Pressure—The Question of Arcing Tips—Buffer Action.

By W. H. THOMPSON, A.M.I.E.E.

UP to the present, the principal use of the "high speed circuit breaker" has been as a safety valve on traction systems, where loads are fluctuating and short circuits not infrequent. And, although there is now a tendency for the application of this type of breaker to become more extensive, it is better to study it in respect to its original use.

Traction systems are almost invariably fed by machines of the rotary converter type, and the effect of a short circuit on this class of machine is generally to cause a flash-over between brushes. Short circuit is, however, accompanied by a collapse of the machine volts, and, while this condition maintains, the tendency to flash-over is comparatively small. But, upon the opening of the circuit by the high-speed breaker or other device, the machine p.d. is almost immediately restored, and pressure put across the commutator segments. Complete flash-over will not be established until the arc has been drawn, via the commutator segments, from one brush to the next. Therefore, if the arc can be destroyed by any means before this happens, flash-over will be averted.

The present trend is to fit to the commutator of the machine an efficient form of flash barrier, the action of which is literally to scoop up the arc from the surface of the commutator, and thus prevent it being drawn across to the next brush. But even with this device there is the necessity for providing some apparatus that will open the circuit in the shortest time possible. It is here that the high-speed circuit breaker finds its principal application.

It is the most effective piece of apparatus, external to the machine, for the purpose of protection in the event of short circuit. There are numerous types of such breakers, which it is not my intention to describe here, but, as they all work on much the same general principle, this principle will be expounded in a general way.

From what has gone before it is obvious that the main function of the high-speed breaker is "speed," and the whole design of the breaker must be subject to the demands of this first essential. But it is very necessary that a clear understanding is obtained as to what is meant by the "opening time" of the breaker, and in order to ensure this, the following analysis of what happens from the moment of short circuit to that of the breaker being fully open, is given.

There is a definite time interval from the instant of short circuit to that at which the current in the tripping circuit reaches its operating value; call this the "alpha" period. There is another time interval from the end of the "alpha" period to that instant at which the contact of the breaker commences to move; call this the "beta" period. The third time interval is that required for the contact of the breaker to move from its closed to open position; call this the "gamma" period. Finally, there is the time interval required for the disruption of the arc; let this be called the "delta" period.

### Important Intervals.

Of all these time intervals, the most important are very definitely those which have been designated the "alpha" and "beta" intervals; as it is quite clear that until these intervals are elapsed, nothing has been done to arrest the growth of the short-circuit current. The moment the contacts of the breaker part, the rate of increase of the short circuit current is diminished as a result of the resistance that is inserted by the establishment of the arc between the arcing contacts. And, as the rate of increase of a short circuit current is of a very high order, i.e., two, three or more millions of amperes per sec. according to the capacity behind the "short," it is very obvious why the "alpha" and "beta" time periods must be kept as small as possible.

The importance of these two time periods will be better appreciated when it is realised that a reduction of even so small an amount as 0·001 sec. on the total of the "alpha" and "beta" time periods, will result in a diminution on the load to be broken of 3 000 A, assuming the current to be increasing at the rate of $3 \times 10^6$ A per sec.

The necessity to keep the "gamma" period as small as possible is only second in importance to that for the "alpha" and "beta" periods. Upon this interval of time depends the resistance of the arc, that is to say, the shorter the "gamma" period, the more quickly will the arc resistance reach its maximum value, and the more quickly will the short circuit current be reduced in value. But, as regards the fourth, or what has been called the "delta" period, care must be taken that this time interval is not too short, as otherwise a rise in voltage dangerous to the insulation of the system may result. In explanation of this it need only be remembered that, as the short circuit current is of a much higher order than that which the system is designed to withstand, except for an extremely short time, if this large current is broken in a small increment of time, then the rate of change of current through the various windings of machines, etc., will induce in them a voltage surge of high value, and the resulting potential gradient across the dielectric of the insulation may be steeper than the particular dielectric will withstand.

### Minimising Inertia.

In the first place, the breaker must be able to carry full load current continuously without overheating, and carry short circuit current—which may be 20 times full load value—safely for a specified time. There is then fixed a minimum cross-sectional area for the current-carrying parts, and certain of these parts will naturally be attached to the moving element of the breaker. At this stage it is sufficient to state that the mass of the moving parts must be as small as possible in order to minimise inertia.

There is required an opening force, the magnitude of which must be such as will give a high acceleration at opening. This force is generally provided by powerful helical springs. As a result, there is required a force to hold the breaker closed. The manner in which this force is applied depends purely upon the imagination of the designer. Because the breaker has to open in such a small space of time, latches and triggers are considered to be too slow in operation to make an efficient agent for the hold-on force; and this force generally takes the form of an electro-magnet as will have been already observed from the descriptions of breakers given above. The hold-on force necessitates a method to control it, and this again will depend upon the type of hold-on force adopted.

With the addition of a disrupting agent to clear the arc, the above may be said to constitute the essentials of the high speed circuit breaker. They are repeated below in abbreviated form:

(*a*) Current-carrying capacity, and contact pressures, to which are allied current density and contact area.
(*b*) The moving mass.
(*c*) The hold-on force.
(*d*) The opening force.
(*e*) The tripping agent.
(*f*) The arc rupturing agent.

It is intended to treat these in the order given above, but they are so interdependent that a certain amount of overlapping is unavoidable.

(*a*) CURRENT-CARRYING CAPACITY AND CONTACT AREA.—Although there are still cases where the high speed breaker is shunted by a "limiting resistance" and, consequently, does not carry all the full load current, it is advisable to design the conducting parts for the full load normal rating.

The limitations to the sectional area of the conducting parts must be governed by the maximum temperature rise that is permitted. And, because the mass of the moving contact must be kept as small as possible, it is necessary to take the fullest advantage of this permission. At present, the B.E.S.A. regulations allow, on this class of apparatus, a temperature rise of 30 deg. C. on that of the ambient temperature. But, in order to apply to the design of the conductor the laws of electro-thermics, it is necessary to take into account the position in the breaker that the conductor in question will occupy. A correction factor can then be applied to cover radiation. The shape of the conductor, particularly the moving portion, which must be of the smallest section possible, should be quite uniform, as violent changes in the sectional area will decrease the electro-thermal capacity.

In high-speed breaker design it can be taken for granted that the moving contact will be freely exposed to the atmosphere, and will be surrounded by other metallic parts; all of which will aid radiation from the conductor.

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Now it is found from the theory of heat radiation, that if $R\theta$ equals the energy emitted per sec. per sq. cm., from a freely exposed surface at a temperature of $\theta$ deg. on the absolute scale, then

$$R_\theta = \sigma\theta^4, \text{ W per sec.} \quad . \quad . \quad . \quad . \quad . \quad (1)$$

The constant $\sigma$ has been found by Kurlbaum to be equal to 5·32 times $10^{-12}$.*

The energy produced in an electrical conductor is $I^2R$ W per sec. Or, if $A$ is the sectional area of the conductor, then the energy absorption is

$$\frac{I^2\rho}{A}, \text{ W per cm. of length.}$$

where $\rho$ equals the specific resistance of the metal.

## Most Practical Shape.

The shape that is most practical for the section of the moving contact of the breaker is the rectangular, and for ease of mathematical deduction it is better to consider the particular rectangle a square, although this is not a necessary limitation.

With this assumption then, if the sectional area of the contact is $A$ sq. cm., as quoted above, the superficial area will be

$$4\sqrt{A} \text{ sq. cm. per unit length.}$$

For obvious reasons the area of the two ends of the unit length are not included.

Now, for a given temperature, the energy produced in the conductor by the current must not exceed that radiated from the surface. Therefore, in the limit,

$$\frac{I^2\rho}{A} \text{ must equal } 4\sqrt{A}\ (5{\cdot}32 \times 10^{-12}\theta^4).$$

From which

$$A = \sqrt[3]{\frac{I^2\rho}{21{\cdot}28 \times 10^{-12} \times \theta^4}} \quad . \quad . \quad . \quad (2)$$

As an example case, consider the normal full load current to be 2 000 A. Then, assuming an ambient temperature of 21 deg. C., and a permissible temperature rise of 30 deg. C., $\theta$ becomes equal to $51+273=324$ deg. absolute. Therefore, from equation (2), the minimum sectional area for the moving contact becomes

$$A = \sqrt[3]{\frac{2\,000^2 \times 1{\cdot}6 \times 10^{-6}}{21{\cdot}28 \times 10^{-12} \times 324^4}}$$

equals 9·067 cm.$^2$ or 1·4 in.$^2$.

From this it follows that a current density of 1 400 A per sq. in. may be adopted for this conductor.

The next question to consider is that of the contact density and contact pressure. The governing feature of this is also temperature rise, and the same value of 30 deg. C. holds in this case, as in that of current-carrying capacity.

The ideal condition for the electrical contact of two plane surfaces would be that in which the unit volume of the metal that composed the contact and that contained the contact faces, may be considered as a solid. But this would require a bedding pressure greater than is practically obtainable, and, although the condition may be used for mathematical purposes, it is clear that values must be assigned to certain of the factors of the equations to meet practical conditions.

Let, then, $A$ equal the area of contact face in sq. cms. in which case the length of side—assuming a square face—will be $\sqrt{A}$ and the superficial area of the unit length of conductor that contains the contact faces will be $4\sqrt{A}$; again, omitting to include the area of the end sections.

Let $I$ equal the current flowing across the contact faces, and $V$ the voltage drop across the unit length that contains the faces. Then, as for the case of current carrying capacity

$$VI = 5{\cdot}32 \times 4\sqrt{A} \times 10^{-12} \times \theta^4 \quad . \quad . \quad . \quad (3)$$

Again, it is found that, within limits, the voltage drop across a pair of contact faces varies directly as the current density, and inversely as the contact pressure.

Or,

$$V = \frac{IC}{AP} \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

Where $A$ is the area of contact face, $P$ the pressure per unit area, and $C$ a constant dependent upon the metal of which the contacts are composed.

* See "Heat," by Poynting and Thomson.

Experiment proves that, for copper, the value of $C$ is 0·00134 approx. Therefore, from above,

$$VI = \frac{0{\cdot}00134\, I^2}{AP}.$$

And from (3), it follows that,

$$\frac{0{\cdot}00134\, I^2}{AP} = 5{\cdot}32 \times 4\sqrt{A} \times 10^{-12} \times \theta^4 \quad . \quad . \quad (5)$$

To continue the same example as given for current-carrying capacity, let $I$ equal 2 000 A.

Then,

$$\frac{4 \times 10^6 \times 0{\cdot}00134}{AP} = 5{\cdot}32 \times 4\sqrt{A} \times 10^{-12} \times \theta^4$$

As the same temperature rise of 30 deg. C. is permitted, the value of $\theta$ will be, as before, 324 deg. absolute.

Therefore,

$$\frac{536}{AP} = 5{\cdot}32 \times 4\sqrt{A} \times 10^{-12} \times 10^{10} \times 1{\cdot}1 = 5{\cdot}32 \times 4\sqrt{A} \times 1{\cdot}1 \times 10^{-2}$$

From which,

$$\frac{536}{AP} = 0{\cdot}234\sqrt{A} \quad . \quad . \quad . \quad . \quad . \quad (6)$$

A convenient practical value to give to $P$ is 15 lb. per sq. cm., in which case (6) becomes,

$$A^{3/2} = \frac{536}{15 \times {\cdot}234} = 153.$$

Or, $$A = 28{\cdot}61 \text{ sq. cm.} = 4{\cdot}43 \text{ sq. in.},$$

and the contact density is of the order of 450 A per sq. in.

So far, then, it has been determined that for a given maximum permissible temperature rise, the maximum current density is 1 400 A per sq. in., and the maximum contact density is 450 A per sq. in. And, with these two limiting features observed, the moving contact may be designed according to the particular ideas of the designer.

The first essential is minimum mass, and, to attain this, the single butt type of contact is preferable to the double butt. A good example of this is given in the high speed circuit breaker manufactured by the Metropolitan-Vickers Electrical Co. In this, the only copper mass that moves as a body is a block made up of two copper plates between which are clamped the ends of the laminations of the flexible lead. These plates are of sufficient area to provide the correct contact density with the fixed brush, while the thickness of the laminations is just sufficient to provide the correct current density in the lead. It is thus not possible to reduce the copper mass below this limit.

Before leaving the moving contact, there is the question of arcing tips—and on this point it would appear that opinions are divided—some makers consider arc tips to be unnecessary, whilst others favour them more as a practical necessity than as a theoretical requirement.

## Risk of Fusion.

When the breaker commences to open, it is quite certain that any following-up action of the contacts will increase the time interval that has been designated $\alpha+\beta$. On the other hand, if the breaker opens directly on the main contacts, considerable scarring is sure to take place on the contact faces, as a result of the arc, and there is a certain risk of fusion.

The opponents of the arc tip design base their argument upon the theory that, provided the bedding pressure is sufficient, the condition of the contact faces is of secondary importance. And, while this theory holds good within limits, it is doubtful whether those limits are wide enough to include the amount of burning of the contact faces that would result on the high speed breaker opening under short circuit conditions.

Furthermore, increase of bedding pressure means increase of bedding force, which, in turn, means stronger supporting members. And the greater mass involved with those stronger members means greater inertia of the moving parts.

The problem therefore resolves itself into whether the loss in opening time—or the increase of the $\beta$ period—due to the increased inertia of the moving element, is greater or less than the corresponding time loss—or increase in the $\beta$ period—due to the following up action of the arc tips.

The design of the arc tip itself is not so difficult as the design of the flexible lead that joins it to the moving contact proper. On the opening of the breaker, the acceleration of the moving contact is so great, that the resulting sudden bend given to this lead ends in the fracture of the latter after

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a few hundred operations. From this, it is obviously an advantage to restrict the movement of the arc tip within narrow limits. Again, particular attention must be given to the mass of this arc tip, as, in the general quest for lightness, the tendency is to make it too small. Because the tip is to be attached to the moving contact, it is necessary to keep it light; but there are two reasons why this lightness must not be allowed to reduce the mass of the tip beyond a certain limit. The first is, of course, the fact that it must be capable of carrying short circuit current value for a fraction of time, and the second is that the opening of the moving contact may be so sudden that the arc tip will open simultaneously with it. This will occur when the inertia of the tip is small and the natural time of the arc tip spring is comparatively long. The latter spring should therefore have a time constant that is not greater than that for the inertia lag due to the arc tip proper.

(*b*) THE MOVING MASS.—Having disposed of the moving contact and the arc tip, there remains to be dealt with, the mechanical and magnetic parts of the moving element before the moving mass can be said to be completed. There is obviously some kind of mechanical coupling required between the moving contact and the pull-off force and the hold-on force. The essentials of the design of this part are lightness, strength and rigidity of structure. The stresses to which it will be subject will be those created by the pull-off force—either spring or magnetic—the hold-on force and the brush bedding pressure. Another point, to which consideration must be given, is the buffer action. However, light the moving element may be, it is certain to possess considerable kinetic energy in virtue of the high velocity with which it moves in opening. And as the buffer will not come into action until nearly the end of the stroke, it is obvious that the whole of this energy will have to be given up over a very small travel, so that the resulting force of impact will be very high.

It is to be observed that any resultant strain on the structure of the moving mechanism will most likely upset the bedding of the main brushes, and the bedding of the armature of the hold-on magnet circuit.

Another feature, or rather essential, that adds to the complexity of the mechanism, is the necessity for a free handle device. That this is an essential is clear from the fact that, otherwise, it would be possible for an operator to hold a breaker in the closed position while a short-circuit occurred.

The principle of the mechanism cannot be too simple, and each additional lever, or other part, is a confession of weakness by the designer. This tenet is manifest, not only from the reason of inertia lag, but also from the maybe greater lag due to friction.

In nearly all makes of high-speed breakers the hold-on force is provided by an electro-magnet; thus necessitating the use of an armature. This armature will form part of the moving element of the breaker, and because of this, will need to be as light as possible.

(*To be continued.*)

# EDUCATION AND INDUSTRY.

## A Summer School for Professors—Manufacturing Principles Demonstrated to Educational Groups—Coupling Academic and Practical Training.

AS already announced in THE ELECTRICIAN, there was held at the Trafford Park works of the Metropolitan Vickers Electrical Co., Ltd., last week, a special Summer School for Professors and Lecturers in Engineering, for the purpose of illustrating where the various curricula fall short in practical knowledge. Members of the school were drawn from the Universities of Aberdeen, North Wales (Bangor), Birmingham, Belfast, Bristol, Cambridge, Cardiff, Dublin, Dundee, Glasgow, Leeds, Liverpool, London, Manchester, Swansea, Nottingham, Sheffield and Tasmania. The Technical College of Brighton, Dundee Technical College and School of Art, the Heriot-Watt College, Edinburgh, the Royal Technical College of Glasgow, the Battersea (London) Polytechnic, the City and Guilds (Engineering) College, the Faraday House Electrical Engineering College, East London College, King's College, Northampton Polytechnic Institute, the Regent Street Polytechnic School of Engineering, and the Manchester College of Technology, were also represented.

The school assembled on Monday and after an address by Mr. A. P. M. Fleming, special director of the Research and Education Departments, upon the objects of the school, a detailed tour of the works was made. The school was split up into groups, each of which was conducted through the various departments of the works by an ex-student of one or other of the Universities and Colleges present. The purpose of the tour was to enable those attending the school throughout the week to form a mental picture of their surroundings and the type of work met with in such works. The evening was devoted to a swimming gala at the Stretford Baths under the auspices of the Metropolitan-Vickers Apprentice Association.

On Tuesday began the school proper and Mr. W. A. Coates opened the day's proceedings with a lecture on "Switchgear Design." He explained that though he had invariably found students well versed in theory, he had in many instances found them sadly lacking in practical application. In some cases he had come in contact with college apprentices really skilled in the design of machines but ignorant of the methods whereby such machines may be controlled, and the purpose of his lecture was therefore to point out the necessity of teaching university and other students more than the mere academic requirements of electrical engineering. Mr. Coates dealt in detail with the design and construction of switchgear of all sizes, illustrating his remarks with lantern slides.

The lecture was followed by a tour of the switchgear and associated departments, where the methods of construction were explained, the equipment then being in actual course of manufacture. The inspection was followed by a discussion.

**The official photograph of the Metropolitan-Vickers Summer School.**

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As a change from the purely instructional programme the afternoon was devoted to a visit to the Manchester College of Technology at the invitation of Prof. B. Mouat-Jones, principal of the College. The college offers a very wide field of education, facilities for studying such subjects as cotton goods manufacture, steam, mechanical and electrical engineering, including radio, photography, printing, etc., being available. At the conclusion of the visit, members of the Summer School were the guests of the Lord Mayor of Manchester, Ald. W. Davy, at the Town Hall, where an address of welcome was given.

In the evening a discussion on "The Engineering Graduate in Industry" was opened by Mr. Kenneth R. Evans, of the Education Department, Mr. A. P. M. Fleming being in the chair. This discussion resulted in an airing of views upon the subject of university education and where it fell short or exceeded the requirements of the young engineer in modern industry.

## Large Machine Design.

The subject of "Large Machine Design" was treated by Mr. R. Townend on Wednesday morning, when by means of lantern slides he described the modern methods adopted in the manufacture of large turbo-alternators and so on. The lecturer confined his remarks chiefly to the manufacturing and testing methods adopted by the company, and later, during the inspection of the appropriate works departments, illustrated his remarks with practical demonstrations. During the tour a visit was made to the oscillograph room where members of the school had explained to them the purposes to which the apparatus is applied with respect to the manufacture of heavy electrical machinery. The oscillograph work conducted by the Metropolitan-Vickers Co. was originally carried out by means of two portable instruments, one capable of recording two quantities simultaneously, and the other, three. A small photographic dark room was provided in a position adjacent to the large machine testing department. For many years, a large amount of work was carried out with these facilities, and the volume of requested work steadily grew as time went on. As the complexity of the work increased, the need for the simultaneous recording of more than three quantities became evident. Work in two other departments, the switchgear and motor testing departments, also began to increase, and the need for improved equipment, more staff and more accommodation became pressing. As the three important testing departments were not far removed from one another, it was decided to provide an adequate test room in a central position in the works, with a dark room adjacent to it, and to instal a six-element oscillograph fixed permanently in the test room. By means of permanent leads run from the test room to the testing departments, the same oscillograph could be used for any of the three departments. The design of the six-element oscillograph was put in hand by the company's Research Department in 1924, and the construction carried out in the workshop attached to that department. The instrument was put into service in 1925, and has since been in continuous use.

It was pointed out during the afternoon lecture by Mr. D. B. Hoseason, who spoke on "Motor Design," that in his opinion the electric motor formed the pivot around which the electrical industry depended. Taking the 1924 Census of Production figures as his basis, he showed that every ton of generating plant installed in the country produced three tons of motors. Mr. Hoseason then went on to explain the various types of motors manufactured and the purposes for which they are made. He took the view that both professors and their students were under the impression that the ground for improvement in motor design was well trodden, but actually the dust raised by past workers was hiding a number of priceless jewels. Special attention should, for instance, be paid by Universities to the dissipation of heat in electric motors, this being only one of the many important possible improvements, and one which occupied most of the attention of designers. Mr. Hoseason then dealt in detail with the construction of motors dating from 1895, pointing out that at that date no serious consideration of heating had been made. In 1924 the method adopted for the dissipation of heat in electric motors was still haphazard, its efficiency being largely dependent upon the fan unit introduced in 1911-12. In later post-war years, however, definite air circuits had been introduced, though there was still much to be done in this direction. Mr. Hoseason went on to explain that he felt that college students entering the works should have already argued either amongst themselves or with their professors the pros and cons of radial and axial ventilation. Since air is the chief cooling property in motor design, students should, in his opinion, receive special training in this subject taking as sub-headings, air flow, pressure-head drops, fans, etc.

Thursday morning was devoted to a lecture on "Turbines and Condensers," followed by an inspection of work in progress and a discussion of the method employed in manufacture. The lecturers were Messrs. K. Baumann and Mr. H. L. Guy. The former dealt mainly with the construction and design of the plant and explained the improvement which had been developed. The latter gentleman described various testing equipment used for testing the efficiency of machines, and apparatus involved in various researches in connection with nozzles and turbine blades. A number of curves were shown which revealed the various data which have been collected in this connection. The work in connection with the company's special disc variation tests was explained, further curves being thrown upon a screen to illustrate their meaning. Among the equipment seen during the works inspection may be mentioned independently fired superheaters in four separate units for a pressure of 40 000 lbs. per hr., gas or oil feed, 750 deg. F.; an air blast oil cooler for use in the Scottish Electricity Scheme; and a 1 000 kW geared machine for 5 000/1 000 revs. per min.; steam pressure 170 lb. 550 deg. F. with a 28 in. vacuum. Other machines were a 10 000 kW 12 550 m.c.r. 3 000 revs. per min., 200 lb. 675 deg. F., 29·1 in. vac., for Northampton; an l.p. 41 000 kW rotor, 1 500 revs. per min., 350 lb., 700 deg. F., for Barton; an l.p. 20 000 kW rotor, 3 000 revs. per min., 350 lb., 700 deg. F., for Shanghai; a machine of 10 000 MCR., 3 000 revs. per min., 300 lb., 700 deg. F., 28·5 in. vacuum, for Bury; a fabricated steel condenser shell, 7 300 sq. ft., 5 ft. 9 in. dia., suitable for 5 000 kW, and a 93/117 central flow condenser, 12 900 sq. ft., 7 750 gpm. at 59 deg. F. (12 500 kW). There were also seen super heaters with control chest and float control drain trap with emergency trip gear, forming the third and fourth heating stages of a 45 000 kW m.c.r.; heating steam pressure 40 and 103 lb.; water side 200 lb., feed outlet 257 deg. F.; water test, 300 lb. (designed for 900 lb.), all for Krasni; and 300, 500, 1 000 kW, 6 000 revs. per min. cruiser sets.

Mr. R. Brooks on Thursday afternoon covered the requirements of railway electrical equipment in a lecture on "Electric Traction," pointing out that the present practice was to favour 1 500 V d.c. systems, with which existing 650 V. d.c. installations could be adjusted. In the tour of the works which followed there were seen a 1 500 V d.c. plant with regenerative equipment for the G.I.P. Railway; a 1 500 V traction motor 310 H.P. for Sydney; a set of 600 V auto-control gear for the Southern Railway; 1 500 V control gear for the Sydney Suburban Railway; railway signalling equipment and colour lights as supplied to Australia and New Zealand.

## The Research Department.

Friday morning was devoted to an outline of the work of the Research Department by Mr. A. P. M. Fleming. His brief description was followed by further explanations by Messrs. R. W. Bailey, B. G. Churcher, K. G. Maxwell, and C. R. Burch, the sections covered by the last speakers being electrical and magnetic, mechanical, process and physics respectively. Following upon these remarks as to the work carried out by each section, the school then visited the laboratories and saw demonstrations of insulation testing and spark-over valuation; the high frequency melting of steel; vacuum distillation; the corrosion of various metals; creep of metals at high temperatures; bore inspection and coker apparatus; rolling of rare metals; and the treatment of insulating and magnetic materials. A visit to the extensive library also formed part of the inspection.

As part of the Summer School course a visit was paid to the Barton power station on Friday afternoon, at the invitation of Mr. H. C. Lamb, chief engineer and manager of the Manchester Corporation Electricity Department. Members of the school proceeded from the works to the power station by special 'buses, and a detailed tour of inspection was made. The station, which stands on the bank of the Manchester Ship Canal, draws its water from the canal by six pumps, each driven by a 320 H.P. motor. These pumps are capable of delivering 7½ million gallons of water per hour, when all are in service. Rotary screens are fitted at the intake, and the water passes through a brick-lined inlet culvert, 9 ft. 6 in. in diameter and 970 ft. long, which was blasted out of the sandstone rock at a depth of 50 ft. below ground level. It is returned to the canal by a second culvert, 1 430 ft. in length. The

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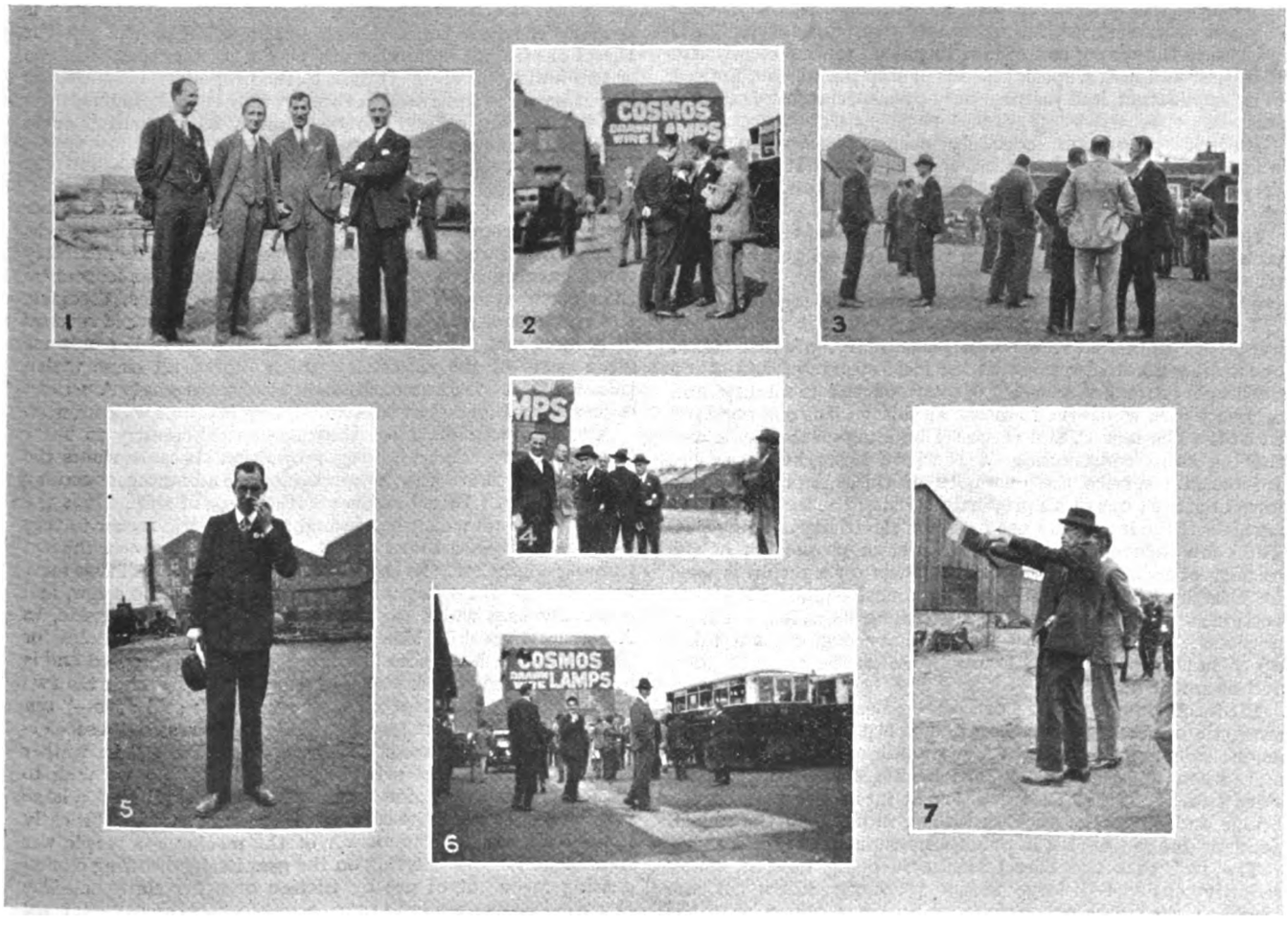
temperature rise across the condensers averages 10 deg. F.

There are nine Babcock and Wilcox marine-type water-tube boilers in the original section of the plant, each of which is fitted with four chain-grate stokers, and is fired from both sides. The grates are 8 ft. wide and 16 ft. long, giving a total area of 512 sq. ft., and are arranged for burning either coal or a mixture of coal and coke breeze. Each boiler, at normal rate of working, consumes six tons of fuel, and has a normal evaporative capacity of 100 000 lb. of water per hour. The total heating surface of each boiler unit is 45 880 square feet. The working steam pressure and temperature are 375 lb. per sq. in., and 730 deg. F., respectively.

The first section of generating plant consists of three main turbo-alternators, manufactured by the Metropolitan-Vickers Electrical Co., Ltd., each having a maximum continuous rating of 27 500 kW and three 1 000 kW house-service turbo-alternators by the British Thomson-Houston Co., Ltd. Each main turbine has fourteen stages of expansion, the overall diameter of the wheels varying from 7 ft. at the high pressure to 9 ft. at the low-pressure end. The surface condensers (supplied by Richardsons, Westgarth and Co., Ltd.) each contains 7 670 tubes, and the weight of each unit is 210 tons, which is carried by spring supports. Current is generated at 6 600 V, and is stepped-up by transformers to 33 000 V for transmission. Cooling of the generators is effected by air, circulated by fans in a closed circuit. This air is cooled by water drawn from the canal. The switchgear control room commands a view of the whole of the turbine house, and all adjustments of load, including regulation of the steam supply to the main turbines, are made from this room. The switching is carried out by remote-control apparatus. In the basement of the switch house, which adjoins the control room, are situated the six main transformers (by the Metropolitan-Vickers Electrical Co., Ltd.) each of 19 500 kVA rating, together with the 6 600 V switching gear on the incoming side, and the necessary oil cooling and water circulating plant.

The boiler-house plant has been augmented by the addition of three Babcock and Wilcox marine-type water-tube boilers, two of which are stoker-fired and one is equipped for burning pulverised fuel. The last has a normal evaporating capacity of 130 000 lb. per hour, and is capable of producing 170 000 lb. of steam per hour on overload. Pneumatic control gear for the fuel valves is operated from the firing floor. For the driving of the various fans, pumps, coal feeders, etc., in connection with this boiler, no fewer than 33 electric motors are employed. A new 40 000 kW turbo-alternator has been supplied by the Metropolitan-Vickers Electrical Co., Ltd., with high and low pressure cylinders arranged in tandem. In addition to the main generator, a house-service generator of 1 000 kW capacity is carried on the same shaft, and is not a separately-driven unit, as in the case of the first installation of plant. There are 23 stages of expansion in the high-pressure and 18 stages in the low-pressure cylinder of the main turbine. The diameter of the wheels ranges from 3 ft. 7½ in. at the high-pressure end to 10 ft. 2¾ in. at the low-pressure end. The speed of the set is 1 500 revs. per min., and the velocity of the low-pressure blade tips is 560 miles per hour. Steam is bled from four expansion stages for feed-water heating. The condenser (supplied by Richardsons, Westgarth and Co., Ltd.) has a total cooling surface of 32 000 sq. ft., and uses 1 860 000 gallons of circulating water per hour, which is supplied by two motor-driven pumps. As in the original installation, the alternator generates at 6 600 V, which is stepped-up to 33 000 V by means of two 25 000 kVA transformers. For the cooling of the main generator, 104 000 cubic feet of air per minute is required. The switchgear is, in general, similar to that originally installed, and, like the latter, was supplied by the British Thomson-Houston Co., Ltd.




*SPECIAL SUMMER SCHOOL SNAPS.*

*THE above snapshots, exclusive to "The Electrician," were taken on Friday, and show many of the personalities connected with the week. (1) Manchester College of Technology well to the fore; (2) A casual group with Prof. F. J. Teago (Liverpool) in the centre; (3) At the conclusion of Friday's "tour," waiting for the lunch signal; (4) Still waiting for lunch; the figure in the light suit is Mr. K. G. Maxwell (Process); (5) The man behind the scenes, Mr. Kenneth R. Evans (Education); (6) Boarding the 'buses for Barton power station; (7) Mr. Evans (with hat) and Mr. P. Brooks (Traction), studying the landscape.*

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# MARINE ELECTRICITY—A NEW INDUSTRY.*

## The Importance of Electricity in the Modern Ship, with Special Reference to its Potentialities for Main Propulsion—Powering the Big Passenger Liner—The Outlook.

By A. C. HARDY, B.Sc., F.R.G.S., A.M.Inst.N.A.

THE use of electricity for the main propulsion of ships is a matter upon which no small amount of controversy has arisen during the past few years. Opinions range all the way from those people who visualise electricity as the ultimate means of propulsion of all types of ships to those of people who regard it only as a matter for auxiliary power. The issue is clouded, also, by the fact that there are two rival methods of generating the electrical energy—the turbine and the Diesel engine.

For auxiliary purposes electricity is at once the most efficient, economical, and cleanly channel through which the driving power can be applied. It is entirely incorrect, however, to dissociate this auxiliary power plant from the power plant which supplies the power for driving the propeller or propellers. On certain types of ships the auxiliary loads are very high. On some passenger liners—notably those which are Diesel driven—the auxiliary power plant is so large as to absorb more tank top space than the main engines, while the power factor for auxiliary purposes is an important consideration.

### Electric Propulsion.

When we talk about electric propulsion, we should not consider it in the same light as steam reciprocating engine, turbine, or Diesel engine propulsion. The electric motor *per se* is not a marine prime mover. It can only be considered in this light when special conditions or circumstances are in operation. Nor is it correct, except perhaps in the case of certain towboats, to consider the electric motor as a speed reduction device between a fast-running prime mover and a slow-turning propeller. In no sense of the word does gearing compete with electric transmission as a speed reducer. That is entirely the wrong conception to put on marine electricity. It is, first and last, a special means of ship propulsion, limited in its application, and justified only by a special set of circumstances.

Electric propulsion certainly seems justified in cases where high auxiliary loads are in operation. It makes for very good economy where big fluctuations of total generated power are necessary.

Regard electric propulsion as an extension of the auxiliary powering to cover also the main powering, and you have the true and logical concept of marine electricity. Electrical propulsion is worth considering only when it is logical.

The case of the fast modern passenger liner is particularly important from this view point. Electricity, whether steam or Diesel generated, represents the ideal system of propulsion for large passenger vessels, because of the flexibility and economy with which the immense auxiliary loads can be taken care of. The new P. and O. vessel building on the Clyde and the big ships constructing at Newport News for American Intercoastal service are examples of this. Auxiliary loads have increased out of all proportion during the last few years, because of the increasing use to which electricity is being put. The consequence is that, while a certain proportion of the totality of prime-mover generated power on the ship is used for actually propelling the ship, an almost equally large proportion is used for generating current for so-called auxiliary purposes. On many ships the auxiliary engine-room takes up as much floor (i.e., tank top) space as the main engines, and as much height.

Electricity, be it turbine or Diesel generared, removes at a sweep the auxiliary engine-room and incorporates it in the main engine room. It permits of fine gradations of power output, and, when more confidence has been gained, will in some ships take the "throttle valve" right up into the navigating bridge and on to the docking bridge, minimising the risk of accident due to time lag in manual transmission of orders.

The fact that the Diesel engine is being used in many recently-constructed large steam passenger liners for the whole of the auxiliary generating purposes shows that the auxiliary load is being regarded with respect, and that its economy is of equal import with that of the main machinery. In the very near future we will see that this segregation of the loads is, above a certain power, merely a compromise and that above a certain power it is more economical to have one big generating station taking care of the whole of the loads, both main and auxiliary.

This point is in all probability in the neighbourhood of 25 000 H.P., above which power, in motorships, the big double-acting engine begins to become unwieldy.

For the more moderate powers used in ocean transport, it is questionable whether the extra first cost of electric propulsion* makes it an economical proposition where general cargo carrying is concerned. The direct prime mover, in conjunction with all-electric auxiliaries, is better in this case. Electricity really is unnecessary except for auxiliary purposes. In certain special trades, however, Diesel-electric propulsion has a big advantage. Consider, for example, the fruit, or banana trade between New York and the Caribbean. Ships engaged in this trade have refrigerated hold spaces, but they are loaded with perishable cargo on the homeward journey only. Outward, they may be in ballast, or carry a general cargo. The fact that a perishable cargo is on board makes it advisable to employ a higher speed than on the outward journey. Also more power is being absorbed because the refrigerating plant is in operation. Electric propulsion enables a very exact proportioning of the power to be made. Certain generators can be shut down when the holds do not require refrigeration, thus saving in fuel and in wear and tear on the plant. As soon as the refrigerated cargo is loaded the balance of the generating sets can be started up, and full power is instantly available. This applies, too, to ships carrying meat.

It is this flexibility of power which is one of the greatest assets of electric propulsion. "Power apportionment" is possibly a better term, meaning that whereas in a straight Diesel or straight steam layout, power is concentrated in one or two units delivering straight to the propellers, in an electric layout power is generated in three or four entirely independent units, and can, at will, be distributed to propulsive or to auxiliary sources.

### More Economical.

Electric propulsion shows a definite economy over other systems of propulsion, in certain trades, as the above remarks have shown, but there are some duties for which its flexibility would have much to recommend it, even were it less economical than other systems of propulsion. Tugs, ferries, dredgers, and vessels generally in which quick, continued, rapid reversal of motion and rotational direction of the propeller or some other parts of the machinery are required, all come within this category. Certain of these ship types are purely American domestic problems, but tugs and dredgers are of wide interest.

America has done more than any other country to foster the use of electricity for tug propulsion, because she is the first country thoroughly to appreciate the advantages accruing from the use of Diesel engines in this type of ship. It is the oil engine alone which has brought the electric motor to tugs—in the first place to act as a reduction gear between the fast running engine and the slow running propeller. All tugs must have a large diameter, coarse pitch, slow running screw, and especially tugs which do most of their towing alongside, as American tugs do. The type of Diesel engine available for tugs, in which headroom is limited, runs at high speed and is invariably of the trunk piston type. How to correlate the two speeds? One school of thought said—and still says—"use mechanical reduction gearing." The other said "use electrical reduction gearing," i.e., electric drive "In neither case," said a neutral school of thought, "do we wish to manœuvre on the engine itself, because we shall need a large manœuvring air storage capacity—and our space is sufficiently limited already" The answer of the mechanical people was to arrange for manœuvring on the gear itself, throwing certain gearing in or out of use by friction or other clutches. The electrical people needed to give no answer, because "electrical reduction gear" *per se* means control at the propulsion motor. Furthermore, it is as easy to locate the propulsive controls in the pilot house as in the engine room. . . . This is the story of the Diesel-electric tug, which can be handled by the helmsman as easily as a tram driver operates his controller. The

*Extracts from a paper read at the Machine Tool and Engineering Exhibition, Olympia, on September 14th.

* See article by Author in THE ELECTRICIAN, vol. xcix, p. 131.

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main generating sets are in operation as required, and the propelling motor does the actual work of moving the tug and her tow.

The dredger field is a wide one in America, and the U.S. possesses some of the largest and finest vessels of this type to be found anywhere. Probably the best exponents of what has been done in this direction are the four Diesel-electric suction-hopper dredgers of the " A. MacKenzie " class, which have electric drive for the main dredge pump and also for twin propellers. There are three 700 kW generators, two 800 H.P., 480 V, propelling motors and one 610 H.P. dredge pump operating motor. So efficient has electricity proved itself for suction reclamation dredgers that steam is almost entirely eliminated for such work in America. The largest dredger of this type in the world, the " Clackamas," which operates around the port of Portland, Oregon, is entirely electrically controlled. This ship, which has a length of 236 ft., delivers as much as 16 000 cu. yd. of heavy sand and gravel per 24 hours. She has two 540 kW and two 610 kW generating sets, and about 85 per cent. of this power is used for the operation of the main pump motor, a 500 V, 2 700 H.P. unit, the largest motor ever built for dredging purposes.

Upon the proportion of the auxiliary demands to the main propulsion requirements would appear to rest the decision as to whether a ship should have " straight " or electric propulsion.

An analysis of main and auxiliary electrical loads on recent moderate-sized merchant ships reveals some remarkable facts when we come to assess the auxiliary loads as percentages of the main loads. This particular analysis is reproduced from an article which I prepared specially for the 1927-28 annual edition of the " Journal of Commerce," Liverpool.

Example A (see table) is a meat-carrying ship with a total auxiliary load amounting to just 20 per cent. of the main propulsive power. This auxiliary load has to take care of two 110 H.P. electric motors for the refrigerating machinery, there being in all 297 000 cu. ft. of insulated space. Note, also, particularly, example C, in which the auxiliary load is as much as 53 per cent. of the main propulsive power. This ship carries light oils and has all-electric auxiliaries, including no less than 270 H.P. for the pump motors. In addition to this, there is a certain amount of power required for a rotary scavenger blower. A 17 400 ton motor tanker has 4 000 S.H.P. for propulsion and 450 H.P. for auxiliary power—11¼ per cent. of the total propulsive power—which includes 280 H.P. for pump motors. All the cargo pumps are electrically driven. This ship has a large number of pump auxiliaries driven off the two main engines.

We can see from the figures before us—chosen at random—that there is logical justification for electric propulsion in certain tankers, meat carrying ships, and fruit ships. First cost, it must be remembered, is undeniably higher than with straight Diesel or steam drive. There is a certain amount of electrical loss between the power developed at the generator sets and the power available for the main motor. But the flexibility of the layout, combined with the economy of the Diesel engine for certain routes, more than offsets this in specified types of ship.

There seems to be less justification for turbo-electric propulsion in special-type freighters, than perhaps in big passenger liners where a compact layout can be accomplished by arranging the turbo-generators on a flat above the main propelling motors, as has been done on the new I.M.M. electric ships.

In considering passenger liners, one is struck with the fact that in example G as much as 23 per cent. of the main propulsive load is absorbed by auxiliary engines. The floor space (i.e., tank-top space) of the auxiliary engine-room is as big as, if not greater than, that of the main engine-room. This load is not, as in the case of the meat ship or the tanker, absorbed by items like cargo pumps or refrigerating machinery, but rather by power requirements for the main propelling engines themselves. This puts another complexion on the situation. Three big Diesel engines are driving injection air compressors ; three more are driving generators supplying current to circulating water pumps, lubricating oil pumps, etc. In yet another big motor passenger liner (example J), no less than three big Diesel engines are used for supplying current to turbo blowers for the main double-acting 2-stroke cycle engines, four of which constitute the main propulsive power for the ship. The auxiliary load is up to 26·4 per cent. of the propulsive load. This tends to show that there must be a movement in favour of electric propulsion for large passenger liners, and particularly on those whose owners tend towards Diesel engines. The emphasis is particularly on the " large " because for ships of powers up to and including about 25 000 H.P. there is very little difficulty in applying a straight Diesel drive. For powers above this, electric propulsion has much to recommend it, and it is here that turbo-electric propulsion can put up more of a fight against Diesel-electric propulsion. Turbo-electric propulsion, however, will never permit of the wide, clear deck spaces which Diesel-electric propulsion gives. The big electric passenger liner of the future may conceivably have two engine-rooms, one above the other, each with not more than 15 ft. head room, provided with the necessary escapes, and suitably ventilated by suction and exhaust fans.

Electric propulsion unquestionably has an important future for certain types of ships—in particular for those whose functions have been outlined in this paper. For passenger ships whose necessarily large auxiliary loads make it but a logical step to eliminate either the main or the auxiliary power source, electricity offers a compactness and a flexibility worthy of comment.

For refrigerated ships and occasionally for tankers—for ships, in fact, with big auxiliary loads not constantly in use, electricity offers flexibility combined with a valuable degree of economy. For tugs and ferry boats electricity affords a speed and r.p.m. flexibility range which gives those rapidly manœuvring ships the manœuvrability of tramcars and the steering capacity of a motor car. One group of New York harbour tug-boats, for example, is cited as giving an average number of 566 signals per ship per 8-hour tour of duty, or one order every 51 seconds. With an electric tug, this can be done directly on the bridge.

MAIN AND AUXILIARY DIESEL LOADS AND PROPORTION AUXILIARY TO MAIN FOR TYPICAL MODERN SHIPS.

| Vessel | Tonnage. | Developed Total Power. | Propulsion Power. | Auxiliary Power. | Type. | Proportion Auxiliary of Main. | Remarks. |
|---|---|---|---|---|---|---|---|
| A | 10 800 d.w. | 5 660 | 4 700 | 960 | Meat Carrier | 20 per cent. | Twin-screw. |
| B | 8 000 d.w. | 3 400 | 3 000 | 400 | General | 14 per cent. | Single-screw. |
| C | 6 500 d.w. | 2 930 | 1 850 | 1 080 | Tanker | 53 per cent. | Lub. oil carrier ; 270 H.P. for cargo pumps ; auxiliary power supplied also scavenger blower. |
| D | 2 761 gr. | 4 200 | 3 800 | 400 | Passenger | 10·5 per cent. | 15 knots. |
| E | 3 830 gr. | 3 300 | — | 2 500 | Fruit Carrier | 100 per cent. | Diesel-electric. |
| F | 17 500 gr. | 14 600 | 13 000 | 1 600 | Passenger | 12·3 per cent. | Single-acting 2-stroke engines. 4 shafts. |
| G | 17 300 gr. | 19 050 | 16 300 | 3 750 | Passenger | 23 per cent. | Double-acting 4-stroke engines. 2 shafts. |
| H | 23 990 gr. | 22 275 | *18 000 | 4 275 | Passenger | 23 per cent. | Double-acting 4-stroke machinery with super-charge. |
| J | 32 500 gr. | 31 600 | †25 000 | 6 600 | Passenger | 26·4 per cent. | Double-acting 2-stroke machinery, 4 shafts. |

* 20 000 supercharged. †At 120 r.p.m.—27 000 at 125 r.p.m.

## MIDLAND ELECTRICAL ENGINEERS' BALL

The Committee has again decided to hold the Midland Electrical Engineers' Ball, at the Grosvenor Suite, Grand Hotel, Birmingham, on Friday, November 16th, 1928. Mr. R. A. Chattock is president, Mr. W. H. Heaton of the General Electric Co., Witton, is chairman, and Mr. W. Y. Anderson, 14, Dale End, hon. secretary. It will be remembered that as the result of last year's Ball the Institution of Electrical Engineers' Benevolent Fund benefited to the extent of 75 guineas.

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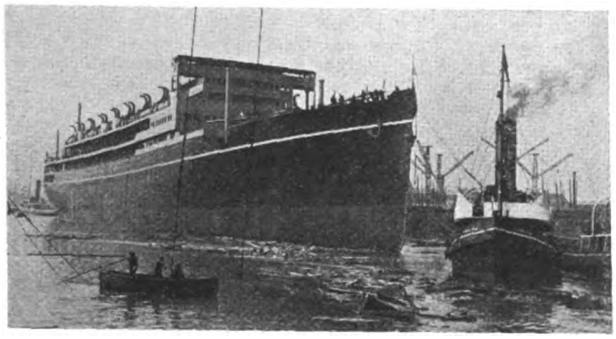
# THE "VICEROY OF INDIA."

## Launch of First Big Turbo-Electric Passenger Steamer—Details of the Electrical Equipment Installed.

THE new P. & O. Mail Steamer "Viceroy of India," launched last Saturday by Alexander Stephen and Sons, Ltd., at Linthouse, may well be termed "the ship of the year" by reason of her many improvements and departures from precedent.

She will be propelled at a speed of 19 knots by twin electric motors of 18 000 H.P. and turbo-electric generators taking high pressure steam from water-tube boilers burning oil fuel.



**The new P. & O. turbo-electric ship "Viceroy of India" after launching at Linthouse last Saturday.**

She is lighted by Diesel-motor generators, electrically heated, mechanically ventilated, and with passenger accommodation in advance of anything afloat.

The "Viceroy of India" has a tonnage of over 19 000 tons, and a displacement of about 25 000 tons, which will make her amongst the largest of the P. & O. fleet, and a notable ship among those using the Suez Canal. Her overall dimensions are: length 610 ft., breadth 80 ft., with a depth of 82 ft.

The main propelling machinery consists of two turbo-alternators, both supplying current to the two slow speed synchronous motors, which are coupled direct to the twin propeller shafts. At reduced powers, one alternator only is in use, supplying current to both motors, the second alternator standing in reserve, thus providing the maximum economy in fuel, both at full and reduced power.

Amongst other advantages of the electric drive are, on the negative side, the absence of noise as compared with a geared turbine, the elimination of an astern turbine, the absence of propeller racing in a heavy sea, and the use of fewer and smaller steam pipes, which will help considerably in keeping the passenger accommodation cool. The absence of vibration due to the fact that the whole of the machinery is of the rotary type will also prove a great benefit.

On the positive side, the command of full power when going astern, low maintenance charges, particularly with regard to consumption of stores and overhauling, at reduced power a single turbine running in place of four or six turbines with geared machinery, and the advantage of obtaining continuously, accurate data as to the power absorbed in propulsion. Moreover, in large ships, there is a considerable advantage to be gained by being able to place the turbo-alternators and motors in separate water-tight compartments.

The main turbo-alternators each develop 9 000 kW at 2 700 revs. per minute, the turbines being of the Curtis horizontal type, each having a Weir regenerative underslung condenser. The alternators are air cooled, the air being forced in a closed circuit through the stator and rotor, and thence through a cooler situated immediately below the alternator frame.

The main propelling motors are of the synchronous three-phase type, and coupled direct to the propeller shafts at the aft end of the engine room. The motors develop 17 000 S.H.P. at 109 revs. per min. Like the alternators, the motors are air cooled, the air being forced through the motor windings and through a cooler in a closed circuit, by two independent motor driven fans, each of which has sufficient capacity for the full duty. Reversal of the propellers is obtained by changing the electrical connections by means of contactors, these contactors being mechanically interlocked, so that the operator can only close them in the correct sequence. This will allow the turbines to run continuously in one direction when manœuvring, and the total turbine capacity will be available for steaming astern.

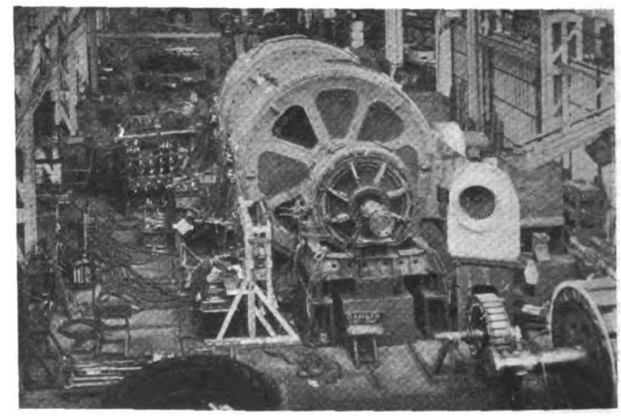
The whole of the main propelling machinery, including both turbo-alternators and motors, has been manufactured by the British Thomson-Houston Co., Ltd., of Rugby.

Immediately aft of the main propelling motors are the thrust bearings. These are of the single collar Mitchell type, fitted with a hydraulic measuring device for measuring the total thrust on the propellers.

Steam is supplied at 350 lb. and 700 deg. F. temperature by six Yarrow boilers, situated in two separate stokeholds. Four boilers are placed in the aft watertight stokehold, and are of sufficient capacity to enable the forward stokehold to be entirely closed down when the vessel is steaming at 16½ knots. In addition to the Yarrow boilers, there are also two cylindrical boilers in the forward stokehold for supplying steam in port if needed, two Diesel-engine generators being installed for harbour purposes.

The boilers are arranged for oil fuel firing on the "Clyde" oil fuel system, manufactured by the builders. All oil fuel plant, including pumping and heating units, transfer pumps and filters is placed in two separate pump rooms, situated between the forward and aft stokeholds. All oil fuel pumps are electrically operated. Some 2 300 tons of oil fuel are carried in 22 tanks surrounding the boiler compartments, the tanks being filled from a central station on each side of the ship; the quantity of oil in each tank may be measured at any time by means of Negretti and Zambra's mercurial gauge.

Feed water for the boilers is supplied by two Weir turbo-feed pumps, and any loss of feed water is made up from fresh water in the double bottom tanks, which is purified by being evaporated in a low pressure evaporator. The feed arrangements are designed on the Weir closed feed system, and the feed heating is in three stages, there being one surface heater on the discharge side of the water extraction pumps and two



**One of the propeller motors for the "Viceroy of India" on test at the Rugby works of the British Thomson-Houston Co., Ltd.**

surface heaters, one I.P. and one H.P., on the discharge side of the turbo-feed pumps. Steam for the heaters is bled from the main turbines and exhaust from the feed pumps, and the feed temperature will be about 300 deg. F.

The two circulating pumps for the main condensers are each driven by a variable speed electric motor, and are cross connected to allow one pump to circulate both condensers. Both pumps and motors are of Messrs. W. H. Allen's make.

Owing to the large demand for electrical energy for heating, lighting, ventilation and cooking, four auxiliary turbo-generators, manufactured by the British Thomson-Houston Co., each developing 500 kW, are installed, as well as two solid injection Petter oil engine-driven generators, each of 165 kW.

The main switchboard, supplied by the British Thomson-Houston Co., Willesden, is at the aft end of the engine room.

From the above brief description it is evident that the bold policy of Lord Inchcape in adopting turbo-electric propulsion for a large passenger vessel, has enabled the P. & O. Company and the builders to take a further step forward in the search for perfection in the interests of passengers and of economy.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Page Sizes of Technical Journals.

[To the Editor.]

Sir,—I should like to support very strongly the letter in your current issue from Mr. W. McWilliam. The high cost of drawings and blocks in relation to space is an unfortunate feature of engineering advertising, particularly when this unproductive expenditure could be so easily turned into productive channels to the benefit both of the advertiser and of the Press, if space sizes were to be standardized.

I am quite hopeful that I shall live to see the day when the technical Press adopts this obvious method of increasing its own revenue, but lest this should be considered too optimistic an outlook, it may be interesting to state that although the various media employed by this company have five different page sizes, it has been found possible to make use of only two standard sizes of space. This has been done by taking spaces of varying length, three-column width in some journals and whole-page width in others.

For the benefit of those interested, the two standard sizes are—10 in. by $7\frac{1}{8}$ in. and $8\frac{3}{4}$ in. by $6\frac{1}{4}$ in., and it will be noted that the proportions are the same in both cases, so that only one original drawing is required.—We are, etc.,

Brookhirst Switchgear, Ltd.
H. M. Goody,
Publicity Manager.

Northgate Works,
Chester.
September 15th.

## "Transmission System and Conductor Comparisons."

[To the Editor.]

Sir,—Steel cored aluminium conductors have now established themselves so securely, for all forms of overhead transmission, that attacks upon them usually can safely be ignored. In an article on the above subject in your issue of September 7th, however, Mr. W. T. Taylor makes certain statements which are, we suggest, entirely mistaken, and coming from so well known a writer, may lead to grave misapprehension. We, therefore, feel that an immediate reply is necessary.

Mr. Taylor gives certain figures relating to the transmission of power by, alternatively, copper or steel-cored aluminium conductors, and from the figures he draws certain conclusions which are distinctly disfavourable to steel-cored aluminium. Now, although he makes no reference to the fact, it would appear that his figures are interpolated from certain charts given in a paper by E. A. Loew which appears in the August, 1928 issue of the "Journal of the American Institute of Electrical Engineers" (Vol. XLVII, No. 8, p. 561). These charts show that, to take one of Mr. Taylor's examples, the best voltage to choose in order to transmit 40 000 kW for a distance of 75 miles would be 132 000 V for copper, but 154 000 V for aluminium.

Unfortunately, Mr. Taylor seems to have misunderstood the meaning of these charts. The charts show in each case the most economical conditions, based upon a modification of Kelvin's law, but Mr. Taylor seems to have assumed that the two lines with steel-cored aluminium or with copper are comparable as regards costs and efficiency. The facts are, that, taking the figures for sectional area which Mr. Taylor gives for the particular example we have cited, the line loss with the copper line would be 19 per cent. greater than with the steel-cored aluminium line, and the first cost of the steel-cored aluminium line would also be substantially lower than for the copper line. Taking the cost of the conductors alone, the copper would cost 32·5 per cent. more than the steel-cored aluminium. These figures are matters of simple calculation, so that in spite of their remarkable nature they are indisputable.

The great superiority of steel-cored aluminium in this case is due to the fact that with this material owing to the higher corona limit, the voltage can be higher. Of course, a higher voltage gives rise to certain disadvantages, a higher charging current, a greater rise in voltage at the end on open circuit, and so on, many of which Mr. Taylor enumerates, but he somewhat unfairly indicates these as disadvantages particularly attached to aluminium, without pointing out the very substantial compensating advantages, namely, a much higher efficiency with a much lower cost.

Again, it may be pointed out that there is no compulsion to use 154 kV with steel-cored aluminium. There is no technical reason why 132 kV should not be used for the steel-cored aluminium lines as well as for the copper lines, although in this case the steel-cored aluminium line will not be operating in the most economical way from the point of view of Kelvin's law. The bulk of the objections which Mr. Taylor places against steel-cored aluminium then fall to the ground, although we venture to say that, even at this lower voltage, the steel-cored aluminium line will be less costly.

Finally, may we add that the choice of steel-cored aluminium for the conductors of the National "grid" was not made without a very careful consideration, both from the economic and technical points of view, and Mr. Taylor is therefore incorrect in thinking that at 132 000 V, with equal transmission distance and efficiency, an aluminium line will not be substantially cheaper than a copper line.—I am, etc.,

For The British Aluminium Co., Ltd.,
Edgar T. Painton.

Adelaide House, King William Street, London, E.C.4.
September 11th.

[We have submitted a copy of Mr. Painton's letter to the author of the article, who replies below.—Ed.]

[To the Editor.]

Sir,—It is coincident that reference should be made to Prof. E. A. Loew's paper, printed in the August, 1928, J.A.I.E.E because the results given for a 50-cycle system are based on the analysis discussed in his book on power transmission.* No human being is above learning, and may the writer suggest that Mr. E. T. Painton would profit in the knowledge of power transmission by a careful study of this book, and vastly improve upon his present conclusions by an application of the principles set forth therein. He would probably then arrive at somewhat similar conclusions as the writer when applying reasonable costs, and perhaps (not unlike those Prof. Leow has already demonstrated) show a more favourable copper line than the writer has done. The writer, Prof. Loew, or others, do not "attack" the steel-cored aluminium conductor; the viewpoints must differ for the reasons more or less apparent to those engineers interested in the subject. The 132 kV example is most appropriate because this is the standard voltage adopted for the National "grid."

The power transmission problem, for voltages within the corona range and for delivery of a given load a given distance, is that of designing a line and system of maximum economy *for* maximum economy. Maximum economy referred to herein involves the efficiency understood by Mr. Painton, along with a combination of others affecting the whole problem aiming for maximum economy of design as well as relative protection and safety (and so forth) of line and system, based on equivalent ratings of equipment and plant, and equivalent mechanical and electrical factors of safety, etc. It involves relative earning power as well as relative delivered power and the biggest power carrying capacity for most economical voltage and so forth for equal terminal stations, rating of plant, etc.

Before a true comparison can be given, it is indispensable to design a line of maximum economy, one including all the economic factors entering into the whole problem such as those mentioned above, including voltage regulation and other equivalents, besides the relative most economical *longest-safest* tower spacing involving the best and safest for the insulation and line protection from induced potentials, etc.

For power transmission systems of this nature the proper choice of line conductor size is intimately interwoven with the most economical line voltage, and, for every transmission voltage there is a definite size of line conductor which is the minimum that may be used for a design satisfying maximum economy. Actual experience with such lines has warned us that false economy may result from a decrease in transmission voltage in an attempt to reduce the corona loss, because the $I^2R$ loss may be so increased as to more than cancel any gain aimed at.

On certain very high voltage steel-cored aluminium lines it has been found that there is a change in the line loss, within the corona range, which does not manifest itself on the copper line. This change might be attributed to possible chemical effect of the conductor metals used.

The economic range is that line voltage somewhat below the critical disruptive value for the conductor used, the size of which is based on almost negligible fair weather corona loss.

* See "Electrical Review" for the writer's review of this book.

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Experience indicates that it is uneconomical to operate below a certain corona loss value.

Efficiency and costs are interlinked, and cannot be separated. When proper costs are properly applied the efficiency is a minimum for each case, but not relatively so for the copper line and the steel-cored aluminium line, because of the different conditions for equivalent reliability and factors of safety, etc.

The total costs of terminals, which include station buildings and land, equipment, arresters, apparatus, condensers, wiring, and so forth (for a given rating and delivered power) increase rapidly with increase in voltage, and are independent of the transmission distance. For proper comparison, this cost item should be measured in terms of cost/mile of line; for the average length of line for the National "grid" this cost item might have an important bearing on the line voltage and conductor size for a line of maximum economy; conversely, it might have an important bearing on the total cost for a design of maximum economy.

The relative costs for line conductors only, are known to be favourable to aluminium. Nevertheless, for the most economical line and voltage, the total cost of terminals and line and its insulation for equivalent security and load delivered, etc., works out practically the same for both types of conductors for the double-circuit line, and probably in favour of the copper line for equivalent factors of safety and reliability for a line of maximum economy.

The copper line may offer a more efficient line and system for equivalent generator and station-terminals capacity for equivalent delivered load and distance of transmission, i.e., the steel-cored aluminium line and system have not equivalent generating or/and transmitting power carrying capacity (for equivalent compensation) as the copper line and system for maximum economy.

The safest configuration and best separation of line conductors, for equivalent factors of safety from these and certain other viewpoints, and for equivalent most economical voltage, favours the copper line. The copper line has the lower voltage for equivalent delivered load and line length, and a relatively less side swing, etc., of conductors.

It will probably interest Mr. Painton, and those who may "be led to grave misapprehension," to know that, extending over a period of many years, Prof. Loew and his able colleagues have made extensive studies of the power transmission problem for lines coming within the corona range, and, following upon careful preparation of examples for this class of lines, based on a line of maximum economy, respectively, and for a type identical with the double-circuit National "grid" line, show that, (using their own words), "*. . . the costs of the transmission lines using steel conductors are IN ALL CASES far greater than the cost for the corresponding lines using copper. . . .*" and that, "*. . . it would therefore seem that the use of steel conductors as part of a composite cable would tend to increase the cost of the line above that of copper.*"

As all the power transmission lines for this country, coming within the corona range, will be under one control (State-owned and operated), the time is opportune for a closer study of this question, allowing for the relatively greater sea-air belt, humidity, fog and smoke-laden atmosphere, etc., in the design of a line of maximum economy—remembering that it is the aged, atmosphere and weather-beaten conductor we must consider, not the newly manufactured, and that this would usually favour *copper*.—I am, etc.,

London, N.2. WILLIAM T. TAYLOR.
September 15th.

# NEWS IN BRIEF.

## Showrooms at Grays and Leeds—Portlands Electricity Scheme—Rugby Electrical Exhibition—Factory and Workshop Lighting Campaign.

A FACULTY has been granted for an electric light installation in Didcot parish church.

Grays U.D.C. has received sanction to a loan of £2 350 for the provision of an electricity showroom.

A tender amounting to £1 175 has been accepted by Southend T.C. for extensions of the Thorpe Bay station.

The sixth annual conference of Women Engineers will be opened at the Bristol University to day (September 21st.)

York Watch Committee recommends that automatic traffic signals be fixed at Museum Street and Queen Street.

Taunton T. C. has instructed the Electricity Committee to prepare a scheme for the assisted wiring of smaller houses.

The city engineer of Wakefield has been asked to prepare a scheme of motor transport for the Electricity Department.

Tiverton T.C. have agreed to grant free use of gas and electricity at the athletic ground for the carnival on October 11th.

Warrington Corporation has decided to obtain sites in Stretton Road, Appleton, and Blackhurst Street, for the erection of sub-stations.

The Statute Labour Committee of Glasgow Corporation has recommended that sanction be given to the erection of eight public telephone kiosks.

Arrangements have been made for the new Leeds electricity showrooms at the junction of Albion Street and Upper Fountaine Street to be opened on September 24th.

Bradford Corporation has given instructions to the town clerk to obtain information with regard to the appointment of lighting superintendents by other municipalities.

Leeds Electricity Committee attended the official opening of the Branch Canal at the Redcote Estate, Kirkstall, and inspected the work in progress at the new power station.

The Liverpool University authorities have decided to throw open the electrical and mechanical engineering shops for inspection by the public on September 27th, which occurs in Liverpool Civic Week.

The congregation of Maryculter Parish Church, Aberdeenshire, has under consideration a scheme for the installation of electricity. It is estimated that a plant to light the manse and church would cost about £400.

Portland Electricity Committee has decided that the tenders for electrical plant and material be submitted to Messrs. A. H. Seabrook and Partners, who will advise as to which are the most favourable.

The opening meeting of the 48th session of the Junior Institution of Engineers will take place at 39, Victoria Street, London, S.W.1, on October 5th, at 7.30 p.m. Mr. A. J. Simpson will lecture on "Swiss Alpine Railways."

An electrical exhibition is being held by Rugby District Council's electricity department from October 4th to 16th to encourage the use of electrical appliances and to celebrate the 25th anniversary of the commencement of the supply.

The first international conference to discuss the application of light rays to the treatment of disease, has been opened at Lausanne. It has been decided to create an International Light Association, and Prof. Rosselet, of Lausanne, has been chosen to be the first president.

Sheffield Improvements Committee has met at the War Memorial and inspected two model lamp bases, fitted by the city architect, and instructed him to instal permanent lamp bases, in stone, similar to the selected model, to each of the lamps at the foot of the Memorial.

The complete autumn illuminations at Blackpool will be switched on to-morrow (Saturday). There will be four miles of decorative lighting along the sea front, from the Pleasure Beach to Bispham. Some 280 standard lamps have been converted into large electric lanterns.

It is interesting to note that Mr. Harry Moss has arranged to give a lecture on behalf of the Electrical Development Association, before the Foremen's Mutual Benefit Society (Engineering, Shipbuilding, and Allied Trades) at the Empress Hotel, Bradford, on October 12th. The lecture will be entitled "Electricity, its History and Development, and Use in Industry."

In connection with the Factory and Workshop Lighting Campaign an E.D.A. Sales Conference and Demonstration for the London and Home Counties Area will take place at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C.2, on October 5th, at 7.30 p.m., when the Campaign will be explained in detail. Tickets can be had from the E.D.A.

Under the rules of the Batti-Wallah's Society all members are subject to re-election annually by the Committee, and this re-election must be unanimous. The scrutiny of the membership and re-election took place at a Committee meeting on September 11th, and this meeting also confirmed the election of the following new members:—S. T. Allen, A. N. East, A. J. Hedgcock. The Society's next annual dinner and dance will be held at the Hotel Cecil, March 1st, 1929.

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# OVERSEAS TRADE.

## Value of Electrical Exports in Eight Months Trebles That of Imports.

THE value of electrical machinery, apparatus and materials exported from the United Kingdom in August, 1928, was £1 436 399, representing an increase of £25 419 over the value of such exports in July of this year, but a decrease of £86 042 compared with the figures for August, 1927. The electrical exports for the eight expired months of this year (£12 224 888) also show a decrease of £61 326, which, it will be noticed, is entirely due to the falling off which took place in August. The total export figures, however, both for August of this year and for the eight months, show a great preponderance over the value of imports in the same periods. The August, 1928, exports, compared with the imports for the same month (£575 984), show an excess of £860 415, and the exports for the eight months of this year (£12 224 888) compared with the imports for the same period show an excess of £8 197 895, or over 200 per cent. Amongst the classes of exports which show increases for the month of August, 1928, compared with August, 1927, are railway and tramway motors, increase £947; other motors and generators, increase £7 030; electrical machinery of all kinds, increase £22 266; submarine telegraph and telephone cables, increase £4 146; arc lamps and searchlights, increase £313; switchboards, other than telegraph and telephone, increase £1 235; and electrical goods and apparatus unenumerated, increase £44 786.

| | Month of August, | | Eight Months, | |
|---|---|---|---|---|
| IMPORTS. | 1927. £ | 1928. £ | 1927. £ | 1928. £ |
| Electrical Machinery | 95 412 | 159 346 | 1 051 080 | 1 186 088 |
| Electric Wires and Cables, Insulated— | | | | |
| Rubber insulated (not being Telegraph or Telephone Wires or Cables) | 6 989 | 14 377 | 78 519 | 108 955 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 46 553 | 59 050 | 383 890 | 389 076 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 11 789 | 6 709 | 60 599 | 55 481 |
| Submarine Telegraph and Telephone Cables | — | — | — | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 32 619 | 55 327 | 268 396 | 391 533 |
| Carbons, Electric | 8 265 | 6 219 | 63 856 | 83 355 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 33 508 | 39 287 | 230 079 | 318 750 |
| Arc Lamps and Electric Searchlights | 1 967 | 588 | 6 354 | 4 890 |
| Parts thereof (except Carbon Rods) | 1 929 | 5 341 | 17 418 | 19 722 |
| Batteries and Accumulators (including parts) | 66 655 | 63 984 | 374 046 | 357 747 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 20 017 | 21 734 | 181 176 | 185 932 |
| Switchboards, other than Telegraph and Telephone | — | — | 1 069 | 780 |
| Electrical Goods and Apparatus, all other Sorts | 100 543 | 144 022 | 809 179 | 924 685 |
| Total of Electrical Goods and Apparatus | 426 246 | 575 984 | 3 525 661 | 4 026 993 |

| | Month of August, | | Eight Months, | |
|---|---|---|---|---|
| EXPORTS. | 1927. £ | 1928. £ | 1927. £ | 1928. £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 22 598 | 23 545 | 371 827 | 349 127 |
| Other Motors and Generators | 218 647 | 225 677 | 1 540 640 | 1 681 761 |
| All other sorts | 311 793 | 326 082 | 2 571 324 | 2 547 824 |
| Electric Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 112 756 | 105 737 | 955 018 | 927 006 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 119 522 | 91 414 | 1 028 466 | 984 353 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 100 340 | 50 910 | 587 803 | 612 903 |
| Submarine Telegraph and Telephone Cables | 35 269 | 39 415 | 433 897 | 157 147 |
| Telegraph and Telephone Instruments and Apparatus (except Wireless Valves) | 217 363 | 162 136 | 1 672 442 | 1 874 032 |
| Carbons, Electric | 134 | 450 | 12 876 | 9 519 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 49 930 | 36 455 | 409 184 | 334 556 |
| Arc Lamps and Electric Searchlights | 311 | 624 | 10 075 | 9 310 |
| Parts thereof (except Carbon Rods) | 169 | 87 | 2 724 | 5 559 |
| Batteries and Accumulators (including parts) | 117 867 | 116 762 | 835 102 | 746 231 |
| Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 36 091 | 31 439 | 245 924 | 264 855 |
| Switchboards, other than Telegraph and Telephone | 8 560 | 9 795 | 47 797 | 55 511 |
| Electrical Goods and Apparatus, all other sorts | 171 085 | 215 871 | 1 561 195 | 1 665 194 |
| Total of Electrical Goods and Apparatus | 1 522 441 | 1 436 399 | 12 286 214 | 12 224 888 |

# PERSONAL.

THE marriage of the Earl of Bective and Lady (Rupert) Clarke was solemnised at the Brompton Oratory on Tuesday.

The marriage of Mr. A. Greenway, electrical engineer, Chester, and Miss R. O. Davis, was solemnised last week at Festiniog.

**The Earl of Bective and Lady (Rupert) Clarke after their wedding on Tuesday.**

Oldham Corporation has increased the salary of Mr. F. L. Ogden, borough electrical engineer, from £900 to £1 100 per annum.

Mr. H. L. Metcalf has resigned his position with Babcock and Wilcox, Ltd. to become general manager of Ruth's Steam Storage, Ltd.

Guildford Town Council has appointed Mr. E. J. W. Brown, who has for some years been with Bruce Peebles and Co., Ltd., as deputy borough electrical engineer.

Mr. S. M. Nicol, formerly Inspector for the Fire Underwriters in Dunedin, has joined the staff of the British Thomson-Houston Co., in the Testing Department at Rugby.

Bury St. Edmunds Town Council has granted a bonus of £25 to Mr. W. C. Cooper for his services as acting chief engineer at the electricity works during the illness of the late Mr. Day, borough electrical engineer.

On the occasion of his marriage at Pauler's Pury, Northants, Mr. T. Hewitt Payne has been presented with a cheque by the technical and sales staffs of Crompton Parkinson, Ltd.

Mr. Louis Jessop, the retiring Liberal representative of the Great Horton Ward on the Bradford City Council, has agreed to stand again for re-election in November. Mr. Jessop is a member of the E.C.A.

Counc. W. H. Giles, who has accepted the mayoralty of Burton-on-Trent, is chairman of the Borough Electricity Committee, and a Corporation representative on the East Midlands Electricity Advisory Board.

Mr. R. H. Simpson, of the Traction Department of the British Thomson-Houston Co., Ltd. having recently undergone a serious operation in a Birmingham nursing home, is making good progress towards recovery, and hopes to resume his duties at an early date.

Mr. P. P. Richardson, turbine superintendent at the Halifax Electricity Works, has resigned, and the Tramways and Electricity Committee recommends the appointment of Mr. H. Fisher, boiler house superintendent, as resident engineer at the power station.

Sir Percy Cunynghame has accepted an invitation by Chelsea (London) Chamber of Commerce to address the Chamber on October 2nd on the subject of electricity charges in Chelsea. It has been decided to invite members of the Chelsea Council, of which Sir Percy is a member, to hear the address.

Mr. James Scott has accepted nomination for the mayoralty of Bootle. Mr. Scott is engineer to the West Lancashire Rural District Council, the Formby Urban District Council and the Westmorland Electricity and Power Committee and is deputy chairman of the Mersey and West Lancashire Joint Electricity Authority.

Prof. A. G. Christie, of Johns Hopkins University, Baltimore, has just completed a stay in England, where he has been making a study of the steam accumulator in connection with electric power plant. This work was started last year in America, but was not finally completed until this summer, during Prof. Christie's visit to England. Results of these studies will be soon be available to the engineering public.

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# BUSINESS ITEMS.

THE British Thomson-Houston Co., Ltd., announces that the price of the C2 loud speaker has been reduced.

The two motor vehicles entered in the Manchester Motor parade, by the Chloride Electrical Storage Co., Ltd., last week won first and second class prizes, respectively.

The rumour that a limited liability company is to be formed to take over the undertaking of J. H. Holmes and Co., of Newcastle-upon-Tyne, was neither denied nor confirmed on Wednesday.

The General Electric Co., Ltd., has received an order from the Exeter Corporation Tramways for four complete tramcar electrical equipments. Each car will be equipped with two motors each rated at 50 H.P. on the one hour rating, 500 V and two series-parallel controllers.

A number of window display lighting installations have been carried out recently at Godalming. Messrs. S. D. Brand, the electrical contractors, of Electric House, Godalming, are responsible for the installation of the "Gecoray" system of shop window lighting in several of the best known business establishments in the town. These include two drapery, one men's outfitting, and one butcher's establishment.

## Machine Tools.

In connection with the Machine Tool Exhibition at Olympia, the British Secheron Co., Ltd., point out that on Stand No. 38 they are showing portable alternating current arc-welding machines and also a combined arc, butt and spot welding machine. The particular features of these two machines are the automatic device for stabilising the arc and for regulating the voltage to the correct value for the current being used.

Recent orders received by Harcourts, Ltd., a subsidiary company of Metro-Vick Supplies, Ltd., include special fittings for the Theatre Royal, Bolton; St. Joseph's Church, Heywood, Lancs; St. Joseph's College, Upholland, Lancs; Empire Theatre, Leicester Square, London; Rialto Cinema, Coventry Street, London; and fittings for the Cutlers' Hall, Sheffield. Harcourt fittings are mainly designed by the well-known sculptor, Mr. Walter Gilbert, with his staff of assistants.

The manufacture of steatite insulators, which, we are informed, hitherto has been a German monopoly, will shortly be commenced at Stourport, Worcestershire, where a new factory is being built for Steatite and Porcelain Products, Ltd., a British firm in which Imperial Chemical Industries are large holders. The new factory will, it is expected, be ready by January next, when employment will be given to about 250 men and 350 women. This number will probably increase to 1 000 in the ensuing 18 months. Mr. C. S. Garland, managing director of the firm, in an interview said the patents had been acquired from the two German companies holding them, and it was hoped to capture the £75 000 spent annually by British firms in buying these insulators from Germany. Stourport had been chosen as the site for the new factory, he added, because it was the highest point on the Severn to which 150-ton barges could be brought.

A large number of electric lighting units, specially designed by the Manchester branch of the General Electric Co., to the instructions of Mr. A. Rangeley, are installed at Allied House, the Manchester headquarters of Allied Newspapers, Ltd. The main entrance on the ground floor has twenty-two 16-in. Equiluxo bowl pendants with cast bronze metal work. These are supplemented by sixteen 3-light bracket fittings of similar finish, which are mounted on the top of the grill, the entrance hall being illuminated by one 20-in. bowl fitting with four 6-in. spherical globes to match, the metal work likewise being of cast bronze. Two bronze 2-light brackets, also with 6-in. spherical globes, supply the porch lighting, while three similar units are installed on the staircase. On the first floor landing a 16-in. bowl pendant unit with cast bronze metal work is installed. The offices on the first floor are illuminated on similar lines, the units consisting of thirty-two 14-in., fourteen 10-in., and one 12-in. bowl fittings. All the switch plates are of cast bronze, and vary from 1 to 12-way. The outside lighting units are fashioned in cast iron, finished black, and comprise four large lantern brackets of a very attractive design. The lamps used in the units comprise 300, 150 and 100 W sizes. The installation was carried out by the Allied Newspapers' own staff.

The electrical illuminations carried out by the West Wilts Electric Light and Power Co., Ltd., for the Trowbridge Hospital Carnival which is one of the largest and best attended in the West of England, contributed in no small measure to its success. Realising the propaganda value of electrical illumination the company organised a scheme whereby they undertook the hire of shop lighting lamps, including erection and supply of current to shop-keepers and others, for the illumination of premises. Although only a comparatively small town of 13 000 inhabitants, over 80 consumers took advantage of the scheme, individual premises being illuminated with from 50 to over 600 lamps in the case of large premises. The most outstanding scheme was designed and carried out by the company for the George Hotel. This consisted of a large "magnet" reaching to the top of the building and provided with over 600 red lamps. In addition, large illuminated arrows were erected to draw attention to the collection boxes at the base of the device and an illuminated thermometer with red lamps operated by a flasher showed the progress. The display on the West Wilts E.L.P. Co.'s offices consisted of a large design of the company's e.h.t. line and the towns and villages supplied with electricity. The lines were picked out in red lamps, operated by a flasher. Two 500 W lamps were installed on the opposite side of the road, also operated by the flasher for the purpose of illuminating the sign at intervals between the sequence of lighting the red lamps. The park, where most of the carnival festivities were held, was illuminated with over 2 000 lamps festooned on poles to outline the paths and walks, and the bandstand was illuminated with strip and flood lighting. To demonstrate the use of flood lighting, the company carried out a scheme of flood lighting of the Town Hall. In addition to white light projectors, amber and yellow units were used for the clock tower producing a very pleasing effect. The roof was illuminated with concealed red lamps giving the appearance at a distance as if the building was on fire. The company's entry in the carnival, which incidentally secured a special prize, consisted of a tableau representing "the old and the new" and was designed to emphasise the advantage of electric light as against other methods of illumination. The "old" depicted a cottage living room provided with an old fireplace, oil lamps and other inconveniences. Its occupant—an old man was making vain attempts to read a newspaper by the aid of the light from the oil lamp. In the "new" display a modern living room was shown equipped with modern electrical helps for the home. Brilliant illumination was provided from a 1 kW Lister set. A novel feature which proved a great attraction was an Electrolux cleaner used by the attendant for the purpose of collecting for the hospital on the route of the procession. Over 8 000 lamps were used for the town illumination, and visitors for miles around were much impressed with the adaptability of electricity for decorative illumination work.

See page 327.

# THE NATIONAL REGISTER.

## Further Applications from Contractors for Registration.

AT a meeting of the Executive Committee of the National Register of Installation Contractors on September 14th, thirty applications for registration were received. Of this number three applications were withdrawn and five were declined.

We give below the names and addresses of those contractors whose applications were accepted:—

Messrs. Pain and Lungley, 155, Portland Road, South Norwood, London, S.E.25; Messrs. George M. McCartney, 30, Church Street, Belfast; Messrs. Frank Porter, 55, Deanhouse, Thongsbridge, near Huddersfield; Messrs. Thistlethwaite and Edgar, Back St. Annes Road West, St. Annes-on-Sea; Messrs. Gibbs and Parker, 7, Wright Street, Oldham; Messrs. Clement E. Crookall, 29, Market Place, Poulton-le-Fylde, Blackpool; Messrs. Harold E. Fletcher, 22, Wellington Road, Oldham; Shemelds, Ltd., 49/53, Berry Street, Belfast; the Lincolnshire Electrical Co., Ltd., 72, St. Peter's Avenue, Cleethorpes; Johnson and Co., 35, Ravenhill Road, Belfast; Messrs. Walker and Hutton, 1, Harcourt Place, Scarborough; Messrs. Dolby Walter Harrison, 58, Grove Road, Wallasey; Messrs. William Elsworth Horace, 37, Western Road, Bexhill-on-Sea; Messrs. Robert Ardis, 3, College Square East, Belfast; Thomasson, Wilfred, and Co., 1, High Street, Shrewsbury; Messrs. Walter Barrett, 86, Third Avenue, Bath; H. L. Bush and Co., 2, Wells Road, Bath; Messrs. Frederic T. Wordley, 31, Norman Road, St. Leonards-on-Sea; Messrs. William G. Walter, 8, Westgate Buildings, Bath; Messrs. Ernest T. Turner, 16, Waterloo Road, Epsom, Surrey; Messrs. Thomas Riley, Station Road, Tunstall, Stoke-on-Trent; and J. and S. Farr, Ltd., 18/20, Parliament Street, Nottingham.

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# SUMMER SCHOOL DINNER.

## Opportunities for University Students in the Supply and Manufacturing Industries.

FOLLOWING upon the conclusion, on September 14th, of the official week of the Metropolitan-Vickers Summer School for Professors and Lecturers in Engineering, at Trafford Park, the occasion was marked by a dinner at the Grand Hotel, Manchester. The speeches which were made were all in favour of the continuation of such schools and the attending members all expressed the view that the opportunities offered by such inspections of works, etc., were most enlightening from the educational standpoint.

Sir Philip A. M. Nash, chairman of the company, who presided, said that in modern business one of the chief wants was leadership. It had always been a matter of surprise to him how men drifted into business, and he considered that it was the work of professors and teachers to see that young men started their career along the road most suited to their talents. Dealing with the manufacturing and supply sides of the industry, Sir Philip said that the latter held as many opportunities for progress as the manufacturing side, and this fact should be borne in mind when considering the future

### The Home Market.

As if to illustrate the truth of this latter remark he pointed out that 50 per cent. of his company's annual business consisted of small orders of an average value of £115, for home consumption, thus showing that the home market was of not inconsiderable value. Though it was general to associate large orders with export trade, home sales were equal in value, though many times larger in the number of orders received. Continuing, Sir Philip said that the supply industry offered extraordinary chances for expansion in that, though there were over 8 000 000 houses in this country, and though he believed that 5 500 000 of them were within reach of a supply cable, only 1 250 000 were wired for electricity. Further, of the motive power in this country only 37 per cent. was electrified, while in the United States and Germany the figures were 73 per cent. and 60 per cent. respectively. These figures thus showed the opportunities for development, revealing as they did the position of both domestic and industrial electrification. The Central Electricity Board represented the first serious step in the direction of rectifying the position, and though Great Britain was the largest exporter of electrical equipment in the world, such was the home condition. He believed that by proper educational methods and the employment of the right men, supply companies could do much to increase the number of consumers both of electricity and plant, to everyone's mutual benefit. The organisation of his company called for the best that the universities could turn out in the way of students, and his message to those anticipating an electrical career was that no matter whether he be college apprentice or workman at the bench the opportunity to advance was there for the asking.

Mr. A. P. M. Fleming also spoke, pointing out that during the last eight years no less than 400 graduates had passed through his hands, and though some were good, others were bad. The conditions in the electrical world to-day were such that one could look only for refinement either in design or manufacture; there was little room for revolutionary changes. Such a point of view should be taught to students in the hope that they would develop their work along those lines. Further, to have captured the overseas market to the extent we have, necessitated brilliance in selling against the competition of the world and in this respect universities should again do more to develop and select suitable students for this branch of industry.

Mr. A. McKinstry, a director of the company, remarked that the lessons learnt at universities had proved of immense value to industry. It had been a practice of Metropolitan-Vickers to absorb graduates, and it should be the effort of universities to turn out as perfect a product as possible, in order to ensure the progress and well being of their country.

Other speakers were Prof. B. Mouat-Jones (Manchester), Dr. C. G. Lamb (Cambridge), Prof. F. Bacon (Swansea) and Mr. A. R. Mullins.

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The following classes of goods are exempt from the recent general increase of duty upon imports into Bulgaria: Dynamos, electromotors, transformers, telegraph and telephone apparatus, measuring instruments, heating apparatus, railway and tramway rails and sleepers, signalling apparatus, etc.

# THE SOCIAL SIDE.

AT the invitation of the Edinburgh Electrical men (Jocks) per Mr. Walter Finlay, the Newcastle Electrical men (Geordies), were the guests of the Scotsmen at Goswick Golf Course just on the Border, on September 12th. This was a return invitation to one last year when the Newcastle team beat Edinburgh. This year the match was halved. After lunch, provided by the Scotsmen, play began at 1 p.m. Each

**Group of Edinburgh and Newcastle Electrical Golfers taken outside the Goswick Club House before the match on September 12th.**

party brought 13 players, six games were won by the Scotsmen and six by the Englishmen, and one was halved. The Scotch players were Messrs. Edgar, Shand, Hill, Nairns, Finlay, Whitely, Pratt Jr., Pratt Sr., E. Pratt of Leith, J. J. Foggo Anderson and Anderson-Begg. The English players were Hugh Patterson, S. Pike, W. Casebourne, K. Wardroper, Devereaux, H. Turner, P. Gibson, Mearns, Tong, Barker, Evans and Bradford. The first six names on either sides being winners. Messrs. N. S. Tenant and Alexander halved their match. Mr. Hugh Patterson did the course in 73, which we understand, was also the score of Messrs. Tenant and Alexander.

At Holborn Baths, on September 7th, the G.E.C. Swimming Club made its first public appearance, when it swam off the final events of the various tournaments which have been running throughout the season. There was a large attendance. The following is a list of the events and successful competitors :—

| Event. | 1st. | 2nd. |
|---|---|---|
| Ladies' Diving .. .. | Miss Atkinson .. | Miss Baker |
| Final Ladies' Handicap | Miss Baker .. .. | Miss Symonds |
| Breast Stroke Ladies .. | Miss Baker .. .. | Miss I. Davies |
| Men's Diving .. .. | Mr. Grimwood .. | Mr. Robinson |
| Final Men's Handicap | Mr. Miller .. .. | Mr. S. B. Allen |
| Breast Stroke Men .. | Mr. Miller .. .. | Mr. Simmonds |
| Men's Team Race .. | The Sun Electrical Co. | |
| Juniors' Width .. | Mr. Stolber | |

The prizes were distributed by Mrs. L. C. Gamage, from whose efforts in founding a Ladies Section of the Club some seven years ago the present encouraging membership has grown.

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# METER ENGINEERS' ASSOCIATION.

## Dissolution of the Technical Association Following upon Arrangement with the I.E.E.

AS a result of certain tentative suggestions put forward some time ago, negotiations have been proceeding between the M.E.T.A. and the I.E.E. with a view to arriving at a basis upon which to found definite proposals for some form of nexus between the two bodies. As a consequence the M.E.T.A. has been invited by the I.E.E. to co-operate in the formation of a new section of the Institution to be called the "Meter and Instrument Section" and definite proposals, deemed to be acceptable to both negotiating parties, have been formulated. The proposals involve, as a necessary initial step, the dissolution of the Meter Engineers' Technical Association as such, and the formation of a new Meter and Instrument Section of the Institution. Members of the M.E.T.A. who already belong to the I.E.E. and those who are subsequently elected from the M.E.T.A. membership will form the nucleus of the Section. A ballot of the members of the M.E.T.A. disclosed a substantial majority in favour of dissolution, and consequently in favour of accepting the I.E.E. proposals, and the Council decided upon December 31st, 1928, as the date for the dissolution to take effect.

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# TRADE PUBLICATIONS.

AMONG the latest publications of A. P. Lundberg and Sons, Ltd., are leaflets E1.65, dealing with a double pole switch for strong rooms, etc. E1.52 describing the Twinob motor starting switch, and E1.66 concerning a flush combination switch.

**A new loud-speaker cut-out by Philips Lamps, Ltd.**

The Automatic Telephone Manufacturing Co., Ltd., have published bulletin No. 300, dealing with Strowger automatic telephones. The subject is treated both generally and with special reference to the application of this system in the Greater London area, as well as in the principal provincial cities and foreign countries.

Watson and Sons (Electro-Medical), Ltd., have issued a new catalogue of electro-medical apparatus. The catalogue contains, in addition to the standard items of apparatus for all branches of physio-therapy, equipment which is claimed to represent the latest advances in electro-medical science. (Reference No. 99.)

An interesting publication by Mather and Platt, Ltd., is a new brochure dealing with the electric drive to the textile, bleaching, dyeing, printing and finishing trades. We specially direct attention to the unusual form of cover of this brochure, which consists of an actual piece of fabric of striking pattern, printed and finished on Mather and Platt textile machinery, driven by the same company's electrical plant.

H. W. Sullivan, Ltd., have sent publications relating to d.c. measuring apparatus, phone wheel double amplifier equipment for the standardisation of the tuning fork of a multi-vibrator wavemeter, a sub-standard wavemeter for 8-10 metres, and hetereodyne wavemeter for 20-300 metres, air condensers, heterodyne and multi-vibrator wavemeter covering various wavelengths and measuring apparatus for high frequency calibration.

The new volume of electric lighting fittings (domestic and decorative section) issued by the British Thomson-Houston Co., Ltd., is the third and completing section of their catalogue of electric lighting equipment. The first two volumes, giving complete particulars of wiring supplies and accessories and commercial and industrial fittings, were issued a short time ago, and the present volume contains complete information regarding all types of domestic and decorative fittings from the simplest pendants for the suburban home to elaborate electroliers for the lighting of super cinemas and public buildings. Shades made of glass, fabric and parchment, bowls made of glass and alabaster, and enclosing glassware in a variety of designs are included, together with necessary accessories. The catalogue consists of 208 pages, bound in board cover of pale green, is profusely illustrated and well arranged. An index ensures easy and rapid references. All the information necessary for the planning of complete lighting installations is contained within its pages.

# RADIO EXHIBITION.

## Rapid Guide to the New Receivers and Equipment on Show at Olympia.

FOR the guidance of those visiting the National Radio Exhibition which opens to-morrow, Saturday, at Olympia, London, we give below a list of a few of the most interesting of the new items, together with the numbers of the stands where they may be seen. As far as we are able to trace, none of the items mentioned has been exhibited before :—

A high frequency choke for all frequencies. Stand 110.

Panel plate tuners in oak, walnut or mahogany finish. Stand 21.

Collapsible cabinets. Stand 106.

A 4-valve screened grid receiver for mains operation. Stand 27.

Battery eliminators for h.t., grid Bias and l.t., which may also be used as trickle chargers. Stand 108.

A selling competition offering valuable prizes is being held on Stands 126-137.

Special aerial units designed for eliminating interference. Stand 31.

A cabinet made of fabric may be seen on Stand 42.

Heavy duty high tension batteries for portable sets. Stand 164.

Multi-stage valve receivers for a.c. mains operation. Stand 42.

Five new multi-valve receivers are on show on Stand 28.

A volt-ampere meter which works on a new principle. Stand 7.

Valves which work from a.c. mains and heat their filaments from the same supply without an independent cathode heater. Stands 59 and 28.

A 5-valve portable for all broadcast wavelengths. Stand 70.

Three-valve receivers which are " superior to a four and equal to many fives." Stand 69.

Instruments which read 0·150 V and 0·30 mAh. Stand 7.

A screened six with dials which read in metres. Stand 61.

Moving coil cones of new design. Stand 60.

Accumulator sets for portable equipments. Stand 95.

Special 3-valve sets for short waves and long distances. Stand 42.

Sets designed to receive Chelmsford 5SW. Stand 31.

Eliminators which may be bought in bits. Stand 42.

A volume control of novel design. Stand 108.

### Other Items.

Home-constructor-sets which need five connections for completion. Stand 110.

Two-volt valves with novel filaments. Stand 86.

A trickle charger shown for the first time. Stand 37.

Components for the reception of pictures. Stand 177.

Sets for television experiments. Stand 11.

A 5-valve portable receiver weighing 30 lb. Stand 74.

Variable condensers with thumb control in capacities ranging from 0·0002 to 0·0005 mfd. Stand 152.

Air spaced coils for short wavelengths ranging from 20 to 90 metres. Stand 91.

Cabinet type loud speakers with unusually large diaphragms. Stand 19.

Switches for use with battery eliminators which cut off both high and low-tension supply in one movement. Stand 35.

Moving coil loud speakers for home construction. Stand 9.

A new 2-valve model which sells at an unusual price. Stand 104.

Thirty new products are shown on Stand 56.

A " mystery " receiver forms an exhibit on Stand 42A.

Special tables designed to accommodate both receiver and loud speaker. Stand 112.

An all-electric radio-gramophone with self-energising moving coil loud speaker. Stand 21.

Three new cabinet type loud speakers in all wood finishes are shown on Stand 31.

High tension batteries whose life is declared. Stand 24.

Frame aerial receivers for long range reception. Stand 131.

Condensers with guarantees to withstand all pressures. Of special interest to eliminator manufacturers. Stand 121.

Accumulator terminals which defy sulphation. Stand 203.

The first appearance of a series of radio-gramophone sets embodying a number of hitherto unused features. Stand 44.

A straight-line frequency amplification transformer. Stand 84.

Special constructor sets for beginners which receive a number of stations. Stand 54.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

WEST LOTHIAN EDUCATION AUTHORITY.—Electrical work in connection with erection of Bo'ness Central School. Specification (No. 11) from Mr. E. Blades, executive officer, Education Offices, Bathgate, on or after September 28th; deposit £1 1s.

ALLOA CORPORATION, September 21st.—Electrical installation in 106 houses at West Ashley Terrace, Alloa, etc. Schedules from Messrs. J. Melvin and Son, Mar Street, Alloa.

GRIMSBY CORPORATION, September 21st.—Supply of extra high pressure switchgear, and alterations to existing switchgear. Specification, etc., from Mr. S. R. Windle, Electricity Offices, Moss Road, Grimsby.

MERSEY RAILWAY CO., September 21st.—Supply of metallic and carbon filament lamps and fittings, etc. Tender form (No. 10) from the Manager and Secretary, Central Station, Birkenhead.

REMENHAM (BERKS) PAROCHIAL CHURCH COUNCIL, September 21st—Electric lighting installation in the church and parish hall. Specifications from the Rector.

GRIMSBY CORPORATION, September 22nd.—Supply of paper insulated, lead covered, low pressure cables required by Electricity Department during one year. Specification (No. 253) from Mr. S. R. Windle, borough electrical engineer.

BEDWAS AND MACHEN URBAN DISTRICT COUNCIL, September 24th.—Supply, erection and laying of overhead and underground mains. Specification, etc., from the Electrical Engineer, Council Offices, Bedwas, Mon.; deposit £2 2s.

CHESTER GUARDIANS, September 24th.—Supply of electrician's sundries for six months. Tender forms from the Clerk, St. Martin's House, Chester.

HALIFAX GUARDIANS, September 24th.—Supply of electrical fittings for six months. Forms of tender from the clerk, Mr. Arthur Longbotham, Carlton Street, Halifax.

HULL CORPORATION, September 24th.—Electric lighting of the open market. Forms of tender, etc., from City Engineer.

PLYMOUTH CORPORATION, September 24th.—Supply of lamp columns to the electricity department. Tenders to the Town Clerk, Municipal Buildings, Plymouth.

WEST RIDING COUNTY COUNCIL, September 25th.—Electric light installation at Harthill Council School. Specifications from Mr. A. Rayner, 151, Cross Hill, Ecclesfield, near Sheffield.

TAUNTON CORPORATION, September 27th.—Manufacture, supply and erection of 2 000/3 000 kW steam turbine generating plant, with condensing plant, auxiliaries and accessories. Specification from Mr. A. J. Howard, borough electrical engineer.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, September 28th.—Supply of electrical fittings. Forms of tender, etc., from the Clerk, 22, Lombard Street, West Bromwich.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

LANCASTER GUARDIANS, September 29th.—Electric light installation in the institution and children's home, Quernmore Road, Lancaster. Specification from the Clerk, 5, Dalton Square, Manchester; deposit £2 2s.

LEEDS CORPORATION, September 29th.—Supply and erection of three-phase switchgear, for Kirkstall generating station. Specification, etc., from Mr. C. N. Hefford, Electricity Dept., 1, Whitehall Road, Leeds; deposit £2 2s.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 29th.—Six months' supply of electrical fittings, etc. Forms of tender from the Clerk and Treasurer, 19, Heriot Row, Edinburgh.

ST. ALBANS CORPORATION, September 29th.—Electric light installation at the Sisters' Infectious Hospital, Folly Mead, St. Albans. Forms of tender from the City Engineer, 38, St. Peter's Street, St. Albans.

GREENWICH (LONDON) BOROUGH COUNCIL, October 1st.—Three ton travelling crane, steam or electric (a.c., 200 V, 50 cycles, d.c., 210 V), and self-acting grab. Particulars from Borough Engineer.

DEVON MENTAL HOSPITAL, October 2nd.—Six months' supply of electric lamps, etc. Tender forms from the clerk, Mr. Cecil Masters, Exminster.

METROPOLITAN ASYLUMS BOARD, October 3rd.—Installation of automatic telephones at Princess Mary's Hospital, Cliftonville, Margate (specification G); and wiring for outside supply of electricity at Colindale Hospital (specification H). Specifications, etc., from the Board's office, Victoria Embankment, London, E.C.4; deposit £1 for each.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2; deposit £2 2s.

WATFORD CORPORATION, October 5th.—Two 750 gal. per min. sewage ejectors, with electrically driven air compressors. Specification from Borough Surveyor; deposit £2 2s.

NORWICH CORPORATION, October 8th.—Supply and erection of 12 500 kW turbo generator and condensing plant at Thorpe power station. Specification, etc., from Mr. F. M. Long, city electrical engineer, Duke Street, Norwich; deposit £1.

GREAT WESTERN RAILWAY, October 9th.—Supply of telegraph instruments (list 18), electrical apparatus (list 19), lamps and fittings (list 23) and electric lamps (list 24). Forms of tender from Stores Superintendent, Swindon.

EDINBURGH CORPORATION, October 15th.—Coal and ash plant, for Portobello generating station, including weighbridge, truck tippler, three electric capstans, belt conveyors and elevators and two ash telpher hoists. Specification, etc., from Mr. E. Seddon, city electrical engineer and manager; deposit 10s. 6d.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 23rd.—Supply of electric cables during 12 months ending November 30th, 1929. Further particulars from the Electrical Engineer, Electricity Works, Penrose Street, Walworth Road, S.E.17.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th.—Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

CAROLINA (SOUTH AFRICA) MUNICIPALITY, October 1st.—Supply of plant for the electric lighting of the town; and supply of electrically-driven pump.

CONSTANTZA (ROUMANIA) PORT AUTHORITIES, October 1st.—Supply of one electric portal crane and two goods lifts. (Reference A.X. 6 797.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st.—Supply of porcelain insulators. (Reference B.X. 4 643.)

TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply and delivery of 250 ornamental electric lamps standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

ANGORA POSTS AND TELEGRAPHS, October 3rd.—Copper wire. (Reference A.X. 6 761.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

INDIA STORE DEPARTMENT, October 4th.—Supply of 24 electric ceiling fans. Form of tender (5s.) from Director-General, Belvedere Road, London, S.E.1.

ROYAL SCHOOL OF ENGINEERING, GIZA, EGYPT, October 4th.—Electrical plant, etc. (Reference B.X. 4 703.)

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South African Department of Posts and Telegraphs, October 4th.—Supply of telegraph line material. Reference B.X. 4 655.)

South African Electricity Supply Commission, October 4th.—Supply of electric cables and wires.

South African Posts and Telegraphs, October 4th.—Supply of copper wire and lead-covered cable. (Reference B.X. 4 657.)

South African Railways and Harbours, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

Argentine Department of Navigation and Ports, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 694.*)

Angora Posts and Telegraphs, October 6th.—Bronze wire and sleeves. (Reference A.X. 6 754.)

Direction Generale des Fabriques Militaires, Angora, October 8th.—Supply of electrolytic copper. (Reference A.X. 6,807.)

New South Wales Railways and Tramways, October 10th.—Ironclad switchgear for Sefton sub-station. Specification (2s. 6d.) from Chief Electrical Engineer.

Saskatoon (Canada) Municipality, October 10th.—Supply of 10 000 kW steam turbo-alternator, condenser and auxiliary equipment, or, alternatively, a 7 500 kW unit. (Reference B.X. 4 721).

South African Railways and Harbours, October 11th.—Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

State Electricity Works, Montevideo, October 15th.—Electrician's pliers, wire-drawing machines, etc. (Reference B.X. 4 702.)

Indian Stores Department, October 16th.—Supply of oil engine-driven alternator sets, and switchgear (order No. N.8 729), for Ahmednagar. (Reference B.X. 4 714.)

Postmaster-General's Department, Melbourne, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

Indian Stores Department, October 17th.—Supply of water turbine and two oil engine driven generating sets, for Mardan power station. (Reference B.X. 4 733).

State Electricity Works, Montevideo, October 17th.—Automatic voltage regulator. (Reference B.X. 4 699.)

Rangoon Municipality, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on closed circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

Victorian Electricity Commission, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

Postmaster-General's Department, Melbourne, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

South African Railways and Harbours, October 25th.—Supply of two 6½ kW crude oil driven generating sets.

Johannesburg Municipality, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

Melbourne City Council, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944.) (Reference B.X. 4 698.)

South African Electricity Supply Commission, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

Postmaster-General's Department, Melbourne, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

Egyptian Ministry of the Interior, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

New Zealand Public Works Department, October 30th.—Protective relay system. (Reference B.X. 4 573.)

Victorian Electricity Commission, October 31st.—Manufacture, delivery and erection of water-tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

India Store Department, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.), from the Director-General, Belvedere Road, London, S.E.1.

Postmaster-General's Department, Melbourne, November 6th.—Automatic telephone switching equipment (schedule C. 353.) (Reference B.X. 4 638.)

South African Railways and Harbours, November 8th.—Electrically-driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

South African Posts and Telegraphs, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

Egyptian Ministry of Interior, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

Victorian Electricity Commission, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

Victorian Electricity Commission, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria Victoria House, Strand, London, W.C.; deposit £50.

Postmaster-General's Department, Melbourne, November 13th.—Switchboard keys and parts. (Schedule C. 362.) (Reference B.X. 4 396.)

New South Wales Railways and Tramways, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

South African Posts and Telegraphs, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729).

New Zealand Public Works Department, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

Victorian Electricity Commission, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68).

## Tenders Accepted.

Potterne Parish Council.—Western Electric Supply Co., public lighting installation (14 lamps), £53 9s.

Forfar Infirmary.—R. Kilpatrick and Co., electric lighting installation in connection with extension of building.

New South Wales Railways and Tramways—Babcock and Wilcox, Ltd., supply of six boilers for Ultimo power house, £261 000.

General Post Office.—Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of Siemens vacuum, traction, and gasfilled lamps.

General Post Office.—General Electric Co., Ltd., supply of Osram vacuum and gasfilled lamps, and Robertson carbon filament lamps for 12 months.

Liverpool Corporation.—English Electric Co., Ltd., supply of seventy 40 h.p. tramcar motors, with roller bearings, £190 per motor. (Recommended.)

Southern Railway.—General Electric Co., Ltd., supply of Osram vacuum and gasfilled lamps, including train lighting lamps, and Robertson carbon filament lamps during 12 months.

Great Western Railway.—S. H. Heywood Co., 50-ton overhead electric travelling crane, at Old Oak Common; Ransomes and Rapier, Ltd., supply and erection of four electric capstans at The Mole, King's Dock, Swansea.

St. Pancras (London) Borough Council.—Brush Electrical Engineering Co., Ltd., supply of 15 000 kW turbo-alternator, £42 760 (recommended). Two lowest tenders, which were for plant made in Switzerland, were: Oerlikon, Ltd., £30 724 and British Brown Boveri, Ltd., £32 933.

Bermondsey (London) Borough Council.—A. Reyrolle and Co., Ltd., e.h.t. switchgear and control panel for additional rotary converter, £1 245; Hart Accumulator Co., Ltd., control and emergency lighting battery, £223; Crompton Parkinson, Ltd., switchboard for control and emergency lighting battery, £34; Siemens Bros. and Co., Ltd., laying e.h.t. cables on time and material basis; and end boxes for l.t. cables, £1 5s. 6d. each.

Adelaide (South Australia) Supply and Tender Board.—Newton, McLaren, Ltd., 20 000 ft. of lead covered, s. and c., enamelled twin wire telephone cable, £180; Elder, Smith and Co., Ltd., paper insulated, lead-covered cables, £422; Johnson and Phillips, Ltd., 2 200 ft. of cable, £440, and 280 ft. £25; A. Herbert (Australasia), Ltd., combination turret lathe and electrical equipment, £1 341; Benson Bros., Ltd., vertical turret lathe and electrical equipment, £1 924.

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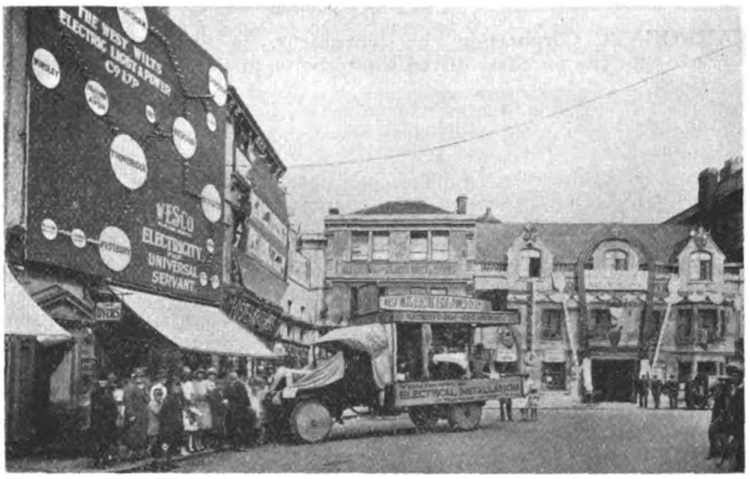
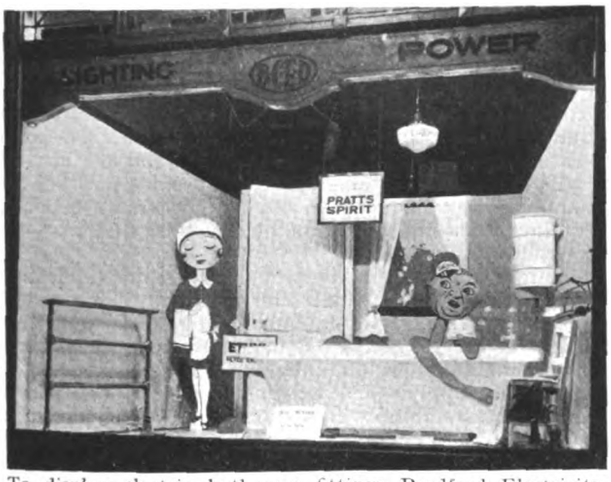
## ELECTRICAL PICTURES OF THE WEEK.

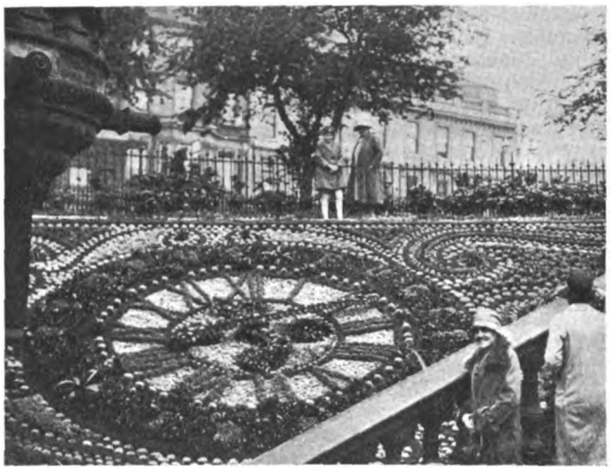
One of the most spectacular fires ever seen in the Manchester district broke out at the Salford Tramways offices, in Blackfriars Street on Monday, when the building was occupied by most of the indoor staff. At the time of going to press the damage is not known.



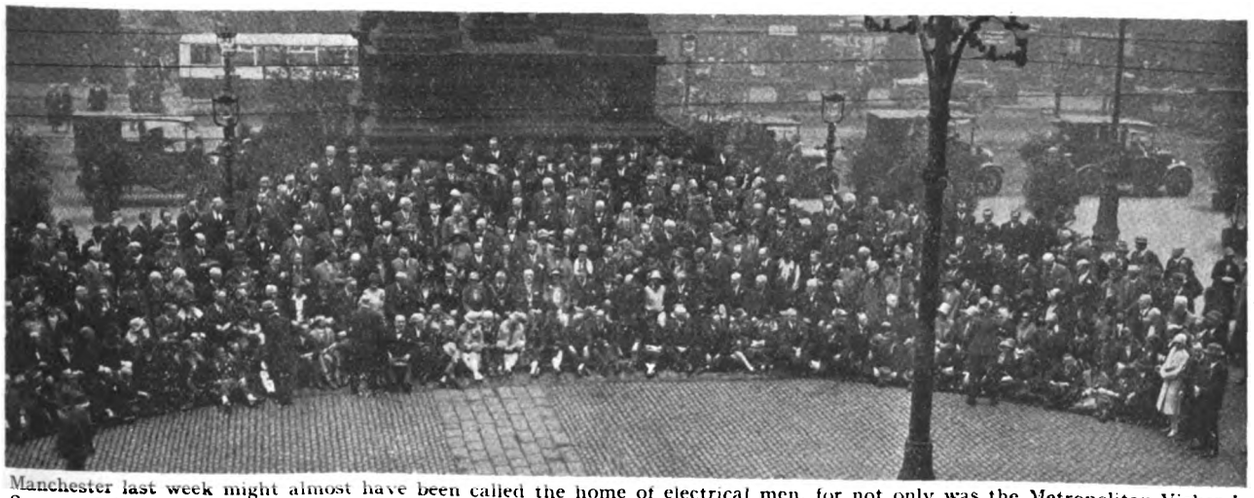

The electrical tableau which was entered by the West Wilts Electric Light and Power Co., Ltd., for the recent Trowbridge Hospital Carnival. The display on the left is situated over the company's offices, and shows, outlined in lamps, the area of supply covered by the company. Another novel effect was the "magnet" seen to the right of the car. The arrows pointing to the collecting boxes were also laid out in electric light. See page 322.




To display electric bathroom fittings Bradford Electricity Department has adapted—with due acknowledgment—the figures known as Ethyl and Mr. Angloco. The bathroom scene in the window represents Mr. Angloco, and Ethyl, with the card "Ethyl never knocks" in her hand.



An electric floral clock in the Prince's Gardens, off Prince's Street, Edinburgh, which provides an attractive feature for visitors to the Scottish centre. It will be remembered that we published some weeks ago, a picture of a somewhat similar clock in the South of France.



Manchester last week might almost have been called the home of electrical men, for not only was the Metropolitan-Vickers' Summer School in full activity (see page 313), but also delegates from all over the country attended the annual conference of the Municipal Tramways and Transport Association throughout the week. The photograph reproduced above shows some of the members of the Association and their friends grouped together in Albert Square ready for the photographer.

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# ELECTRICITY SUPPLY.

## The Knaresborough Undertaking—New Mains for Manchester—Switchgear and Transformers for the Shannon Scheme—Supply in the Isle of Man—London Joint Authority and Employees' Organisations—Station Plant for Oldham.

HARROGATE Corporation, by agreement, is to pay £12 805 for the purchase of the Knaresborough electricity undertaking.

Retford T.C. intends to apply for a loan of £16 250, for supplying electricity in the rural areas, when such a departure is justifiable.

Manchester Electricity Committee has obtained authority to borrow £26 500 for h.t. transmission mains and £50 000 for electricity services.

The Electricity Supply Board is advertising for supply and erection of switchgear and transformers for the Shannon scheme at Fleet Street, Dublin.

A company has been formed to give a supply of electricity to the parish of Caersws, and the erection of the plant is to be commenced forthwith.

Lichfield R.D.C. has decided to raise no objection to the application of the City Council for consent to carry an overhead electric line to Whittington.

Carlisle Electricity Committee has sanctioned extensions of the electricity mains to a large number of new houses, at an estimated cost of £2 213 3s. 6d.

Salford Electricity Committee seeks sanction to borrow £15 000 for the installation of a 33 000 V step-down transformer at Trafford Park sub-station.

Liverpool Electric Power and Lighting Committee has obtained authority to borrow £15 000 for the provision of h.t. switchgear and rotary converters.

Prestwich U.D.C. has prepared schemes for the electric lighting of housing estates at a cost of £2 124 and converting gas lighted roads to electricity at a cost of £2 863.

Mr. F. E. Spencer, borough electrical engineer of Birkenhead, has consulted the Electricity Committee as to the system to be employed in furnishing a supply of electricity to Irby and certain other villages in Wirral.

The Mersey Docks and Harbour Board has decided that, subject to certain conditions, the engineer be authorised to lay an electric cable to the shed at the berth appropriated to the use of the Cunard Steamship Co., Ltd., at the north side of the Huskisson Branch Dock No. 1.

Complaint was made at a recent meeting of Portadown U.D.C. regarding the prices charged for electric light by the Portadown Electric Co. It was decided to ask the Electricity Commissioners to inquire into the administration of the [illegible] and to see that reasonable prices were charged.

Oldham Electricity Committee has obtained sanction to borrow a further sum of £72 872 in respect of expenditure on the new generating station. The Electricity Committee has agreed to receive a deputation from the Oldham and District Chamber of Trade with reference to shopkeepers being charged for energy on the rateable value system.

Buxton T.C. is about to make application to the South East Lancashire Electricity Advisory Board for approval to the scheme for taking electricity in bulk from the Trent Valley and High Peak Electricity Co., Ltd., and to the Electricity Commissioners for sanction to the borrowing of £10 000 for the necessary converting plant, cables, etc.

The Central Electricity Board has under consideration representations by owners of electricity undertakings regarding the North-West England and North Wales scheme, preparatory to giving its approval to the same, with or without amendment. The Yorkshire and North-East England scheme, or schemes, will, it is anticipated, be published before the end of the current year.

Horsham U.D.C. will apply for a Special Order to supply electricity to an extended area, including Warnham, Kingsfold, Southwater, Christ's Hospital, Broad Bridge Heath, and parts of Faygate and Rowhook. The estimated cost is £7 100, but £1 250 of this is chargeable to the existing undertaking. It is calculated that in less than five years the added area will show a substantial profit.

The Derbyshire and Nottinghamshire Electric Power Co. has decided to lay a cable from its Spondon power station to Hatton, and has asked if a temporary supply from Burton-on-Trent Corporation's Tutbury l.t. main can be given. The engineer has agreed to give such a supply, subject to the company bearing the whole cost of the mains and paying 1½d. per kWh for power consumed.

Willesden Electricity Committee, commenting on the accounts of the electricity undertaking for the past year, refers to an increased charge for depreciation in connection with the showroom. This increased charge is occasioned chiefly by depreciation on motors let on hire for commercial purposes, and the committee is of opinion that this account should, in the future, be kept entirely separate from the ordinary showroom account.

Barnstaple R.D.C. has decided to withdraw its objections to the application of Braunton Electric Light and Power Co. for a Special Order to supply electricity to the parishes of Braunton and Heanton Punchardon on condition that provision is inserted to the effect that provided a request for current signed by no fewer than six persons within any part of the area of supply is received, and such request is not granted, any other persons shall be at liberty to provide their own supply three months after the original request.

Douglas (Isle of Man) electricity department has quoted the General Electric Co., 1d. per kWh, plus a fixed charge, for a bulk supply of electricity at the boundary of the Corporation's area of supply. The General Electric Co. has notified its intention of applying for distributing powers for the whole island, excluding the area covered by the Douglas Electric Light and Power Act, purchasing the current in bulk from the Corporation.—The Electricity Committee has purchased land at Summer Hill for the purpose of erecting a rectifier sub-station.

Willesden U.D.C. has considered a report with regard to the wiring of the houses which are being erected by the Council on the Neasden Estate, and recommends the Electricity Committee to execute the work of fitting all the heating points required, at a cost of £440 15s. One or more 2 kW portable radiators are to be supplied to each house and flat, at a rental of 2s. per quarter. It is proposed to provide facilities for all tenants to have installed an electric cooker, wash boiler, or any other domestic apparatus, at any time they may desire, upon the usual terms.

Stretford Electricity Committee is to make application to the Electricity Commissioners for approval of the system of supply within the Stretford area being made applicable to the area of the Barton and Urmston Board. The committee has obtained sanction to an alteration in the system and pressure of the supply.—The existing charge of 15s. per yard, over and above the 6 yards laid at the Council's own cost, has been reduced to 8s. 6d. per yard in the case of domestic consumers.—The period of repayments under the assisted wiring scheme is to be extended from 4 to 10 years, and for radiators and cookers on hire-purchase rental is to be paid for 5 or 3 years.

The Minister of Labour gives notice that as soon as may be after September 20th he will designate to the London and Home Counties Electricity Authority the employees' organisations having members in the employment of authorised undertakers in the London and Home Counties district, in order that the organisations so designated may choose two representatives of persons employed in connection with the supply of electricity in the District to be members of the Joint Authority. Any such organisation desiring to be considered for such designation should apply to the Minister by September 29th, on form supplied by the Secretary, Ministry of Labour, Montagu House, Whitehall, London, S.W.1.

Mr. T. Roles, city electrical engineer of Bradford, has reported to a special sub-committee on the question of the use of electricity instead of gas for street lighting in the districts of the city which are within the supply areas of gas companies, and upon the question of improvement in the street lighting in Cutler Heights Lane and Dick Lane. The gas manager has submitted suggestions and estimates of cost for improvement of the present gas lighting in the roads mentioned. The committee has given instructions for lighting electrically the thoroughfares in question at an estimated annual cost of £585, and has requested the city electrical engineer to prepare an estimate of the cost of substituting electric lighting for gas lighting in all other streets within the areas of supply of gas companies.—A new d.c. feeder is to be laid from Sunbridge Road sub-station to Southgate, at a cost of £7 300.

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# LOOKING BACKWARD.

## Wheatstone's Fifty Years Old Definition of Electromotive Force.

FIFTY years ago it was stated in THE ELECTRICIAN dated September 21st, 1878, that :—

An expedition had started to connect Cyprus with Alexandria, and thus to England by means of a submarine cable.

Wheatstone defined electro-motive force as " the cause which originates *current* in a closed, and *tension* in an unclosed circuit."

Under the direction of Mr. Edward Gilbert, the English chief superintendent, Japan had in eight years put 6 000 miles of telegraphs into operation.

M. de Meriten claimed to have invented a magneto electric machine capable of lighting three or four Jablochkoff lamps per horse power. It was thus three or four times more effective than the Gramme machine.

M. P. Jablochkoff had successfully applied condensers of very large surface to distribute to several points the electricity derived from one source, having in view such application to the requirements of electric lighting.

A novel battery, described by Pouci, an Italian electrical engineer, consisted of " a glass jar and a porous vessel, the latter filled with a solution of ferrous chloride, and having an iron plate as a pole. The outer solution was of ferric chloride, with a carbon as a pole."

* * *

Twenty-five years ago, according to THE ELECTRICIAN for September 25th, 1903 :—

Dublin Electricity Department inaugurated its new power station at Pigeon House Fort.

Mr. R. L. Gamlen was appointed engineer and manager of the Lancashire Electric Power Co.

Tenders for telephone wires received by West Ham Corporation varied from £27 10s. to £63 13s. per mile.

Wolverhampton Corporation decided to take over from the Lorain Steel Co. the experimental surface contact tramway system, and to equip additional routes on the same method. The decision was followed by the resignation of five members of the Tramways Committee.

It was pointed out that this country was the first to use oil-break switches, Messrs. Ferranti having designed switches of this kind in 1894, the first large switchgear containing oil-break switches being installed by them at the City of London Co.'s Bankside station in 1895.

# ELECTRIC TRACTION.

## Railless Electric Traction at Doncaster— A New German Tramcar.

THE net profit on the Derby Corporation tramways for the past year was £4 370.

The towns of Mafra and Loures, near Lisbon, have arranged for the construction of an electric railway to Lisbon, a distance of about 50 miles.

Traffic receipts on the Mersey Railway for the week ended September 8th were £4 010, a decrease of £113. Aggregate for 36 weeks, £155 141, decrease £1 634.

Doncaster's first trolley bus service was officially opened recently. The railless service supersedes the Doncaster-Bentley tram route, and embraces a circular route of over five miles beyond Bentley New Village to Victoria Avenue, and by way of Askern Road back to Marshgate.

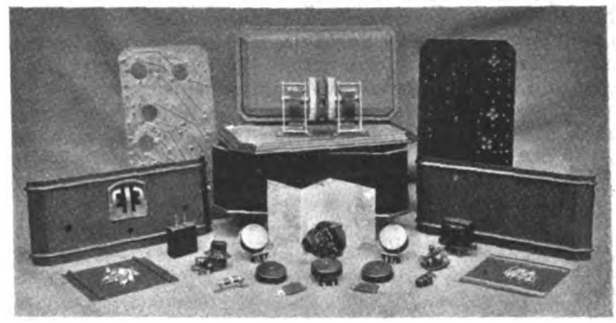
Tests are being made in Dresden with a new tramcar 75 ft. in length, which accommodates 117 persons, and travels at thirty miles an hour on parts of the tramways. It is stated that, owing to the length of the vehicle, the conductor has to use a loud speaker to announce the stopping places.

An extension of the Sheffield Corporation tramways to the city boundary at Woodhouse Mill, has been approved. This tramway will pass for a short distance through the rural district of Rotherham, part of the Retford Road being situate in that area. Other extensions approved are from Barnsley Road along Norwood Road and Herries Road to Moonshine Lane, from Firth Park along Stubbin Lane, Barnsley Road to Sheffield Lane Top, from Intake along Mansfield Road to the corner of Hollinsend Road. A new tramway siding in Pinstone Street, for the purpose of which a portion of St. Paul's Churchyard will be required, and a junction tramway between Firth Park Road and Page Hall Road have also been approved.

# WIRELESS NOTES.

## Details of a Receiver which can be Assembled in Less than an Hour.

THE Igranic Electric Co., Ltd., have placed on the market all the parts for a " home made " wireless receiving set, which is called the " Igranikit." The parts are so numbered that any person without technical knowledge can assemble



**The components forming the " Igranikit " described.**

them without difficulty, and this was demonstrated to a gathering of technical Press representatives on September 14th, the whole process of assembly being accomplished in about three-quarters of an hour. A great attraction of this set is that it is ready wired.

As Mr. Kenneth Alford explained on the occasion of the demonstration, this set was designed to meet the needs of wireless listeners who are anxious to turn their hands to the making of a set, but have not yet ventured to do so. The constructor has no drilling or soldering to do, and there can be no doubt, when the assembly is completed that the circuit is correct. and it is claimed that the set will compete, as regards selectivity and good reproduction, with any of the better-class receivers sold in completed form. It can be run completely from a.c. house mains, in which case the use of the popular a.c. valves is essential. As a safeguard against bodily injury, an arrangement is provided which automatically cuts off the mains supply when the set is lifted. It was thought necessary to look ahead to the time when the regional scheme will come into operation. One cannot get selectivity in its true form without the use of high-frequency amplification, and therefore a single stage of high-frequency amplification has been incorporated in this set. The reaction control is arranged so that the minimum of radiation is caused through the aerial circuit.

The baseboard is drilled to take all the components, the holes in the baseboard are marked, and a key is supplied which identifies the component. When the whole of the components are screwed on there are a large number of screws projecting underneath, and a piece of fibre board contains the whole of the connections. This is dropped on to the connecting screws, and nuts are then put on projecting studs and screwed down.

Amongst other new lines which the company has produced are a condenser in which the two elements are completely isolated from the spindle, and a metal screen surrounds the whole of the component ; a wirewound resistance of 250 000 Ω, which has its steps graded in logarithmic fashion, and which gives gradual control over volume ; a new type of volume control in which the track is made of a piece of fibre of a graphite mixture with a wire wound on, which permits the contact arm to make contact with a different part of the track each time it passes over one of the convolutions of the wire and a resistance capacity coupling unit having two values of resistance for the anode.

### BIRMINGHAM ELECTRIC CLUB.

The Birmingham Electric Club will meet on September 28th when Mr. G. Rogers will give an address on " Automatic Sub-Stations." Other meetings will be held on October 26th, Prof. W. Cramp on " The Singing Arc " ; November 23rd, Mr. P. E. Erikson on " Some Aspects of Long Distance Cable Telephony " ; December 14th, annual meeting ; January 25th, Presidential Address ; February 22nd, Mr. G. E. Britton on " Electricity in Agriculture " ; March 22nd, annual dinner ; and on April 26th, Mr. H. Blades will give an address on " Electric Cables, Installation and Maintenance."

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# COMPANY NEWS.

## Electrical Securities Show Increased Activity—Official Quotations Granted—Baird International Television Co.'s Statutory Report—Other Reports and Dividends—New Companies Rgistered.

THERE has been a considerable revival of activity in the electrical share market during the past week. Newcastle and District Electric Lighting ordinary have risen 2s. 6d., Shropshire, Worcestershire and Staffordshire Electric Power B. ordinary 3s. 6d., and Yorkshire Electric Power ordinary 1s. and preference 6d. Metropolitan Electric Tramways 5 p.c. debenture have improved two points, Siemens Bros. and Co. ordinary 1s. 3d., Marconi's Wireless Telegraph ordinary 2s. 6d. and Marconi International Marine ordinary 3s.

| Last Annl. Divd. | Description | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | " " " 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6* | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | " " " 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 40/6* | 40/6 | 68/6 | 14/6 |
| 6 | " " " 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*e*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 28/- | 28/9 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 48/1½ | 48/9 | 43/- | 8/- |
| 4½ | " " " 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 27/6 | 22/6 | 7/9 |
| 6 | " Elec. Sup. Ord. .. | 26/3 | 26/3 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 7/4½ | Shrops,Worcs&StaffsPowerB.Ord. | 30/3 | 33/- | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | " " " 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 37/6 | 36/6 | 32/9 | 12/6 |
| 6 | " " " 6% C.P. .. .. | 24/- | 23/6 | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | " " " 6% Pf. Stk. .. | 126 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72 | 72 | 89½ | 40½ |
| 4 | " " 4% Deb. .. .. | 80 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | " " " 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | " " " 4% Deb. .. .. | 80 | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | " " " 5% Deb. .. | 68½ | 66½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 67½ | 68 | 84½ | 19 |
| 3½ | " " 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | " " 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 79½ | 66½ | 12½ |
| 4½ | " " 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | " " 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 62 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/6 | 27/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | " " " 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P... | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 83/9 | 86/3 | 26/6 |
| 6 | " " " 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/3 | 24/6 | 19/7 |
| 7 | " " " 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 81/3 | 81/3 | 80/- | 22/- |
| 6½ | " " 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | " " 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 18/- | 18/- | 18/- | 8/- |
| 7 | " " 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | " " 1st. Pref. .. .. | 25/7½ | 25/7½ | 20/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | " " 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 6/10½ | 7/6 | 29/3 | 7/3 |
| 6 | " " 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/-* | 19/6 | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 28/- | 30/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 10/9 |
| 7 | " 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 41/- | 41/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 111/3 | 110/- | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 37/6 | 37/6 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 33/1½ | 33/1½ | 37/- | 13/1 |
| 8 | " " 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 30/- | 28/9 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 247½ | 247½ | 213½ | 113/2/6 |
| 3½ | " " 3½% Pref. Stk. .. | 69½ | 69½ | 84/17/6 | 49 |
| 4 | " " 4% Deb. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 24½ | 25 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 39 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 40½ | 40½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 71/3 | 68/9 | 9/10/3 | 20/9 |
| 12½ | " Int. Mar. .. .. | 51/- | 51/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 24⅛ | 24⅛ | 23 | 11/3/6 |

(*a*) 1s. 7 ⅞d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·940d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d.
* Ex-dividend. ‡ Including 1s. bonus.

WESTERN UNION TELEGRAPH CO.—Regular qrtrly. div. of $2 p. sh. is announced.

WARD AND GOLDSTONE, LTD.—Intm. div. of 4 p.c. actual, on ord. shs. has been declared.

EAST AFRICAN POWER AND LIGHTING CO.—Gross receipts for June, 1928, £8 588; increase £916.

BRITISH INSULATED CABLES LTD.—Intm. div. of 5 p.c. (same rate as last year) is announced.

FARNHAM GAS AND ELECTRICITY CO.—Intm. div. of 3¾ p.c. on ord. shs. for past half year is announced.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Intm. div. of 6d. p. sh. (2½ p.c.) is announced.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—Regularly qrtrly. div. of 1½ p.c. will be payable on Oct. 15.

TILLING AND BRITISH AUTOMOBILE TRACTION CO., LTD.—Intm. div. on ord. shs. at rate of 4 p.c., less tax, is announced.

GLOBE TELEGRAPH AND TRUST CO.—First int. div. for year endg. May 31, 1929, at rate of 5s. p. sh., will be payable on Sept. 29.

NORTHERN MEXICAN POWER AND DEVELOPMENT CO.—Divs. of 1¾ p.c. on pref. stk. and 1 p.c. on common stk. will be payable on Oct. 1.

HENDON ELECTRIC SUPPLY CO., LTD.—Intm. div. of 10 p.c. p.a., tax free, on ord. shs. (same rate as last year) will be payable on Sept. 26.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The transfer books of the 6½ p.c. convertible 10-year 1st deb. stk. were finally closed on Sept. 17.

ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. at rate of 8 p.c. p.a., less tax, on ord. shs. (same rate as last year) will be payable on Sept. 26.

NORTHERN MEXICO POWER AND INVESTMENT CO.—Net earngs. for July, $117 656, increase, $9 411. Aggregate from Jan. 1, $769 690, increase, $15 565

NORTH AMERICAN EDISON CO.—Messrs. Dillon, Read and Co. recently offered, at par, $20 000 000 5½ p.c. debs. of this co., a subsidiary of the North American Co.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Intm. div. of 6d. p. sh. on ord. shs. (agst. 1s. p. sh. last year) will be payable on Oct. 15.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Net earngs. for qrtr. ended June 30 last were £282 011, before providg. for British and South African taxatn.

HUNGARIAN TRANS-DANUBIAN ELECTRICAL CO., LTD.—Transfer books of 6½ p.c. B. deb. stk. are closed until Sept. 29, inclusive, for preparation of warrants for int. due Oct. 1.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Transfer books and register of hldrs. of 7 p.c. red. deb. stk. are closed until Sept. 29, inclusive, preparatory to paymt. of int. due Oct. 1.

DIRECT SPANISH TELEGRAPH CO., LTD.—Div. for half year to June 30, 1928, at rate of 10 p.c. p.a. on pref. shs. and intm. div. of 4 p.c., tax free, on ord. shs. will be payable on Oct. 1.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Transfer books and register of hldrs. of 4½ p.c. 1st deb. stk. are closed until Sept. 29, inclusive, preparatory to paymt. of int. due Oct. 1.

EVER READY CO. (GREAT BRITAIN), LTD.—In reference to recent reports that the shs. of this co. may shortly be listed on the New York "curb" market, it is announced that the co. has taken no action in the matter.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Intm. div. for three mos. ended June, 1928, of 5s. p. sh., tax free, will be payable on Oct. 15. Share register will be closed from Sept. 29 to Oct. 6, inclusive.

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.—An intm. div. on ord. shs. of 3¾ p.c. (9d. p. sh.) is announced. Pref. and ord. sh. registers are closed until Sept. 22, inclusive, for preparatn. of intm. div. warrants payable Oct. 1.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. of 1¾ p.c. ($1.75 p. sh.) in respect of fixed div. of 7 p.c. p.a. on the non-cum. participatg. pref. shs. will be paid on Oct. 1. London agents: Canadian and General Finance Co., Ltd., 3, London Wall Bdgs., E.C.2.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee have granted special quotations to 9 6517 £1, fully paid,

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6 p.c. cum. pref. shs. of the County of London Electric Supply Co., Ltd., and 47 282 £1, fully paid, ord. shs. of the Underground Electric Railways Co. of London, Ltd.

MADRAS ELECTRIC TRAMWAYS (1904), LTD.—Intm. div. at rate of 6 p.c. p.a., less tax at 4s. in £, on the pref. shs. in respect of pfts. for year endg. Dec. 31, 1928, will be paid on Oct. 1, to hldrs. of pref. sh. warrants to bearer, at the Royal Bank of Scotland, 3, Bishopsgate, London, E.C.2.

EASTERN TELEGRAPH CO., LTD.—A div. at the rate of 3½ p.c. p.a., less tax, on pref. stk. for qrtr. endg. Sept. 30, 1928, and a div. of 2½ p.c. on ord. stk., tax free, for qrtr. endg. June 30, 1928, will be payable on Oct. 15. Transfer books of ord. stk. will be closed from Oct. 1 to Oct. 8, inclusive.

WIRELESS PICTURES, LTD.—Subscriptns. have been invited during the present week for an issue of 775 000 4s. ord. shs., at par. Co. has been formed to acquire for the United Kingdom and the British Empire patents relatg. to inventions for the transmission and receptn. of pictures, etc., by means of wireless broadcasting, and to carry on the business of manufacturers of and dealers in wireless apparatus and accessories. The inventns., the British Empire rights in which are being acquired by the co., combine the features of the "Fultograph" and the "Izon," which in future will be marketed under the name of the "Fultograph."

CROMPTON PARKINSON, LTD.—Net pft. for 15 mos. ended June 30, 1928, after provisn. for depreciatn., deb. int., directors' fees, etc., £70 826, plus £25 600 brt. in. After deductg. intm. div. for 9 mos. ended Dec. 31, 1927, on pref. shs., div. on 6 p.c. pfd. ord. shs. for six mos. ended June 30, 1928, and intm. div. of 2s. 6d. p. sh. on dfd. ord. shs., paid on March 31, 1928, blce. is £70 129. Directors recommend div. of 4 p.c. on pref. shs., makg., with intm. div., 8 p.c. p.a for the 15 mos., and fin. div. on dfd. ord. shs. of 7s. 6d. p. sh., making, with intm. div., a distributn. at rate of 10s. p. sh. Fwd. £44 550.

NORTH AMERICAN CO.—Consolidated blce. sheet as on June 30, of North American Co., and its subsidiaries, indicate a consistent expansn. Total assets are $811 582 951, increase since June 30, 1927, of $110 866 523. Investmts. total. $44 398 879 compared with $40 001 030, and curr. and workg, assets amt. to $48 168 638 agst. $47 787 629 a year ago. On the liabilities side, reserves amt. to $101 228 587, includg. $87 165 216 for depreciatn. and $14 063 370 for other reserves, compared with a total res. fd. a year ago of $77 812 982. Total surplus is $90 970 465, increase $23 557 641. Of the total surplus $65 302 432 represents undivided pfts., and $25 668 032 capital surplus. Current liabilities includg. notes and bills payable, accts. payable, and sundries, amt. to $19 818 411 agst. $19 929 979. All divs. on common stk. are distributed in the form of new common stk, and earngs. are thus automatically reinvested in the business. Stkhldrs. who wish to turn their divs. into cash are afforded special facilities for selling their new stk. through the co.'s brokers. An indicatn. of the rate at which expansn. is proceedg. is given by the fact that the co.'s output of electricity during the first half of 1928 was 2 729 963 605 kWh, an increase of 13·6 p.c. over the output for the first half of 1927. Net earngs. for year ended June 30, 1928, show increase of 26.94 p.c.

## Baird Television.

BAIRD INTERNATIONAL TELEVISION CO., LTD.—The statutory rept. states that total number of shs. allotted is 1 000 000 "A" shs. of 5s. ea. and 1 400 000 "B" shs. of 5s. ea., of which 1 000 000 "A" shs. have been issued for cash, at a premium of 1s. p. sh., and 1 400 000 "B" shs. have been allotted as fully paid up, as consideratn. payable by co. on sale to co. of 300 000 dfd. ord. shs. of 1s. ea. in cap. of Baird Television Development Co., Ltd., and 33⅓ p.c. of net proceeds, whether in cash, shs. or other securities, payable to Television, Ltd. in respect of sale and exploitatn. of foreign and Colonial rights in Baird inventions and patents. Total cash received in respect of shs. issued wholly for cash is £299 940. Paymts. on cap. acct. to Sept. 8, 1928, are as follows:—Prelim. exes., £23 687; underwritg. commissns. and brokerage on shs., £13 831; purchase of office equipmt., £12; sundry paymts., £1 411; cash, £261 048; total, £299 990. Prelim. exes., includg. underwritg. commissns. and brokerage and *ad val.* duty payable in respect of purchase price are estimated at £41 071.

BRITISH ALUMINIUM CO., LTD.—Intm. div. of 4 p.c. actual, less tax, on ord. shs. (same rate as last year) will be payable on Oct. 1.

BRITISH COLUMBIA POWER CORPORATION, LTD.—A div. of 50 c. p. sh. on class A shs. has been declared for period endg. Sept. 30, 1928, payable Oct. 15. Messrs. Andrew Holt and Co. and Wood, Gundy and Co., Ltd., announce that temporary scrip certificates to bearer for class "A" common shs., carrying bonus of one-qtr. sh. of class "B" stock with each class "A" sh. should now be lodged with Montreal Trust Co., 2, Bank Buildings, Princes Street, London, E.C.2, for exchange for definitive registered certificates.

## Company Meeting.

J. M. NEWTON VITREO-COLLOID (1928), LTD.—Mr. John M. Newton, presiding at the statutory meeting last week, said they had purchased a site at Dunton Green, near Sevenoaks, on which their main factories would be erected. The amount of capital in hand was approximately, after having paid for the land, £130 000. In the meantime they were proceeding with the construction of their special machines. They had at present three or four side lines for which they had applied for patents. These included matters dealing with wireless, for electrical works, and one or two other important commodities, and they were already assured that they would meet with a ready—he was going to say with a tremendous—sale. One particular form of their manufacture now under test with the largest electrical people, for the purposes of insulation, and they anticipated, as the result of their experiments, entering into important contracts with them.

## New Companies.

LEYLAND ROAD GARAGE, LTD.—Cap., £300. Garage proprietors, electrical and general engineers, etc. Reg. office: Clifton Chambers, 20, Fishergate Hill, Preston.

ROAD AND RAIL PUBLICITY, LTD.—Cap., £5 000. Mechanical and electrical engineers, moving sign manufacturers, etc. Solicitors: Kimbers, Williams and Co., 79, Lombard Street, E.C.

ROTUNDA, LTD.—Cap., £4 000. Manufacturers of and dealers in insulating materials and goods, electric wires and cables, etc. Reg. office:—Manchester Road, Denton, Manchester.

PERCY HEALEY, LTD.—Cap., £2 000. Electrician and manufacturer and importer of and general dealer in electrical appliances, etc. Reg. office:—241, Great King Street, Birmingham.

ALUMINIUM (II), LTD.—Cap., £100. Dealers in aluminium and all similar metals, electrical, radio and general technical engineers, etc. A first director:—W. V. Esperson, Bush House, Aldwych, London, W.C.2.

HILTON AND HILTON, LTD.—Cap., £500. To acquire business of dealers in wireless instruments and accessories, etc., carried on by J. Hilton and A. J. Gray at 74 and 76, Brinksway, Stockport, as "Hilton and Hilton."

C. N. VERNON AND CO., LTD.—Cap., £1 000. To acquire business of wireless engineers and contractors, etc., heretofore carried on by C. N. Vernon and J. W. Vernon as C. N. Vernon and Co., at 11, Halliwell Street, Manchester.

MERCURIAL CUT-OUTS, LTD.—Cap., £100 000. To acquire interests in any invention relating to electrical apparatus, and to carry on business as mechanical and electrical engineers. Reg. office:—126, Bishopsgate, London, E.C.2.

HEBDEN BRIDGE AND DISTRICT TRADES SUPPLY CO., LTD.—Cap., £100. General merchants and traders, etc. A director: W. A. Harwood, 16, Blenheim Street, Hebden Bridge, installation contractor. Reg. office: 18, Market Street, Hebden Bridge.

AUSTINLITE, LTD.—Cap., £6 000. To acquire business of electrical engineers carried on at Banbury until recently by Austin Lighting Co., Ltd., and since March 10th, 1928, carried on by Clarkson Thimble Tube Boiler Co., Ltd. Reg. office:—1, Broad Street Place, London, E.C.2.

MILLS HUMIDIFIERS, LTD.—Cap., £500. Motor, electrical and general engineers, manufacturers and repairers of, agents for and dealers in motor and other vehicles, lamps, batteries, accumulators dynamos, magnetos and other accessories, etc. Reg. office: 167, Edmund Street, Birmingham.

SOLIGHT SIGN CO., LTD.—Cap., £200. To acquire business of sign maker, merchant and dealer carried on by J. B. Alexander at 114, Windsor House, Victoria Street, S.W., as the Zenith Sign Co., and to carry on same and business of manufacturers of and dealers in materials used in the construction of signs, electrical engineers, etc.

JUDD ACCUMULATOR AND EQUIPMENT CO., LTD.—Cap., £4 000. To acquire from G. Judd benefit of certain existing inventions relating to electric storage batteries or accumulators and patents numbered 251 487, 251 488 and 251 489, and to carry on business of electrical dealers and engineers carried on by him at Raymouth Road, Bermondsey, London, S.E.

WIRELESS PICTURES, (1928) LTD.—Cap., £425,000. To acquire trade mark No. 450 529 "Izon," the benefits of an application numbered 493 129, for the registration of the word "Fultograph" as a trade mark, and the undertaking of Wireless Pictures, Ltd., to adopt certain agreements and to carry on by means of wireless, wireless broadcasting, telephone or telegraph lines or by any other means the business of transmission and the reception of pictures, etc. Registered office: 11, Bishopsgate, London, E.C.3. (Public Co.)

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from hte "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CAFFIN, Arthur (the elder), 43, Riley Street, Bermondsey, electric light and power contractor. £26 12s. August 15th.

GARDINER, L., 2, The Broadway, Bognor, wireless engineer. £11 6s. 3d. May 14th.

GODFREY, Mr. W., 24, Ipswich Road, Colchester, electrical contractor. £17 5s. 5d. August 8th.

HOWSON AND CO. 2, The Facade, High Road, Goodmayes, trical engineers. £32 9s. 5d. August 10th.

POWELL, Horace John, 2, Arthur Street, King William Street, E.C., electrical contractor (trading as ELECTRICAL EQUIPMENT AND MAINTENANCE CO.). £31 10s. 1d. April 20th.

ROBERTS, Mr. R. C., 29, Jewry Street, Winchester, radio dealer. £34 8s. 10d. August 8th.

WOOD, H. L., 32, High Street, Eastleigh, wireless dealer. £17 8s. 6d. August 9th.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ELECTRICALS, LTD., Newcastle-on-Tyne.—Registered August 15th, £2 000 debenture, to R. C. Taylor, Consett Chambers, Pilgrim Street, Newcastle-on-Tyne; general charge. *Nil. December 30th, 1927.

MAYBROOK ELECTRICAL CO., LTD., London, E.C.—Registered August 28th, £2 000 prior lien debenture, to H. L. and J. S. Faulkner, 17, Warham Road, Croydon; general charge and a sinking fund policy. *£1 000. June 7th, 1927.

NORTHERN COUNTIES ELECTRICITY SUPPLY CO., LTD., Newcastle-on-Tyne.—Registered August 13th, Deed of Covenant, etc. (supplemental to Trust Deed dated July 14th, 1905, securing £100 000 debenture stock); charged on land and premises at Norton. *£187 958. April 4th, 1928.

OCTRON, LTD., Birmingham, electrical engineers.—Registered September 3rd, £2 500 debentures; general charge. *Nil. August 17th, 1927.

PONTYPOOL ELECTRIC LIGHT AND POWER CO., LTD.—Registered August 21st, £300 debentures, part of £15 000; general charge. *£5 435. January 2nd, 1928.

WAKELIN'S WIRELESS CO., LTD., Ipswich.—Registered August 7th, £675 mortgage, to Building Society; charged on 66, Norwich Road, Ipswich. *——. December 19th, 1927.

## Satisfactions.

BERRY'S ELECTRIC, LTD., London, W.—Satisfactions registered August 15th, all moneys, etc., registered February 8th and March 29th, 1921.

CHESHAM ELECTRIC LIGHT AND POWER CO., LTD.—Satisfaction registered August 31st, £35 000 registered July 23rd, 1921.

MAYBROOK ELECTRICAL CO., LTD., London, E.C.—Satisfaction registered August 28th, £1 000, registered July 17th, 1928.

NEWQUAY ELECTRIC LIGHT AND POWER CO., LTD., London, S.W.—Satisfactions registered August 15th, £4 000, registered July 4th, 1906; £1 000 registered March 17th, 1919; and £8 000, registered January 26th, 1923.

OCTRON, LTD., Birmingham, electrical engineers.—Satisfaction registered September 3rd, £3 000, registered December 15th, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure-Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

BARNETT, T., electrical engineer, 934, Plains Road, Mapperley, Nottingham. The creditors interested herein were called together recently, when a statement of affairs was submitted which showed liabilities of £1 880, of which £740 was due to the trade, and £1 140 to cash creditors. In addition there was a fully secured creditor for £540, who held securities valued at £625. The assets were estimated to realise £355, from which had to be deducted £18 for preferential claims, leaving net assets of £337, or a deficiency of £1,542. The assets comprised fixtures and fittings, £54, expected to produce £30; stock, £346, valued at £200; work in progress, £6; book debts, £39, estimated to realise £25; cash in hand, £2; life policy, £8, and surplus from fully secured creditor, £85. After a short discussion, the creditors decided that the debtor should be given time within which to submit an offer. The following are creditors: Ediswan, Ltd., London, £141; Hough Bros., Ltd., Nottingham, £43; Stern Electric Co., Ltd., London, £37; British Driver Harris Co., Ltd., Manchester, £32; Detex Distributiors Ltd., London, £22; Brilliant Sign Co., Ltd., London, £20; A.E.G. Machinery Co., Ltd., London, £17; Electrical Appliances Co., Ltd., London, £14; Premier Electric Heaters, Birmingham, £10; Electric Heater and Cable Co., Ltd., Liverpool, £11.

BAYNES, Maudsley, and NEWMAN, Edmund Harold, trading as THE LANGHAM RADIO, radio manufacturers, 96, Regent Street, London, W.1. A conference of the principal creditors of the above was held recently at the offices of W. H. Cork and Co., accountants and auditors, 19, Eastcheap, E.C. Mr. W. H. Cork then submitted an approximate balance sheet, prepared by the firm's accountants, which showed that the assets, excluding the goodwill, exceeded the liabilities by some thousands of pounds. Mr. Cork added that he was consulted by the partners as they were being pressed, and as a result of overtrading, were unable to meet their "prompts." The turnover of the business exceeded £150 000 per annum, and large profits were being made. The present position was due entirely to over-trading. The partners were anxious that everyone should be paid in full, and were of the opinion that within six months the whole of the trade creditors could receive 20s. in the £. If the creditors agreed to a scheme a claim for £10 000 would be withdrawn until the other liabilities had been paid in full. During the discussion the creditors were unanimously of the opinion that the business was one that should be continued as there was every prospect of it being carried on at a substantial profit in the future, and the whole of the liabilities paid in full. It was decided that subject to the claim of £10 000 being withdrawn, the business should be turned into a limited company, and first debentures carrying interest of not less than 6 per cent. per annum, issued to the creditors, and secured by a trust deed to Mr. Cork as trustee on behalf of the creditors. It was also decided that the details of the scheme should be carried through under the supervision of a committee of inspection consisting of the representatives of Messrs. Pitchford and Thomas, Ltd., W. and H. Gidden, Ltd., Electron Co., Ltd., Grosvenor Battery Co., Ltd., H. Bowyer and Co., E. Doherty, and the General Electric Co., Ltd. Following the conference of creditors, meetings of the committee of inspection were held, and finally it was decided that a deed of inspectorship should be executed with Mr. W. H. Cork as inspector. It is pointed out that the assets are far in excess of the liabilities, and that the deed of inspectorship has only been taken with a view to securing the continuity of the business, the turnover of which had been rapidly increasing, and was continuing to develop. The business will be continued under the deed, and the whole of the liabilities eventually paid in full. The conduct of the business will not be affected in any way by the execution of the deed. The latter discloses total liabilities of £29 390, against assets of £37 029.

JONES, William, trading as RADIO AND ELECTRICAL SUPPLIES, electrical and wireless dealer, 37, Lakefield Road, Llanelly. A meeting of the creditors of the above was held recently at the offices of E. T. Collins and Son, C.A., 28, Baldwin Street, Bristol. The statement of affairs disclosed ranking liabilities of £795, of which £615 was due to the trade and £180 to a partly secured creditor. The latter was the bank, their claim being £370, and as security they held certain shares valued at £190. After allowing £17 for preferential claims, the net assets were £141, or a deficiency of £655. The assets consisted of stock, fixtures, etc. £11; book debts £198, expected to produce £96; and life interest £50. Mr. Arthur Collins reported that the shares held by the bank represented the capital with which the debtor started business in 1924. The bank also held collateral security in the shape of shares deposited by relatives. The household furniture was the property of the debtor's wife. The accountants were unable to submit any trading figures, owing to the absence of a complete set of books. The bank passbook showed that the takings had varied from £29 to £160 per month, whilst the drawings had been £4 weekly. The deficiency was attributed to loss on trading and bad debts. Mr. D. Jennings, solicitor, Llanelly, who appeared for the debtor, stated that his client had no definite offer to make, but friends were prepared to come forward and assist him in repurchasing the assets from the trustee. A resolution was passed confirming the deed of assignment already executed to Mr. Collins.

MANCHESTER MAGNETO CO., LTD., magneto manufacturers, Manchester. The adjourned meeting of the creditors of the above was held on September 13th, at the offices of A. L. Price and Co., 8, Exchange Street, Manchester. The statement of affairs submitted showed liabilities of £3 192, made up as follows: trade creditors £597, cash claims £781; bank overdrafts, £1 807; and partly secured creditors, £7. The latter claimed £28, and held security valued at £21. There was also a fully secured creditor for £17. The assets consisted of stock, £50; plant, utensils and fixtures, £23; good book debts, £103; doubtful debts, £214, valued at £71; and surplus from fully secured creditor, £3, making a total of £251. After allowing £179 for preferential claims, the net assets

(*Continued on page* 334.)

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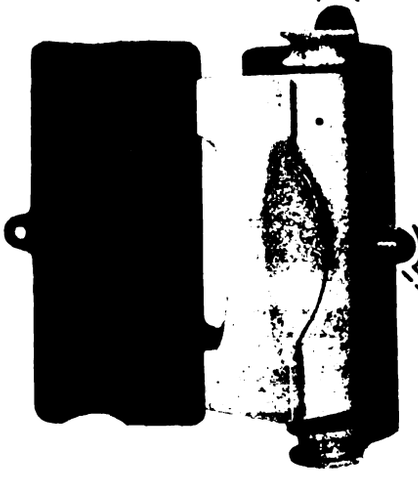
The Illustration shows a Bridge Type Fuse Box for circuits up to 500 volts. Cable lugs are fitted with pinching screws.



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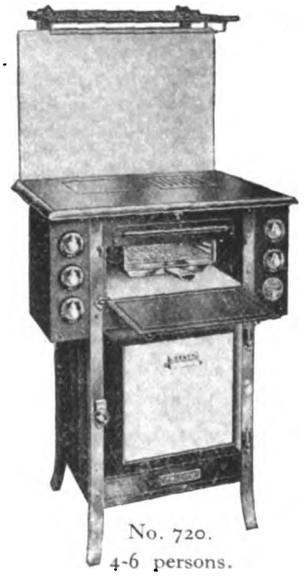

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were £72, or a deficiency so far as the creditors were concerned of £3 120. The issued capital of the company was £400, and as regarded the shareholders, there was a deficiency of £3 520. That deficiency was accounted for by the following items: net loss on the business from August, 1925, to August, 1928, including depreciation written off the fixed assets, £3 300, preliminary expenses, £77, and estimated reserve for doubtful debts, £143. It was reported that the company was registered on August 31st, 1925, with a capital of £1 000. At the outset it traded at Liverpool Road, Manchester, but in April, 1927, removed to Hardman Street, Deansgate. During the first year, the turnover was £2 774, but in the following 12 months, it increased to £5 215. During the last year, the turnover had only been £1 774. The loss on the trading was attributed to the heavy overhead expenses following the removal, too large an indoor staff, and the retail prices obtainable being too small. It was decided to confirm the voluntary liquidation of the company with the present liquidator.

## London Gazette, etc.

### Company Winding-up Voluntarily.

THE RIDGWAY STORAGE BATTERY CO., LTD. By reason of its liabilities, August 13th. W. H. Dunning, 11, Springfield Road, Kingston-on-Thames, appointed as liquidator.

### Bankruptcy Information.

BARNETT, Timothy, 934, Woodborough Road, Mapperley, Notts, electrical contractor. Receiving order, September 13th. Debtor's petition. First meeting, September 27th, 11.30 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, November 1st, 10 a.m., County Court House, St. Peter's Gate, Nottingham.

### Notices of Dividends.

DIXON, Leslie Arthur Nevett (trading as C. FORGHAM AND CO.), 23a, Princess Street, Shrewsbury, and Old Post Office Yard, Shrewsbury, Salop, electrical engineer. First and final dividend, 3s. 11½d. per £, payable September 24th, Official Receiver's Offices, 22, Swan Hill, Shrewsbury.

HILTON, Reginald, 81 Blackburn Street, Radcliffe, electrical engineer. First and final dividend, 4s. 9d. per £, payable October 1st, 16, Silverwell Street, Bolton, Lancs.

### Application for Discharge.

TIZZARD, Norman, trading with Frank John Tizzard, as TIZZARD BROTHERS, Dalkeith Street, Barrow-in-Furness, 121, Market Street, Dalton-in-Furness, Lancashire, electrical engineer and contractor. Hearing, October 10th, 10.15 a.m., Old Town Hall, Barrow-in-Furness.

### Order Made on Application for Discharge.

KIRK, Ernest William, formerly trading as the ACE RADIO MANUFACTURING CO., 26, Curzon Street, Derby. Discharged August 1st, subject to consenting to judgment for £24 and £1 10s. costs.

## PATENT RECORD.

### Applications for Patents.

*The following information is prepared from the Illustrated Official Journal (Patents by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

#### September 3rd.

25 189 W. Aitken. Telephone systems.
25 258, 25,259 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Connecting devices for electric circuits.
25 260 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Sealing chambers for cables, etc.
25 261 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Fuse boxes for electric circuits.
25 214 Cie Generale d'Electro-Ceramique. Suspension insulators, etc. (3/9/27, France.)
25 203 G. H. Dean and Electric Control, Ltd. Detection of faults in electrical transmission, etc.
25 223 General Electric Co., Ltd., and F. Hopewell. Voltage, etc., regulators.
25 204 H. Harding. Thermionic valves, and holders therefor.
25 212 C. McAllister and A. Munn. Electric switches.
25 290 I. E. McCabe. Thermostatically operated switch.
25 276 Marconi's Wireless Telegraph Co., Ltd. High frequency electric circuits. (3/9/27, U.S.)
25 276 Marconi's Wireless Telegraph Co., Ltd. Radio receivers, etc. (1/9/27, U.S.)
25 239 W. Russell. Electric switches.
25 221 J. E. Wilson. Method of electrical fog signalling.

#### September 4th.

25 314 H. E. Augold and Smith Meters, Ltd. Electricity meters.
25 332 J. Atkinson. Box for packing electric lamps, etc.
25 371 N. Bendixen. Fire alarms.
25 375 British Thomson-Houston Co., Ltd. Locomotives.
25 376 British Thomson-Houston Co., Ltd., and R. D. Given. Dynamo-electric machines.
25 423 E. A. Manufacturing Co., Ltd., and H. R. Guest. Flexible cord grips for lampholders, etc.
25 367 J. T. B. Gale. Circuit testing device.
25 399 K. Schaffler-Glassl. Low tension igniters, etc.
25 372 J. Harden. Mercury lamps.
25 393 Ideal Werke Akt. Ges. fur Drahtlose Telephonie. Loud speakers. (4/4/28, Germany.)
25 410 Igranic Electric Co., Ltd. (Pacent Electric Co.). Electrical connecting devices.
25 329 F. W. Lanchester. Transformers.
25 417 Siemens-Schuckertwerke A.G. Electric switch. (22/10/27, Germany.)
25 364 Westminster Tool and Electric Co., Ltd. Loud speakers.
25 374 H. C. Willson. Means for providing high potentials.
25 406 H. C. Willson. Radio receiving apparatus.
25 321 H. C. Wingfield. Automatic switch indicator for electrical prepayment meters.

#### September 5th.

25 483 Automatic Telephone Manufacturing Co., Ltd., and W. H. Paulett. Telephone systems.
25 479 British Bead Printers, Ltd., F. A. H. Heynert, Pollopas, Ltd., and J. C. Vredenburg. Insulating compositions.
25 474 British Thomson-Houston Co., Ltd. Electric contacts. (7/9/27, U.S.)
25 473 British Thomson-Houston Co., Ltd. Cie Francaise pour l'Exploitation des Procedes Thomson-Houston). System for regulating speed of asynchronous motors.
25 519 J. Brown. Feeder distribution boxes.
25 484 S. G. S. Dicker (N. V. Philips Gloeilampenfabricken). Electric lamps, etc.
25 483 C. Gillings. Telephone systems.
25 434 A. Peacock and G. A. Penrith. Electric lamp pedestals, etc.
25 442 R. Pearson. Electric switches.
25 491 L. F. J. Rousseau. Direct current generators.
25 509 N. and O. Schmitt. Electric fuse for mines, etc.
25 488 Siemens-Schuckertwerke A.G. Means for supervising fault indicating devices. (26/9/27, Germany.)
25 504 Siemens-Schuckertwerke A.G. Transformers. (5/11/27, Germany.)
25 430 H. Stahl. Electrically driven hoists. (29/9/27, Germany.)
25 462, 25,464 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Telephone systems.
25 463 Standard Telephones and Cables, Ltd., and J. K. Webb. Power cables.
25 451 Voigt and Haeffner A.G. Manufacture of electric heating bodies. (5/9/27, Germany.)

#### September 6th.

25 623 Ateliers J. Carpentier. Telegraphic printing systems. (30/9/27, France.)
25 603 N. Blades, F. Ellis and Sterling Telephone and Electric Co., Ltd. Loud speakers.
25 654 A. Blondel. Electrical signalling systems. (7/9/27, Belgium.)
25 593 British Thomson-Houston Co., Ltd. Welding torches. (12/9/27, U.S.)
25 605 S. Clifford and G. Kent, Ltd. Electrical measuring instruments.
25 592 W. A. E. Crombie and A. J. E. Hill. Illuminated signs.
25 572 A. Demblon. X-ray apparatus. (6/9/27, Belgium.)

## METAL AND CHEMICAL PRICES.

Tuesday, September 18th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £66 10 0 | £1 5 0 | — |
| Electro Wirebars | „ | £70 15 0 | £1 10 0 | — |
| H.C. Wires, basis | per lb. | 10 1/16d. | ⅛d. | — |
| Sheet | „ | 10⅛d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1 1/16d. | ⅛d. | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8½d. | — | — |
| Sheet „ | „ | 9 3/16d. | 1/16d. | — |
| Wire „ | „ | 9¼d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | „ | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 5 0 | — | 5s. 0d. |
| Foreign or Colonial | „ | £22 0 0 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £213 10 0 | £3 10 0 | — |
| Wire, basis | per lb. | 2s. 9½d. | ½d | — |
| *Aluminium Ingots* | per ton | £93 0 0 | — | £2 0 0 |
| *Spelter* | „ | £24 10 0 | — | 5s. 0d. |
| *Mercury* | per bottle | £24 5 0 | 10s. 0d. | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2¼d.
„ Roll, „ £10 15 10
*Sulphuric Acid* (Pyrites, 108°) per ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) „ £30 *Sodium Bichromate*—Per lb. 3¼d.
*Rubber*—Para fine, 10¼d.; plantation 1st latex, 9⅛d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

### LEAD MARKET REPORT.

According to James Forster and Co. the market opened last week with a firmer tone, September lead advancing to £22 2s. 6d., while a further 2s. 6d. per ton was made on the Tuesday. Since then, the tone has been easier and prices have fallen away 3s. 9d. per ton. The American price remains unchanged at 6·40 cents.

Closing prices on September 17th were £22 1s. 3d. for September, £21 18s. 9d. for October, £21 17s. 6d. for November and £21 16s. 3d. for December, or 2s. 6d. per ton higher on the week.

## Coming Events.

**Saturday, September 22nd.**

Machine Tool Exhibition.—Olympia, London.

**Saturday, September 22nd-September 29th.**

National Radio Exhibition.—Olympia, London.

**Monday, September 24th-October 6th.**

World Power Conference (Fuel Conference).—Imperial Institute, South Kensington.

**Monday, September 24th.**

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

**Tuesday, September 25th-September 26th.**

Iron and Steel Institute.—Autumn meeting in Spain (Bilbao).

**Tuesday, September 25th.**

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Café. Ordinary meeting.

**Wednesday, September 26th.**

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—Ordinary meeting, 5, Bedford Street, 3.30 p.m.

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# THE ELECTRICIAN

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# Current Topics.

## Autumn Trade.

It would be difficult to think of any previous autumn in the history of the British electrical industry in which the prospects in nearly every section have been better than they are now. On the heavy manufacturing side a number of very big orders have been placed by home and foreign purchasers, and a real start has been given to the South East England electricity scheme by the placing, by the Central Electricity Board, of contracts worth about £1 000 000 for the construction of the 132 kV transmission lines in that area. On the traction side there is considerable work in prospect for at least one of the big Indian railways, and even the marine side of the industry is beginning to experience its first bright period for several years. So far as the domestic and small apparatus market is concerned, everything points to a season of quite unwonted activity. Widespread reductions of charges for energy, extensive developments in the various forms of assisted wiring and in the provision of domestic electrical apparatus on the hire-purchase system, and cheaper lamps, coupled with the wider adoption by supply authorities of two-part tariffs, offer to prospective electricity consumers unprecedented facilities to employ the greatest and most ubiquitous of all public services with the least possible drain upon their financial resources. The trade is also fortunate in having permanently in existence a large number of the Electric Circles formed originally for the W.O.B. Campaign, which can be relied upon to exploit to the best possible advantage the various possibilities in the domestic field. Then, in addition, we have the Factory Lighting Campaign, which, as we have frequently pointed out, is directed to one of the most fruitful and yet compact fields that has yet been tackled in a wholesale manner by the entire industry. In recommending improved factory and shop lighting the electrical trader is not advocating something of which the advantages are problematical. On the contrary, he is merely selling materially increased production, a commodity which must be welcomed by all who are shown the way to secure it. Prospects generally are brighter than they have been for a long time, and we confidently anticipate a winter season of considerable activity.

## Suggestions Schemes.

The electrical industry provides several examples of far-sightedness and breadth of outlook in the relations between employers and employed. Nowhere is the mutual benefit of schemes devised in this spirit more noticeable than in the "suggestions schemes" which a number of the big electrical firms have in operation. An instance of the value of such arrangements was provided by Mr. Sam Mavor, who, at one of the British Association meetings, mentioned that at one big engineering works—presumably Mavor and Coulson's—suggestions came in at the rate of 2 500 a year, or five ideas a year per person employed. Of these suggestions no fewer than 42 per cent. were adopted, and it was notable that office boys—so generally regarded as being incapable of any work outside stamp licking, and devoid of any interests beyond the reading of detective stories and the cultivation of supremely long and oily hair—were, as a class, second from the top in point of idea productivity, and averaged 14 ideas a year. Knowing that a number of big firms, of which the Metropolitan-Vickers Electrical Co. and the Eastern Telegraph group of companies are but two chosen at random, are finding it well worth while to foster the production of ideas by all grades of their staffs, we would suggest that the plan is equally applicable to the smaller business. It helps to give the worker a real interest in his job, and in an industry where, in the lower grades at least, the work is largely of a routine nature, anything that lessens monotony is to be welcomed.

## The Next High Tension Conference.

Notices already sent in to the managers of the Fifth Biennial International High Tension Conference, to be held in Paris from June 6th to 16th next, show that the matter to be discussed will be of considerable interest. A number of International Advisory Committees were set up at the end of the 1927 session, and the chairmen of these committees are preparing reports as follows:—Prof. Maillouse, rational utilisation of fuels; H. Weiss, transformer oils; J. Grosselin, testing of insulating materials; J. C. Bellaar-Spruyt, report on international quality mains, and report on specification for supply and testing of h.t. cables; T. Norburg Schulz, international statistics; C. D. Busala, the improvement of cos $\phi$; A. Rousaldier, parallel operation of power stations; and U. del Buono, neutral earthing. Among the individual reports of interest will be found three papers on testing at very high voltages by engineers of the U.S.A.; one on "Two Million Volt Impulse Testing," by D. J. Miner and H. W. Tenney; another on "The Breakdown of Air Gaps," by J. Torok and Dr. J. Slepian; and the third on "Latest Research at the High Tension Laboratory of the Ohio Brass Co.," by A. O. Austin. K. Strömberg of Finland will deal with the use of wood for high



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tension lines. Reports bearing on the interconnected systems, a subject of importance at the present moment, will be furnished by F. RUTGEES (Switzerland), who will deal with induction regulators for cos $\phi$ for power station interconnection; P. RIEUNIER (France), with interconnection of different frequencies; P. TRAVERSE (France), investigation and statistics on surges; and A. SMOUROFF (Russia), operation of large interconnected power systems. The British contributions so far arranged for are a report on "The Influence of Atmospheric Conditions on the Performance of Insulators," by B. D. GOODLET and J. B. NUTFORD; "The Selective Protection of Transmission Lines," by REGINALD O. KAPP; while L. C. GRANT will present two reports, one on "The Interrupting Capacity of Oil Switches and a New Form of Quenched Arc Switch," and the other on "Lightning and Surge Propagation."

## British Liaison Committee.

AT the 1927 High Tension Conference 28 countries were represented, the membership being 544, comprising 246 manufacturers and line contractors; 234 distributors of energy, and 64 consulting and State engineers and professors. A committee, with Mr. W. B. WOODHOUSE as President, and Mr. P. F. ROWELL, of the Institution of Electrical Engineers, as hon. secretary, has been set up to assist those who are preparing reports, and to secure liaison with the secretariat in Paris. As international conferences go, that which took place in 1927 was particularly well organised, and similar methods are being adopted for the next meeting, the reports for which have to be in by January 1st if in one language only, or by February 15th if presented in both English and French. The headquarters of the conference are at 25, Boulevard Malesherbes, Paris; M. TRIBOT-LASPIEU (who understands English) is the general secretary. In order to assist those who are strangers to Paris and those who might find difficulty in getting rooms during the season, arrangements are made at headquarters for the reservation of accommodation in hotels at charges to suit all pockets. There is little doubt that the success of 1927 will be repeated, but it is to be hoped that Great Britain and the Dominions will be well represented, not merely in attendances, but in the number and nature of the subjects presented for discussion.

## A Canadian "Grid."

THE Saskatchewan Power Commission appointed by the Provincial Government has reported unequivocally in favour of Government ownership and operation of the production and distribution of electrical energy, and has recommended the immediate purchase of the plants at Regina, Moose Jaw and Saskatoon as the initial step in the development of a provincial scheme. The Commission proposes in the first instance that Regina and Moose Jaw be connected by a transmission line to form a southern system, while a northern system would be formed by connecting Saskatoon with Prince Albert and Battleford by the same means; ultimately the southern and northern systems would be interconnected. The Commission also suggests the formation of secondary lines at points remote from the main system based on such places as Estevan or Weyburn, Swift Current, Yorkton, Melfort, Unity and Kerrobert, and eventually linking these lines with the main system both north and south, thus bringing into being a unified system forming a network of transmission lines over the entire Province. The plan envisages a capital investment covering purchases and extensions of plants of $6 700 000, of which $5 500 000 would be needed at the outset and $1 200 000 in 1934 to meet a predicted consumption of 150 000 000 kWh in 1935. Immediate development of the large available water power on the Churchill River is not found to be necessary. The cost for generation by means of coal have been worked out by the Commission for the five years 1930-35, during which period the unit cost would be gradually reduced. On the predicted consumption, the cost of production per kWh in Regina would fall from 0·925 cents in 1930 to 0·8 675 in 1935; Moose Jaw, 1·26 to 1·0051; Saskatoon, 1·27 to 1·082. Prince Albert, 1·722 to 1·265; and North Battleford, 2·91 to 2·003. In the event of this scheme coming into being, it is understood that it will receive very considerable support from the agricultural districts, of which the area covered by the recommended scheme is largely composed.

## Theatre Heating Possibilities.

ACCORDING to a writer in the "Cinema" there appears to be a strong tendency on the part of licensing authorities throughout the country towards concerted action in the direction of standardising the minimum ventilation and heating requirements so far as theatres and cinemas are concerned. In the case of new buildings it has long been the practice to insist upon a very efficient ventilating and heating system, but a certain amount of latitude has hitherto been allowed to the older houses, where it was probable that the installation of costly plant would make undue calls on the finances of the proprietors. Apparently however, some proprietors took too great advantage of the concession, and the public outcry against "freezing theatres" during the cold snap last winter brought matters to a head, and has caused licensing authorities to pay special attention to the heating of the older theatres and cinemas. As it seems to be only a matter of time before some compulsory measures are taken, the present seems an opportune time to recommend modern electrical heating systems to supply the already existing widespread deficiencies.

## "Hush-a-bye"—New Style.

THE various recent exhibitions of inventions have clearly indicated that a vast amount of misplaced ingenuity is to be found in the ranks of the inventors. An amusing example of such ingenuity, which may or may not add to the peak load problems of supply undertakings, is furnished by a recent British patent of German origin which seems to demand an up-to-date electrical version of the old "hush-a-bye baby" nursery rhyme. In the words of the inventor, the device is intended for moving a perambulator to and fro, and comprises an electric motor adapted for connection to the lighting supply of a room, and operating by means of gears and a crank, a connecting rod of adjustable length which is removably secured to the handle of the perambulator. The motor may be secured by clamps to a table. In an alternative arrangement the motor is removably secured to the perambulator itself, the connecting rod being, for example, attached to one of the wheel spokes. Thus, it seems, we are in danger of adding yet another to the myriad uses of electricity, and adding point to the saying that the hand that rocks the cradle rules the world.

## A Lesson from Cuba.

FOLLOWING closely upon the complete breakdown of our own rubber restriction scheme, the news that Cuba is giving up sugar restriction will be welcomed by those who still believe in the wisdom of the freedom of trade. Producers of sugar, like rubber and other commodities with which our readers are more closely associated, have for the past few years been under the delusion that wealth and prosperity could come out of scarcity, and have adopted all the modern devices for limiting output and regulating markets. The result, so far as Cuba is concerned, corresponds exactly to our own experience in rubber; while the world's supply of sugar has shown a healthy increase, the Cuban share of it has gone down to an alarming extent. In a letter to President Machado, the Association of Producing Companies urges that the best interests of the sugar interests in Cuba require that the industry be freed of all restrictions and permitted to rehabilitate itself along economic lines. The same might also be said of other industries in other countries.

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# THE HIGH-SPEED CIRCUIT BREAKER.

## Armature Characteristics—Effect of Pressure Variation on the System—A Speed-Spring Fallacy—Advantage of the Impulse Coil Method of Tripping.

By W. H. THOMPSON, A.M.I.E.E.

(*Continued from page* 313.)

IN order to determine the mechanical characteristics of the armature, let it be assumed that $P$ is the pull required at the face of the magnet to keep the breaker closed against the pull-off force. Then, if $\tau$ equals the radius of gyration of the mass of the armature,

$$P \propto \frac{1}{\tau} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (7)$$

Now assume the width of the magnet face on the armature to be $W$, and the depth of the same face to be $D$, then, from the standard equation,

$$P = \frac{B^2 A}{8\pi},$$

it follows that, if $W$=width, and $D$=depth of armature, then,

$$P \propto WD \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (8)$$

Therefore,

$$\frac{1}{\tau} \propto WD \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (9)$$

The mass of the armature will vary directly as $W^2D$, if it is assumed that the thickness of the armature is the same as the width, $W$, which is an advisable condition.
Or, if $M$ equals the armature mass,

$$M \propto W^2 D \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (10)$$

Therefore, from (10), as $D \propto \frac{1}{W\tau}$, it follows that,

$$W^2 D \propto \frac{W}{\tau}.$$

Or

$$M \propto \frac{W}{\tau} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (11)$$

Let $I$ equal the moment of inertia of the armature about its centre of rotation; then, from fundamental principles,

$$I \propto M\tau^2 \propto \frac{W}{\tau} . \tau^2$$

And by substitution from above,

$$I \propto W\tau \quad . \quad . \quad . \quad . \quad . \quad . \quad (12)$$

### Varying Moment of Inertia.

From the above, then, it would appear that, for a given size of magnet, the moment of inertia of the armature will vary directly as the radius of gyration and width of the armature. The value that can be given to $\tau$ will depend so much upon the type of mechanism adopted, that it is only possible to generalise on this part of the subject.

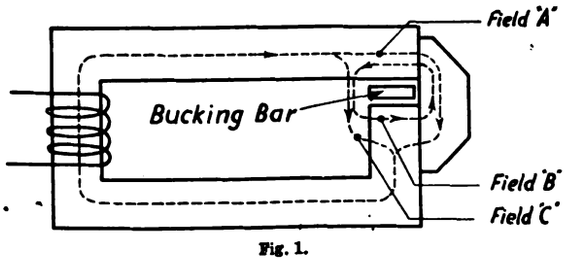


Fig. 1.

For all parts of the moving element other than the armature there is nothing to guide the designer, apart from the standard equation for inertia, $I = M\tau^2$, except that, in the effort to keep the value of $\tau^2$ as small as possible, great care must be taken to avoid so concentrating the parts about the centre of rotation, that there is a risk of flash-over during the pressure surge that follows the opening of the breaker on short-circuit.

(c) THE HOLD-ON FORCE.—The design of the hold-on magnet circuit presents no great difficulty. One point to be remembered is that as the coil for energising this circuit is to be for continuous rating, it should be designed for minimum watt loss.

In Fig. 1 there is given a diagram of such a magnet circuit, and from what has gone before, it is clear that, in order to trip a breaker that employs such a magnetic circuit, it is necessary, by some means, to remove the flux from the armature. In the diagram shown, the bucking bar method is indicated as the means employed; but, in any other case, the configuration of the magnetic fields will be something like that shown in the figure.

The field "$X$" will be that which exists under normal conditions, with the breaker closed. Field "$Y$" will be that created by current in the bucking bar, or similar contrivance;

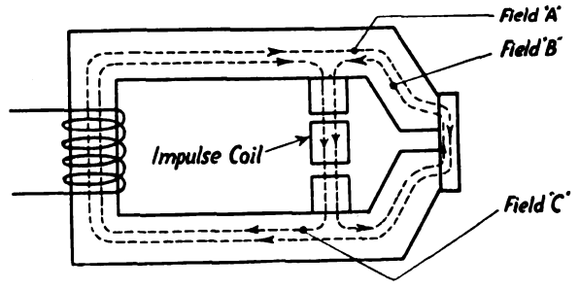


Fig. 2.

while field "$Z$" is really an alternative path of field "$X$" when field "$Y$" is active.

### Only Two Variables.

Now with $P$ fixed as the pull required at the magnet face, and, from the equation, $P = \frac{B^2 A}{8\pi}$, it is clear that the only two variables are "$A$" and "$B$," and from the conditions of the case, that "$A$" must be as small as possible on account of armature mass, "$B$" will need to be correspondingly large. This is all to the good, since the pull varies directly as the second power of "$B$."

The maximum practical value it is advisable to assign to "$B$," is of the order of 18 000 gausses, and, with this fixed, it is an easy matter to determine "$A$" for a given value of "$P$."

The value of "$B$" across the magnet face will be practically at saturation, but it is not necessary to maintain that density in the body of the armature, although, in the quest for lightness, there will be a strong tendency to do so. On reference back to equation (10), it will be seen that this has been assumed by making "$A$" represent both the width and the depth of the magnet face and armature body respectively. And, although this will provide a high reluctance path, the gain in the weight of the armature makes it worth while.

Another point that calls for magnetic saturation across the magnet face, is the effect of pressure variation on the system. It is obviously not desirable that a momentary drop of the system pressure will result in magnetic release; neither is it desirable that a rise of pressure on the system should render the breaker less sensitive. It, therefore, follows that the value of "$B$" must be so chosen that this variation of voltage will not appreciably alter the flux density across the magnet face. To sum up, then, the value of "$B$" should be one that is well above the "knee" of the magnetisation curve of the iron used in the magnet. This is the only way to provide constant hold-on force with variable voltage on the coils; except for the alternative of supplying these coils from a separate source of supply altogether—a not very usual arrangement.

When considering the main body of the magnet, there is not the necessity to maintain the same degree of saturation through this part as across the magnet face.

In Fig. 2 there is shown diagrammatically, the hold-on magnet circuit of the Metropolitan-Vickers high speed breaker. With this, the "impulse coil" method of tripping is adopted, and the disposition of the fields is somewhat as shewn. "$X$," again represents the field due to the magnet coils under normal conditions, with no current in the "impulse coil." Fields "$Y$" and "$Z$" are those due to the energising of the impulse coil.

This latter coil is arranged so that the field "$Y$" will be in opposition to the field "$X$," and field "$Z$" will be in the

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same direction with field "X." Here again, it is necessary that the flux density through that portion of the magnet common to fields "X" and "Z" should be at saturation, for by this means the strength of field "Z" is reduced to a minimum, with the consequent increase in the strength of field "Y." Or, the energy of the impulse coil circuit will be mainly distributed along the path of field "Y," as is the required condition.

It has been stated that in order to trip a breaker of this kind, it is necessary to remove the flux from the armature. This, however, does not apply universally, since there is a breaker on the market in which the tripping is effected by reversing the flux in the armature. Also, it is not impossible so to arrange the magnetic circuits that tripping can be effected without any change in the armature flux whatever.

(*d*) THE OPENING FORCE.—The opening, or pull-off force takes the form of either a magnet or springs. If it is magnetic, then it must be considered in conjunction with the hold-on magnet, as obviously they will be so closely allied that their joint consideration will be an essential. When, however, springs are used there are one or two special features to be observed.

## A Fallacy.

In the first place, it is a fallacy to believe that the highest speed is necessarily obtainable with the strongest springs. The problem is to obtain the required acceleration with the smallest force possible, which will mean the minimum of mechanical stress on the structure. The gain in pull due to a stronger spring may be more than counterbalanced from the point of view of speed, by the increased inertia due to the greater mass of the stronger mechanism parts.

There is, however, a more important point to be considered in the design of these springs: this is the time constant or natural frequency of the spring. When the spring is loaded, and then the load is suddenly removed, there is a definite time required for the spring to extend itself, and this time depends upon the natural frequency or time constant of the spring. In the majority of cases where springs are used, this time constant is of no importance, but in high speed breaker application, where time is the main object, it should be allowed for.

Consider a spring of weight $W$ to be compressed $x$ inches. The resultant force, which may be represented by $Kx$—where $K$ is a constant dependent upon the material of the spring—will produce an acceleration, $\frac{d^2x}{dt^2}$.

Now acceleration is proportional to the force which produces it, and a body of weight $W$, subject only to the force of gravity, will have an acceleration $g$, where $g$ is the gravitational constant. Therefore, there is the proportion

$$\frac{d^2x}{dt^2} : g :: Kx : W \quad . \quad . \quad . \quad . \quad . \quad (13)$$

Let

$$gK/W = P^2$$

Then,

$$\frac{d^2x}{dt^2} + P^2x = O. \quad . \quad . \quad . \quad . \quad . \quad (14)$$

It can be proved that a solution of the equation (14) is when

$$x = \propto \cos (Pt - \beta).$$

For,

$$\frac{d[\propto \cos (Pt-\beta)]}{dt} = -\propto \sin (Pt-\beta)\, P.$$

And,

$$\frac{d[-\propto \sin (Pt-\beta)\, P]}{dt} = -P^2 \propto \cos (Pt-\beta) = -P^2x.$$

The solution, $\propto \cos (Pt-\beta)$ is perfectly general; therefore, it applies when $t=o$; in which instance,

$$x = \propto \cos \beta, \text{ and } \frac{dx}{dt} = Px \sin \beta \quad . \quad . \quad (15)$$

These equations are of the form,

$$a = r \cos \theta, \text{ and } b = r \sin \theta. \quad [b = \frac{dx}{dt}, P]$$

And it can be proved that these forms only hold when the function is a simple harmonic function of period, $\frac{2\pi}{P}$.

Here, however, $\frac{gK}{W}$ has been represented by $P^2$.

Therefore, the natural frequency of the spring equals

$$\frac{1}{2\pi}\sqrt{\frac{gK}{W}} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (16)$$

where $K$ is the rate of the spring.

As an example case, consider a spring which is composed of 12 turns of steel wire 0·324 in. dia. wound on a mandrel of 1 in. dia. The area of the wire equals 0·082 sq. in. and the length (assume) 59 in. From this the volume will be 4·85 cu. in., and consequently the value of $W$ becomes 1·36. The rate of the spring is 580 lb. per in.

Hence,

$$f = \frac{1}{2\pi}\sqrt{\frac{580 \times g \times 12}{1{\cdot}36}} = \frac{1}{2\pi} \times 406.$$

$$= 65 \text{ cycles per second.}$$

From this it is easy to obtain the time of one oscillation, which is 0·0154 sec.

This time will be constant for a given spring, whatever the amplitude of oscillation may be. But, from the practical standpoint, the travel of the spring will be some portion of a quarter cycle. Now the time of a quarter cycle is 0·00384 sec., and, assuming an effective travel of 0·5625 in., the time of opening of the spring, *in situ*, will be $0{\cdot}5625 \times 0{\cdot}00384$; which equals 0·00216 sec. It is perfectly obvious that with this spring the breaker cannot commence to open in a time less than 0·00216 sec. Actually, the time will be greater, since there is the inertia of the moving mass to overcome, as well as the lag due to friction.

(*e*) THE TRIPPING AGENT.—Most of the tripping agents employed can be put under one or the other of the two types, bucking bar and impulse coil. There are, of course, other methods of tripping, and there will, no doubt, be still other methods yet; but as it is not possible to treat them here, it will be sufficient to treat the two above-named in order to indicate the general problems that beset the tripping agent.

Of the bucking bar there is little to be said; as, with the hold-on flux known, it is an easy matter to calculate what portion of the main current is to be shunted through the bucking bar in order to give the correct counter flux that will trip the breaker when required.

The problem of the impulse coil is somewhat more involved. On reversion to Fig. 2, it will be seen that, provided the current "I" in the impulse coil is in the right direction, the tripping of the breaker will be effected by the field "A" being neutralised through the armature by the action of the field "Y."

## A Salient Difference.

This impulse coil is connected in parallel with a "reactor coil," which latter is in series with the main circuit. The voltage induced in the reactor coil by any sudden variation of current will then be impressed across the impulse coil. A salient difference between the action of the bucking bar and the impulse coil tripping is that the former opens the breaker as a result of the main current reaching a predetermined value; whereas the latter depends solely on the rate of change of the current. The impulse coil method of tripping has, therefore, the big advantage that it reduces to a minimum the time interval that has been denoted by the "alpha" period. This will be better understood when it is remembered that, whatever may be the nature or extent of the short circuit, the maximum rate of change of the current will be at the very beginning of the "fault epoch," and decrease as the fault current increases.

It therefore follows that while the bucking bar must wait until the current has reached the tripping value, the impulse coil receives its maximum energy practically instantaneously with the birth of the short-circuit current. It is from this feature it derives its name.

(*To be continued*).

## BOOKS RECEIVED.

"Electrical Sub-stations." By H. Brazil. (London: Edward Arnold and Co.). Pp. vii+215. 12s. 6d. net.

"Collected Papers on Wave Mechanics." By Dr. E. Schrödinger. (London: Blackie and Son.) Pp. xiii+146. 25s. net.

The Student's Physics, Vol. VI, "Modern Physics." By H. A. Wilson. (London: Blackie and Son.) Pp. xiv+381. 30s. net.

"Journal of the Institution of Electrical Engineers." Vol. 66, No. 381. September. (London: E. and F. N. Spon.) 10s. 6d. net.

"Selected Papers on Wave Mechanics." By Louis de Broglie and Léon Brillouin. (London: Blackie and Son.) Pp. 151. 15s. net.

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# A TWO-PART TARIFF BASED ON WATER HEATING.

## Assigning the Annual Charge as Cost of an Unmetered Supply for Water Heating—Some Advantages of the System.

By B. V. CLARK, B.Sc., M.Inst, C.E., M.I.E. (Aust.), A.M.I.E.E.

IT is generally agreed that the most appropriate tariff for domestic electricity supply is a two-part one. The chief difficulty in designing such a tariff is to arrive at a suitable and equitable basis for determining the annual charge.

A variety of optional two-part tariff that appears to have many advantages is one in which the annual charge is definitely assigned as the cost of an unmetered supply of electricity for water heating, all units used for other purposes being charged for at a low flat rate. Thus the quarterly account under such a tariff is rendered as :—

| | £ | s. | d. |
|---|---|---|---|
| Hot water supply, 1 000 W at £12 per annum per kW .. .. .. .. .. | 3 | 0 | 0 |
| Units as per meter, 186 units at 1d. .. .. | | 15 | 6 |
| Meter rent .. .. .. .. .. .. | | 1 | 6 |
| | £3 | 17 | 0 |

Such a tariff may be made satisfactory to the supply authority by the inclusion of the proviso that it is only available to those who instal water heaters of approved pattern and of minimum wattage capacity, determined upon a specified basis, which may be in accordance with rateable value, floor space, number of rooms, number of lights, or any other basis deemed more appropriate.

### Off-Peak Water Heating.

If such a tariff were adopted with provision for the water heater to be in circuit continuously, except when cut out by a thermostat, the nominal charge for the hot water supply would be excessive, since it would have to carry, not only its own capital and running charges, but also the capital charges incurred by the other load as well. It appears essential, for such a tariff to be reasonably attractive, that the water heating be so arranged as to be an off-peak load, as by a time switch.

Upon such a system, the time switch would cut the heater in at, say, 10 p.m., and out at 8 a.m., the precise hours depending on the station load curve. The capacity of the heater should be such as to provide a liberal supply of hot water; and a suitable size appears to be about twice the estimated peak lighting load of the installation. As domestic lighting does not constitute the whole of the evening load, and has a diversity factor *inter se* of 1·5 to 2, it follows that on this basis the all night peak would remain less than the evening peak unless some 30 to 40 per cent. of the domestic consumers came over to the new tariff.

Flat rate tariffs of about 5d. per kWh for lighting and 1d. per kWh for heating are not unusual in Great Britain, and may be used as a guide to arriving at a suitable tariff. These rates correspond to an annual charge appropriate to the small domestic consumer of £15 per kW per annum of station peak due to lighting, plus running costs of ½d. per kWh on an assumed load factor due to lighting of about 9 per cent. The power rate of course allows some margin to cover capital charges caused by the superposition of its peak on that of the station.

A typical house, having a peak lighting load of 500 W and an annual consumption of 240 kWh, with an individual load factor of 5·5 per cent. would pay for current, at the flat rate of 5d., £5 per annum. With a heating element of 1 000W, in use for ten hours per day, an additional 3 600 kWh would be used, which, at ½d. per kWh, cost £7 10s. The appropriate two-part tariff for this consumer without water heating is £4, plus 1d. per kWh, or with water heating, £12 per annum, plus 1d. per kWh, the annual charge including 10s. as rental for time switch.

The B.Th.U. generated by 1 kW in 10 hours are 34 000, which would raise 34 gall. of water 100 deg. F., ignoring radiation losses. Hence 35 to 40 gall. would be an appropriate size for the tank. Water at 140 to 160 deg. F. would be available in the morning, the temperature falling somewhat as the day progressed.*

* Dr. S. Parker Smith's paper, "An All-Electric House," where for a house appreciably larger than the one under consideration, the annual lighting units being 568, the hot water tank was 87 gall., and a 2 kW heater, in use all night, was ordinarily found to be satisfactory.

The tariff, £12 per annum per kW of water heater element, plus 1d. per kWh for other purposes, suggested as suitable for a typical British undertaking, and requiring a heater of 1 kW capacity in a house of rateable value of about £30, is perhaps not particularly attractive to the average consumer; but that is unimportant. The essence of an optional tariff is that it shall be attractive to some present or prospective consumers, and encourage new uses of electricity profitable to the undertaking.

The proposed tariff complies with these requirements, offering a good talking point to the salesman of water heaters. A charge of £12 for 3 600 kWh is only 0·8d. per kWh, and prices of this order are quite common for continuous heaters. The rate is therefore by no means exorbitant; and though somewhat on the high side regarded as a charge for hot water alone, is distinctly appealing to those now on a flat rate, owing to the marked reduction in charge for lighting that it brings about.

Figures given by Major Carter in the discussion on Dr. Parker Smith's paper show that a charge of £9 per annum for 2 600 kWh, used in a continuous heater supplemented by an additional heater for occasional use, is not out of the way, though in that case it carried with it no rebate in the lighting tariff. And where a normal two-part tariff is in use, the talking points are again manifest, since the extra charge for the hot water supply is seen in its full merit; and the inherent objection we all have to paying "something for nothing" will give a strong urge to the alternative tariff.

The details of the system—specified rating of water heater, hours in circuit, annual charge, and running charge—must, of course, be determined for any particular undertaking in accordance with its costs and load curve, and also after due consideration of the position of the most likely adopters of the new tariff. The smaller the specified heating element, the less is the annual charge, but the greater is the apparent cost of current for water heating. This point should be determined only after regard has been paid to the capacity of water heater already in use that appears to give satisfaction.

Wherever night heating is relied on, ample lagging of the tank is a *sine qua non*, and dissatisfaction would certainly arise if shoddy apparatus were installed. The tariff should therefore be restricted to those using an approved type of tank. It would probably add markedly to the convenience of the installation if the plan described by Dr. Parker Smith were adopted of having near the top of the tank an additional heating element, connected by switch to the metered service, so that on occasions more or hotter water could be obtained.

There appears to be a strong prejudice among supply engineers against time switches; and possibly their use may be regarded as the most serious defect of the proposed tariff. However, there are other ways of adopting a two-part water heating tariff than by the use of a time switch. For example, an undertaking adopting the Wilkinson "change circuit" system of water heating would probably find such a tariff appropriate. The size of the heater element would be smaller, as it would be in circuit at almost full rate for some nine hours per night, and at a reduced rate for a further ten or twelve hours; but this only means a suitable rating and annual charge.

One objection, of course, is that on the "change circuit" system the units consumed by a heater of given rating vary from day to day and from season to season with the varying load curve; but this certainly suggests that the consumer would be more attracted if he knew in advance what it would cost him, than if he found this out when the bill came in.

### An Inherent Drawback.

An inherent drawback of any two-part tariff, as already pointed out, is that the fixed charge must be arrived at in some arbitrary fashion; and this drawback is not eliminated in the tariff proposed. But, whereas in other such tariffs any elasticity in the method of arriving at the annual charge is apt to provoke complaints of preferential treatment, this particular trouble is not likely to arise where the charge is definitely assigned to the hot water supply. Once the minimum permissible size of heating element is fixed, the annual charge follows as a matter of course.

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# THE AUTUMN WINDOW DISPLAY.

## Seasonable Display Features—Topical References in the Window—Some Representative Examples—The Selling Value of Movement.

By A. EDWARD HAMMOND (Author of "Shopfittings and Display")

IT is surprising how few electrical contractors take advantage of the seasonable nature of the autumn appeal by making special window displays of domestic electrical goods suitable for winter use. With the holiday season over and the winter approaching, there should surely be every incentive to attract the interest of the public. Truly the autumn months are one of the busiest times of the year for many contractors, but not all of them are so fortunately placed that they are in a position

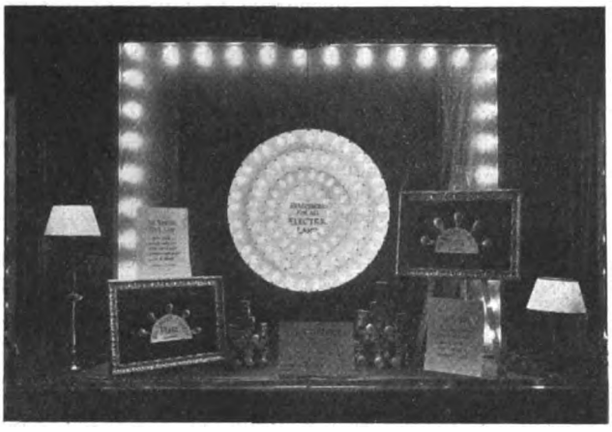

Fig. 1.—A Selfridge window, illustrating the use of light to sell lamps.

to turn down orders. In any case, an addition to the staff will relieve the pressure, so the excuse of being too full up with orders is hardly valid as a reason for neglecting the dressing of the window.

In preparing his window display plans for a particular period, the first matters for an electrical contractor to consider are, of course, seasonable goods; but he will find that he is considerably helped in working out ideas for interesting and attractive displays if he studies the calendar to see what anniversaries are commemorated, or festivals and holidays celebrated, during that particular month. October is not rich in either. September 29th is Michaelmas Day, and, for the week prior to this, a seasonable element could have been added to the display by the introduction of one or two sprays of real or artificial Michaelmas daisies, with a colour scheme in the window to correspond.

On October 1st pheasant shooting commences; on this date, and for a few days after it, therefore, the contractor in a country town could very suitably make a special appeal to sportsmen, and for this purpose a seasonable and topical setting could be arranged by the use of artificial moss, grass

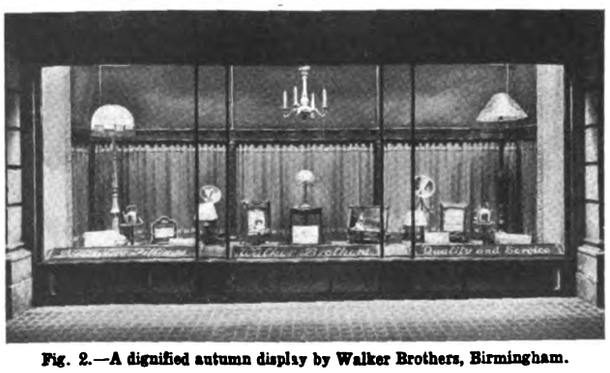

Fig. 2.—A dignified autumn display by Walker Brothers, Birmingham.

and heather, and prominence given to electrical devices which provide comfort for the sportsman on his return from the moors. Suitable printed appeals in support of such goods might also be used, such as: "After a hard day on the moors—the warmth and cheery comfort of an electric fire will counteract the effect of dampness and fatigue."

October 21st is Trafalgar Day. This date is still of sufficiently historical interest to justify some reference in the window to Nelson or Trafalgar. It could be used with advantage in association with a special window display of electrical accessories all entirely of British manufacture.

Specially suitable window displays for the autumn are those in which falling leaves are depicted. One way of doing this is to obtain a supply of artificial leaves, and to thread them on to brown thread or cotton at irregular distances of from 2 to 6 in. apart. The thread should be attached to the ceiling and base of the window by means of drawing pins or tacks, and arranged at intervals of about 1 ft. across the window. To add a further touch of realism, a few brown leaves should be sprinkled here and there on the base of the window.

The seasonable colours are light brown, russet, bronze, copper and similar autumn tints, and crepe paper of these hues makes an excellent covering for the window base and enclosure throughout October. Another method of introducing an autumnal setting into the window is to use showcards and price tickets of autumn colours cut in the shape of leaves. Paper pelmets of copper or brown colouring used in the top of the window also help to add to the seasonable effect.

Towards the end of the month, printed appeals containing warnings against approaching winter, and the need for preparing to fight influenza and other early winter maladies by ensuring an adequate supply of warmth throughout the household should be arranged in a prominent position in the window in conjunction with suitable electrical devices. Window dressing paper printed to represent heather and gorse and other natural autumn settings is an excellent covering for the

Fig. 3.—An example of display possibilities of crepe paper.

window base during the autumn months. It is obtainable in rolls 12 yd. long by 22 in. wide.

Towards the end of November it is not too soon to introduce a little Christmas atmosphere into the window, and to commence showing electrical goods suitable for Christmas presents, at the same time introducing showcards which emphasise the importance of not leaving Christmas purchases until the last minute.

### Attention to Window Lighting.

It should not be necessary to tell the electrical contractor that at this time of the year special attention must be given to the window lighting, for bright, well-lighted windows have an added attraction on dark evenings. Unfortunately, however, all contractors do not appear to appreciate the wisdom of practising what they preach.

It would be difficult to find a better example of the value of light for publicity purposes than the Stephenson shop front shown in Fig. 4. Here it will be noticed that in addition to a well-lighted window the contractor has employed an illuminated fascia. Only one small point prevents this shop front from being a complete success from the illuminating point of view, and that is that pelmets were not used to screen the lighting equipment in the top of the window.

The accompanying illustrations have been chosen because they demonstrate features which should be emphasised for autumn display. The point about the small window shown in Fig. 5 (reproduced by courtesy of Messrs. Watson, Marsh and Co. (Brondesbury), Ltd.), is that it is fully representative without being overcrowded. An excellent method of avoiding the bare effect normally noticeable in the upper section of a window without an enclosure has been introduced in the form of a hanging display of shades which can be inspected inside as well as from the footway outside. The tier arrangement of

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the shades is also an improvement on usual methods, where one row so often screens the other from view.

It will be noticed that two loud speakers are shown in this window. The electrical contractor who handles wireless accessories should remember that the autumn is a suitable period to commence an acceleration of wireless sales.

Fig. 3 shows the windows of the Manchester branch of Siemens Electric Lamps and Supplies, Ltd. These windows are excellent examples of what can be done with crepe paper. This material, incidentally, can be obtained in all the autumnal tints. It is a little unfortunate that the finished effect of these two windows is somewhat marred by an over use of showcards, which have a more conspicuous place in the window than the electrical goods themselves. A moderate use of this printed matter further back in the window would have been preferable.

Fig. 2 is an excellent example of a really high-class electrical display, and shows one of the windows of Messrs. Walker Bros., of Birmingham. A display of this description is eminently suitable for the autumn window in a good-class shopping centre, for it shows a well assorted collection of electrical goods for winter use.

## Selling Power of Light.

In Fig. 1 is shown an unusually attractive display of pearl lamps, in one of the windows of Messrs. Selfridge and Co., Ltd. Here the selling power of the window is enormously increased by the fact that the lamps are actually lighted, and the pleasing effect of the light in question thus forcefully demonstrated.

The electrical contractor is more favourably situated in one respect than the ordinary retailer, in that his own expert knowledge of electricity enables him to introduce moving devices into his window without the necessity for calling in outside advice. And, for this reason, he is very favourably situated for using fountains in his window—display devices which have come to the front very much during the past twelve months—and which are by no means limited to the summer window display.

Movement of any sort is valuable as a means of attracting attention; but it must be favourable attention which will cause people to look at the goods displayed. The trouble with the funny little automatic figures, frequently seen in shop windows, is that they seldom do more than cause the passer-by to smile; in any case, their novelty soon wears off.

On the other hand, moving water always has a pleasing effect as an aid to interior or to window displays, and, for this reason, fountains are valuable in conjunction with the special exhibition of electrical goods in the contractor's window.

The electrical contractor who wishes to make use of a fountain for window display purposes will find it a comparatively simple procedure, for it can be done by means of an electric motor and pump, while an alternative method is to have a small hose pipe connected up with the water tap. When the water is turned on, the force of the pressure through a small rose or spraying device would give the desired effect. This, however, must be done carefully; the pipe and other accessories should be so placed that no water drips where it is likely to do damage, and it is advisable to make fairly frequent inspection for possible leakages. Certain devices are

**Fig. 4. An illuminated fascia adds to the attractiveness of this window.**

available which permit the same water to be used over and over again.

With one type of fountain constructed for this purpose the plinth, bowl and dome are of coloured and decorated glass. The fountain comprises a centre sprayer and six arm sprayers, each having four tiny jets which are embodied in miniature lilies or roses made of glass. The flow of water is started and stopped by an ordinary electric light switch.

One difficulty about fountains in the window is that they may cause a certain amount of moisture from the spray to accumulate on the plate glass in front, and thus nullify the effect for which they are employed, but this can generally be counteracted by the use of a window or skirting heater.

**Fig. 5. A window which is representative without being overcrowded.**

These heaters are of the low temperature class, and have a low current consumption. They are standardised in three lengths of 2, 3 and 5 ft., and each heater is provided with suitable brackets for mounting. Two can be connected up to one plug point to form a heater of 4, 6 or 10 ft. lengths.

## INSTITUTE OF FUEL.

### Programme for Winter Session.

THE winter session of the Institute of Fuel will open with a meeting on October 10th, at 6 p.m., at the Chemical Society's Rooms, Burlington House, London, when Mr. T. A. Peebles, vice-president of the Hagen Corporation, Pittsburgh, will read a paper on "Automatic Combustion Control of Liquid, Solid and Gaseous Fuels." The annual two days' conference of the Institute will be held at the Institution of Electrical Engineers, November 21st and 22nd, commencing each day at 10 a.m. On November 21st, the morning will be devoted to Lord Melchett's presidential address, followed by a paper on "Fuel Conservation in Locomotive Practice," by Sir Henry Fowler, of the L.M.S. Railway, while in the afternoon there will be papers on "The Economics of Coal Production and Distribution." The annual dinner will be held in the evening. On November 22nd, there will be a whole-day symposium on "Fuel Control in Industry."

Evening meetings will be held in London in the New Year on January 9th; February 13th; March 13th; and April 10th. There will also be a provincial meeting early in 1929. The annual dinner will be held on November 21st, 1928.

The Council have taken more commodious premises on the second floor of 53, Victoria Street, London, S.W., including, in addition to a general office and library, a reception and reading room available for the use of members during office hours.

Mr. G. F. Francis, of the British Electrical Development Association, addressing Rotarians at Exeter last week, said there was nothing in the latest Electricity Supply Act which gave promise of immediate reductions in the price of current, but in course of time more general distribution would encourage greater consumption and lower cost. If electricity were used as effectively as steam the foundations could be laid of a new civilisation—one that would be clean where the other was dirty, spacious where the other was congested and healthy where the other was unhealthy.

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# THE NATIONAL RADIO EXHIBITION.

## A Brief Review of the Olympia Show—Complete Sets Becoming More Popular—Receiver-Gramophone Equipments Find Favour—Some of the New Apparatus Described.

THE National Radio Exhibition, held in the New Hall at the Olympia, London, concludes to-morrow, Saturday, after a very successful week. The occasion marked the showing for the first time of many new receivers and components, the outstanding features of which were quality in manufacture and performance. The latest developments in short wave receivers were particularly noteworthy, and many sets incorporated a high frequency stage, a feat which was last year considered by many to be a mere waste of a valve, in that to amplify at such high frequencies was not a practical proposition. The introduction of the screen grid valve, however, has changed these views, for practically all the multi-valve short-wave receivers amplify at radio frequencies in addition to the audible range.

### Selectivity Problems.

As some 180 firms were exhibiting at the exhibition it is obviously impossible to deal comprehensively with more than the most striking novelty of each manufacturer in the space available, and a personal selection of the special features has had to be made. This choice has been made rather from the standpoint of the general listener than from that of the home constructor. Manufacturers have not been slow to realise that the new regional scheme, projected by the B.B.C., by means of which two or more stations will use the same wavelength may cause some difficulty at first for crystal users, who, because of the low selectivity of their sets, may not be able to "separate" the programmes. There is little doubt that such crystal users, if they do not make use of a wave trap, such as is exhibited by the London Electric Wire and Smiths, Ltd., will turn to the lower-priced valve sets with which selectivity is assured. Among such valve sets ne notices the Gecophone Victor 3.

Another set of interest was the Empire Screened our receiver, made by Burndepts Wireless, Ltd., which has been specially developed for the colonial listener. This receiver covers the wave-bands of 20-48 and 220-560 metres and thus is suitable for receiving short-wave telephony from 5SW, or from the American or Australian stations. At the same time, the medium wavelength range will be of use for any local transmissions that are available. For listeners in England this set might also be considered, but it should be noted that it will not receive the long wavelength stations such as Daventry 5XX. As, however, broadcasting outside Europe is carried out almost exclusively on the 250-500 metre band it will be seen that the omission of the long wavelength range will not affect colonial or foreign reception. Another set designed specially for foreign or colonial listening is the Cosmos short-wave set made by Metro-Vick Supplies, Ltd., which is of robust make and capable of withstanding tropical conditions.

Perhaps the most prominent feature at the Show was almost universal application of mains as a means for supplying current to complete receivers. In this respect may be mentioned the exhibits of Metro-Vick Supplies, Ltd., who in addition to their 5-valve equipment also showed 3- and 4-valve receivers of the same type. Mains-operated sets were also prominent among the varied exhibits of the General Electric Co., Ltd., including a special All-Electric Three which operates directly from a mains transformer so far as filament current is concerned, the new "P point" series of valves being used. The G.E.C. also showed a new 6-valve stabilised receiver for use on all wavelengths covered by both short and long wave broadcasting. In all, the G.E.C. has introduced no less than six new receivers, in addition to a new a.c. type h.t. rectifier giving an output of 50 mA at 180 V. Multi-valve non-battery equipments were also exhibited by Gambrell Bros., Ltd.

The Igranic Electric Co., Ltd. was responsible for a very wide range of new components, as were also R. I. and Varley, Ltd. Neutro-regenerative short-wave sets and universal 5-valve portable sets by the Igranic Electric Co. attracted a good deal of attention, as did also the new "aperiodic" tuner and totally enclosed 4-valve set by R. I. and Varley, Ltd.

Another type of apparatus which was conspicuous was the portable receiver, either as a receiver by itself or as a gramophone-receiver combination instrument. Of the latter type of equipment may be mentioned the product of J. L. Gottlieb and Co., Ltd., which, besides being a portable 4-valve set complete with loud speaker, also contained a good gramophone mechanism. Other types of the same combination instrument were shown by the Electramonic Co., Ltd., the Radio-Arc Electrical Co. (1927), Ltd, M.P.A. Wireless, Ltd., and others, indicating that this combined outfit would appear to be a more or less standard practice where portable sets are concerned.

One of the most interesting exhibits was, of course, the stand of the Baird Television Development Co., Ltd., where were shown a big combination outfit comprising a dual receiver-televisor, with M-L converter for h.t. supply, moving coil loud-speaker, batteries, etc.

From a close examination of the various sets which were exhibited, the impression gained was that completely screened stages of amplification seemed to be gaining on the screened coil, the constant anode-feed system having done much to eliminate the back couplings experienced some short while ago. Output filter circuits for the loud speaker, eliminating to a considerable extent possible damage to the windings, are also gaining in popularity, no doubt as a result of the growing tendency towards battery eliminators. The component which perhaps governs the quality of reproduction to the greatest extent is the loud speaker, and one of the many interesting facts revealed by the exhibition is the advance made by the coil-driven type. In this connection it is interesting to note that the British Thomson-Houston Co., Ltd., showed two junior models of the well-known R.K. instrument. These, like the larger type, possess their own audio frequency amplifiers and eliminator, and components for their construction, where preferred, are available to the public. A new cone loud speaker with cobalt steel magnets is another new B.T.-H. line. Two other new lines of unusual interest were seen at the Show, the first being, we believe, a complete innovation. The exhibit was one by Ferranti, Ltd., and showed a trickle charger specially designed for h.t. batteries. The second, also by Ferranti, Ltd., was what was claimed to be a super h.t. eliminator for a.c. mains. It employs a permanent dry metal rectifier and is capable of a smoothed d.c. output of 100 mA at 200 V. Mains hum and commutator ripple are said to have been overcome in this new design. All the past year's lines were also shown, including the anode-feed resistances introduced at the British Industries Fair last February.

### The Amateur Position.

Following on the success attained by the "R.C. Threesome" receiver, the Edison Swan Electric Co., Ltd., showed special 1929 models of the same characteristic design. Four- and five-valve screen grid sets for home assembly, together with a home-constructor portable, were also lines which attracted a good deal of public attention. The amount of interest shown by visitors to complete receivers and components for assembly was about equally divided, indicating that the future tendency will in all probability be towards the complete receiver. Radio manufacturers, it would seem, are preparing for this condition, for it was noticed that practically all the exhibitors, including those who hitherto have not touched receivers, were this year showing at least one. In a series of interviews with our representative, it was explained that a certain class amateur who in the past had always built his equipment was gradually being converted into buying his apparatus complete, and in this connection a number of "try-outs" in the way of sets were being made before deciding upon the best design for mass production. The real amateur will be always with us, but the amateur whose knowledge of radio extends only to wiring a set from a published blue-print is fast fading from the serious consideration of the trade in favour of that type of amateur who, though not desiring to buy a ready-made set, still does not wish to follow the technical drawings of a published design. For such amateurs the "Igranikit," described in our columns last week, is proving popular, the latest addition to this design being a two-valve mains model which on demonstration gave excellent results on London and Daventry during the exhibition.

On the whole, this year's show may be regarded as a distinct advance on that of last year. The lighting scheme has improved and many of the exhibitors have taken full advantage of the facilities extended to them for special lighting effects on the stands, many striking displays being shown as a result.

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# THE BERLIN WIRELESS EXHIBITION.

## A General Survey of the Exhibits—Rapid Development of the Industry—Cabinet Loud Speakers for Eight Shillings—Popularity of Mains Receivers—The Self-Selecting Set—Picture Transmission Apparatus.

By A TRADE CORRESPONDENT.

THERE is a general disposition on the part of electrical and wireless traders in England to complain that the date of the R.M.A. Exhibition at Olympia (which for several years runs into or up to October) is rather too late. The Berlin Exhibition, which is its great rival on the Continent, usually antedates the Olympia show by two or three weeks, and this year was opened on August 31st, closing on September 9th.

Fig. 1.—A front view of the Hans Vogt mains operated set, and loud speaker showing the controls.

As a consequence of its earlier date, it is considered in some quarters that the earlier show is responsible for attracting many Continental wholesalers, who may be tempted to place their orders for the season without waiting to see the later London exhibition.

Regarded from another point of view, however, the later date is not altogether a disadvantage. The toroid coils which made their appearance at Olympia last year were not to be seen at the earlier German show; but, to indicate the rapidity with which any new development is taken up in the wireless trade, this type of coil was being advertised and sold in Germany within four weeks from its first appearance.

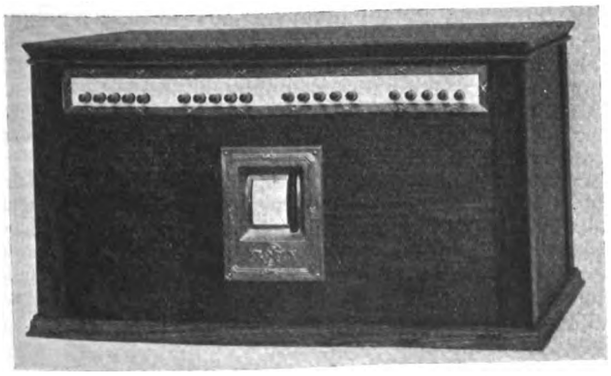

Fig. 2.—The Kramolin self-selecting instrument.

The wireless trade in Germany is developing tremendously, and this year three exhibition halls were required to house the exhibits. All these were situated on the exhibition grounds at Witzleben, and could be visited without having to leave the grounds, the latter being laid out in a very attractive manner with the object of making the place a regular resort for Berliners. It is probable that the attractions of the well-ordered gardens and the miniature Eiffel tower helped to account for some of the extremely large attendances—frequently in the neighbourhood of 200 000—which have been a feature of the wireless exhibitions held there.

The exhibition was strictly confined to the display of wireless goods manufactured in Germany, no foreign-made articles being admitted. This precaution was not altogether unnecessary, as the German market is not, as is often supposed, the exclusive preserve of home manufacturers. In spite of tariffs and the strength of local competition, there is an influx of certain imported wireless material, more especially valves from Holland and Austria. In a rather unexpected direction, there is also some competition from Sweden, and the Baltic Company have now established a subsidiary company in Berlin. British trade with Germany is, unfortunately, practically negligible.

Amongst the exhibits this year, loud speakers were most conspicuous by their number and variety, and it is fairly evident that German competition in this line will be as severe as it used to be in telephones in the earlier days of broadcasting. As some indication of the pitch which competition has attained in Germany in both these accessories, the following is an extract from a German radio periodical, the writer had before him at the time of writing:—

| | | |
|---|---|---|
| "Double head telephones, 4 000 O, weight 6 oz., black finish | .. .. | 3s. 5d. per pair. |
| Ditto. red finish, de luxe | .. | 3s. 9d. ,, |
| Loud speakers in wood cabinets | .. | 8s. each. |

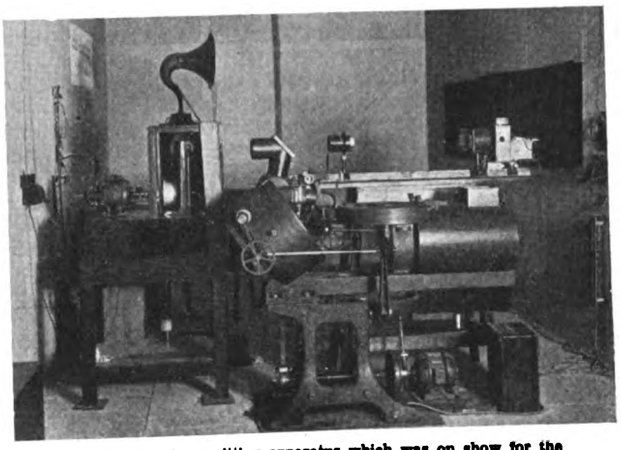

Fig. 3.—The transmitting apparatus which was on show for the transmission of wireless pictures.

The price is, in most cases, an index to the quality of reproduction obtainable, but on the other hand it must not be overlooked that the buyer who is prepared to pay the price can now find some loud speakers of very good quality. Moving coil loud speaker units are available this year for the first time, and are obtainable at retail prices in the neighbourhood of £3 8s. upwards.

A rather interesting loud speaker being shown for the first time this year was one of the electrostatic principle, manufactured by the firm of Hans Vogt. Fig. 1 shows the speaker, incorporated in a mains operated set, the press switches at the foot being for tuning, current control, and reaction.

In receiver design, the trend which was noticeable a year ago in the direction of mains operation has become very accentuated, and a casual survey of the number of mains-operated sets and battery eliminators would lead a visitor to think that no receivers are installed nowadays in Germany except in houses which are wired for electricity supply. Incidentally the battery makers, particularly those manufacturing the h.t. type which is an important industry, have for the past twelve or fifteen months, been extremely busy explaining the cost and the drawbacks of mains operation with a view to combating this development.

The old type of "local station receiver" continues to be shown practically unchanged, and at the same astonishingly low prices which have always been a feature of this class of

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business in Germany, such as 39s. 6d. for a three-valve instrument with valves, but without coils.

In the more expensive models, simplification of controls is becoming more and more marked, and the medium-priced German receivers are now very similar in general appearance to English models. Amongst the simplified control sets, the

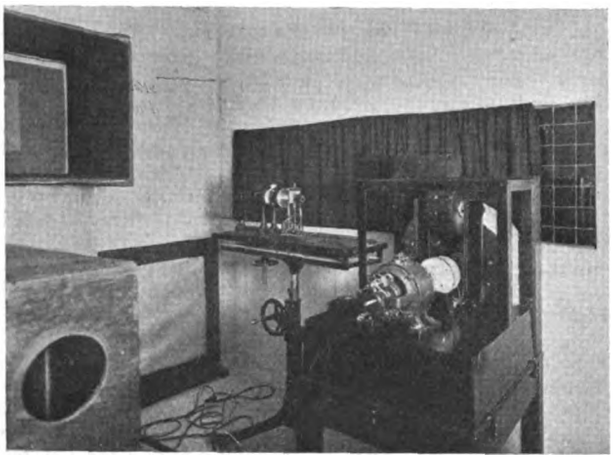

**Fig. 4.—The apparatus exhibited and used for the reception of wireless pictures.**

latest and most interesting model is probably the Kramolin self-selecting instrument No. 51, which is illustrated by Fig. 2. It will be noticed that at the top of the panel there are twenty push switches, and the mere pressure of any one of these will bring in a different station. It is a five-valve instrument giving the results of six valves owing to the reflex stage employed, and the superheterodyne principle incorporated. It is priced at £24 without valves, which figure puts it amongst what is considered to be the " expensive " class of German receivers.

In valves, the multiplication of types and makes has been causing traders as much inconvenience as it has in this country, and it is interesting to note that this season the firm of Dr. O. G. Spanner has attempted to bring down the number of valves manufactured to three. These three classes of the Delta valves are further sub-divided into two V and four V types, and with these the firm claims it will be possible for the trader to replace the 20 odd types made by such firms as Telefunken, Valvo, etc.

The greatest valve novelty of the year, as far as Germany is concerned, is the screen grid type, which, though it has only just been produced in Germany, is being boomed extensively there.

Another class of valve which possesses a peculiar interest for the English visitor is the " multiple valve " which has received so much publicity in connection with the Loewe application heard before the British Patent Office Tribunal a few weeks ago. Although they will be an innovation when manufactured in England in the near future, they have, of course, been highly popular on the German market for the last two years, having been brought out as the " clou " of the 1926 exhibition. The popularity that the class of valves has enjoyed over there for the past two years is sufficient to assure users in this country that the system is a thoroughly well-tried one.

### Wireless Pictures.

Amongst the more elaborate apparatus exhibited this year should be mentioned the Lorenz-Korn picture transmitting apparatus as used by the police authorities. Dr. Korn is one of the original investigators in the field of wireless picture transmission, although now not so much heard of as some of the later inventors. Telefunken apparatus for speaking films was also demonstrated, as well as the other interesting Telefunken development for the wireless transmission of film pictures. Fig. 3 illustrates the transmitting apparatus used, and Fig. 4 the receiver. With the Karolus system, the film runs continuously through the transmitter at a speed of 10 pictures per second, and each picture is divided into 10 000 elements, though it is stated that it is quite possible for this speed to be increased. From a technical point of view this exhibit is one of the most interesting at the exhibition, and at a later date it is hoped to describe this development in detail.

# MERCHANDISE MARKS.

## Compulsory Marking of Imported Copper Goods Recommended.

THE Standing Committee under the Merchandise Marks Act, 1926, in a report issued last week (Cmd. 3 199, H.M. Stationery Office, 2d.), states that a case has been made out for an Order-in-Council requiring that copper plates, sheets, strips, rods, wire and tubes should bear an indication of origin at the time of sale or exposure for sale, and recommends that the Order-in-Council should come into force three months after the date on which it is made. The applicants were the Manufactured Copper Association, the High Conductivity Wire, Bars and Strip Association, and the Brass and Copper Tube Association. It was stated on behalf of the applicants that it was almost impossible to distingiush between British-made and imported goods of these descriptions, and that, in the absence of an Order in Council, there was a substantial possibility that a purchaser might be unaware of the origin of the goods which he was buying.

## LOOKING BACKWARD.

### A Steel Battery with 28 Plates—Selective Wireless Telegraphy.

FIFTY years ago, according to THE ELECTRICIAN of September 28th, 1878 :—

The Eastern Extension Co.'s cable-repairing ship " Edinburgh " ran ashore at Singapore.

With the sixpenny telegram in the immediate prospect, there was a public desire for a still cheaper service.

M. Lippman formulated the law that a metal can be completely depolarised only in (solutions of) its own salts.

The question, " What is electricity ? " was being asked, needless to say, with the same negative result that the same question attracts to-day.

Following successful experiments, the Perth dyeworks of Messrs. J. Pullar and Sons were considering the installation of a permanent electric lighting system.

A description was given of Professor Palmiri's diagometer, an instrument designed to test the quality of oils, and based upon the principle that olive oil is a poorer conductor of electricity than any other oil in common use, and that mixtures and oils made from seeds are the better the more resistance they offer to the passage of electricity.

A curious peculiarity of Ladd's electro-magnetic motor was that " if the commutator was placed in the position which, theoretically, should render all movement impossible, the machine would nevertheless rotate indifferently in either direction. The velocity was even much more considerable than that obtained with the commutator in a rational position.'

### Early Batteries.

Twenty-five years ago, as recorded in THE ELECTRICIAN dated October 2nd, 1903 :—

The claims made for the new Edison steel battery with 14 positive and 14 negative plates were receiving critical attention.

Details were given of tests made with Mr. Anders Bull's system of selective wireless telegraphy.

Mr. C. H. Yeaman, the chief assistant at Islington, was selected, out of 135 candidates, for the post of borough electrical engineer at Morecambe.

At the annual meeting of Dick, Kerr and Co., which firm had recently taken over the Preston works of the English Electric Mfg. Co., Mr. Claud T. Cayley emphatically denied reports that the company were at the head of a combine for consolidating several other similar undertakings. A similar disclaimer was made at the meeting of the Electric Railway and Tramway Carriage Works, Ltd.

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The result of researches by Mr. S. C. Blacktin regarding " Spontaneous Electrification in Dust Clouds " has been published by the Mines Department. It has been discovered that almost all kinds of finely divided matter, when blown into a cloud of dust by an air current, becomes electrically charged, apparently with an opposite charge to that in the air itself. Further research is being carried out to ascertain whether sparks sufficient to cause explosions of gas or coal dust can be created in this way.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## "Costs for Manufacturers."

[To the Editor.]

Sir,—The review of my book "Costs for Manufacturers," published in your issue of September 14th, shows evidence of careful consideration of the points raised, but I perceive that a more closely defined line of demarcation between the functions of "Costing" and "Selling" is necessary if confusion of opinions is to be avoided.

It may be that, in some concerns, these functions are inextricably merged in the price fixing, but I suggest that in any large well-managed concern, a sales manager would not thank the cost accountant for any figures other than details that reflected "actual" labour, material, and expense, whose accuracy can be eventually proved by their collective agreement with the total expenditure in these directions.

The sales manager decides the "saleability price," fixing the profit, high or low or the price at cost, or under cost, if policy makes it desirable or necessary.

It is encouraging that you endorse the soundness of the principle of "a unit rate of expense," and appreciate the full importance of the factor of "overheads" in the cost, although your qualifying comments would, I am afraid, give the principle a somewhat limited sphere of application.

I suggest that, in the close analysis of the heavy burden of overhead expenses, and in the problem of getting down to the bone in an exact appropriation of the share of expense each cost should bear, *there lies the effective answer to foreign competitive prices.*

In a wide range of manufactures, "cotton, steel, electrical goods," etc., we appear to be resignedly and completely accepting the serious position that we cannot compete against our Continental neighbours. It is a position that should long ago have forced the reconsideration of our costing systems, some of which are the inadequate, if easy, methods handed down from a past age, when we had practically little, if any, competition to meet.

The sound principle of a "unit" rate of expense based on time and space occupation, can give a new viewpoint to prices, which may lead to the recapture of markets.

There are probably few industries in which the initial difficulties of adopting the "unit rate" cannot be overcome—once it is done, succeeding years' statements will not present the same trouble.

Thanking you for your courtesy in allowing me to emphasise the need for a wide use of the "unit rate of expense" in costing, I am, etc.,

Charles Smith.

2, Corona Road,
London, S.E.12.
September 20th.

[Though it is true that some industries are finding it difficult to compete in overseas markets, the British electrical manufacturing industry, far from accepting the position that it cannot compete, may justly claim to have established its capacity to compete in every important market of the world, despite many handicapping factors which directly or indirectly aid the foreign competitor.—Ed.]

## "Page Sizes of Technical Journals."

[To the Editor.]

Sir,—I was extremely pleased to see the letter of Mr. W. McWilliam in your issue of September 14th. It is a subject on which I have felt very keenly for a long time. The cost of blocks is a very serious item, and is out of all proportion to the amount spent on advertising. May I supplement the illustrations given by your correspondent by this comparison? The printing space of "The Engineer" is approximately 14 in. by 9½ in., that of "Engineering" 11 in. by 8¼ in., "Electrica Review," 11¾ in. by 7 in., and The Electrician, 10 in. by 7 in. In most cases this means that four separate blocks have to be made from the same design. They are each used once, or perhaps twice, and then scrapped. The waste is enormous, and can only be eliminated by the managements of the various technical journals putting their heads together, and agreeing on a standard size. Personally, I prefer 10 in. by 7 in.

As far as I am concerned, this question has an important bearing on the placing of new advertising contracts. If the size of advertisement blocks could be standardised, I should have a much larger share of my appropriation to spend on advertising.

Now that somebody has set the ball rolling, I sincerely hope something will be done.—I am, etc.,

E. Reed,
Advertising Manager Ed. Bennis and Co., Ltd.

28, Victoria Street,
London, S.W.1.
September 18th.

[To the Editor.]

Sir,—I cordially agree with everything that Mr. McWilliam said in his letter which you published in your issue of September 14th, and I am sure very many of us are grateful to him for writing it.

It can be a matter of no doubt that standardisation of page sizes, such as he suggests, is long overdue. It is obvious, of course, that art work cannot specially be produced to meet every variation in size of page, and it is a deplorable fact that many engineering advertisement pages are to-day, pictorial misfits.

It would seem that the technical and trade papers dealing with the motor industry have made the biggest stride in the direction of standardised pages, for they all appear to be more or less approximately of the 10 in. by 7 in. dimensions, and this, I feel sure, is the most convenient and useful size.—I am, etc.,

C. C. Roe,
Publicity Manager,
Relay Automatic Telephone Co., Ltd.,
Sterling Telephone and Electric Co., Ltd.

Relay House,
Streatham Hill,
London, S.W.2.
September 24th.

## The E.T.B.I. Festival.

[To the Editor.]

Sir,—I would be glad of the opportunity to notify your readers that the annual festival of the Electrical Trades' Benevolent Institution will be held at the Trocadero Restaurant, London, on Wednesday, November 14th, 1928, at 7.30 p.m., when Mr. L. G. Sloan, J.P., has kindly consented to preside.

The festival is, as you are well aware, an occasion for a special collection of funds to assist this Institution in the good work it undertakes, and if the Institution is to continue to uphold its claim that it has assisted every qualified applicant for relief, then, in view of the rapidly extending services which it is called upon to give, we shall have to look for a record collection this year, and the whole-hearted co-operation and support of every member of the electrical industry.—I am, etc.,

J. T. Keeping,
Secretary, Electrical Trades' Benevolent Institution.

9, Southampton Street,
London, W.C.1.
September 24th.

## What is Good Lighting?

[To the Editor.]

Sir,—In view of personal experience of many finely furnished and decorated rooms which I have seen lately, I would like to ask whether the policy apparently adopted by electrical engineers in the provision of "perfect" lighting schemes for domestic interiors is sound? As far as I have been able to judge, the ideal aimed at is to produce lighting by means of reflecting surfaces so that the immediate origin of the illumination is hidden, and thus to attain an effect devoid of shadow.

The description applied to the kind of lighting I have in mind by an illuminating engineer was a "block" of light, by which I understood him to mean perfect equality of illumination without appreciable direction, throughout the interior. It seemed to me as though he aimed at filling the room with light as one would fill a vessel with water.

Now, I suggest that, by this apparent desire to eliminate shadow, the engineer defeats the legitimate object of lighting, which surely should be to enable one to see. For one cannot

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easily realise with the eye an article in projection without light and shade. All light and no shadow seems to me almost as bad as all shadow and no light.

It has been pointed out to me by illumination experts in respect to rooms of which they say they have every reason to be proud, that the print of a newspaper can be read in any position and in any part of the interior, and this has been proved by demonstration. But I would like to suggest that the object of lighting in any domestic interior is not only to enable people to read newspapers. They may conceivably want to play cards; they might have sufficient artistic perception to wish to enjoy the contemplation of furniture, ornaments, pictures, and so on. They might even be desirous (one can never tell) of seeing the round (not flat) faces of their friends!

Now, if this be so, shadow is of as great importance as light, and I would go further than this, and suggest that in many a room the artistic value of the shadow is of very much greater importance than general illumination. I find that the perfectly distributed lighting to which I refer is extremely unpleasant, and very tiring to the eyes. I find a difficulty in seeing, without strain, objects which call for definition to enable their true form to be appreciated. If the object of this form of illumination is to produce flatness and dulness of effect it succeeds admirably, but it is at the expense of destroying what, so far as I can see, is a condition almost universal throughout nature, that you cannot have light without shade, any more than you can have all day and no night.—I am, etc.,

E. W. G.

Sevenoaks.
September 17th.

## "The Complex Number."

[To the Editor.]

Sir,—In Mr. G. Windred's article on the above subject in your issue of August 24th, page 201, the demonstration is marred by a slip in the notations leading to equation (25):—

$\omega^2$ is not $(-1.\omega)^2$ [for this is $(-1\times\omega)(-1\times\omega)=\omega^2$; it is $-1\times(\omega)^2$.] so that $D=\sqrt{(-1)\omega^2}$, [not $\sqrt{(-1).\omega)^2}$, which is $\sqrt{\omega^2}=\omega$.].—I am, etc.,

M. Gheury de Bray.

## Advertising the National Register.

[To the Editor.]

Sir,—In your issue of September 14th "Publicist" says that apart from retail druggists and grocers, he can think of no other class of ttade which is more spoon fed by manufacturers than is the electrical contractor of to-day.

Perhaps he did not think for very long, but I would suggest that wine merchants, tobacconists, booksellers, and a host of other retailers sell by publicity, which is arranged by their manufacturers.

Such slogans as "it pays to advertise," and "if you have something to sell, say so," are true for a manufacturer, but where you have only service or someone else's proprietary article to sell, you can only afford to say so in a very small voice. It would no more pay a tobacconist, wine merchant or electrical contractor to advertise that he sells Players' cigarettes, Dewar's whisky, or Cosmos fires, than it would pay the manufacturer of these articles to keep silent.

Manufacturers sometimes claim credit for the fact that they spend enormous sums on advertising in order to promote the retailers' trade. As a matter of fact, of course, the manufacturer is only advancing the money to his buying public, who in the end pay for all advertising, though perhaps without realising it.

Will "Publicist" tell us what his publicity policy would be if he were an electrical contractor.—I am, etc.,

C. H. Flower,
Managing Director, Tredegars, Ltd.

London, September 14th.

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It would appear in effect that the present policy of the patent law is to thwart the inventor in every possible way —*Dr. A. P. Thurston.*

Few persons in any civilised country would to-day fail to recognise a radio receiving set at sight.—*Mr. W. L. McPherson.*

# S. E. ENGLAND CONTRACTS.

## Important Orders for Transmission Lines Placed by the Central Electricity Board.

The Central Electricity Board has placed with the General Electric Co., Ltd., a contract, the value of which amounts to nearly £500 000, for the erection of overhead transmission lines in the south-east of England. The contract covers the erection of 132 000 V transmission lines in the district north of the Thames, stretching from Reading on the west to Peterborough on the north, and Ipswich and Colchester on the east. The total mileage of the lines will be 254, of which about 158 miles is to consist of single circuit lines and 96 miles of double circuit line, while the total length of conductor will be 1 300 miles. Steel-cored aluminium conductors will be employed, having an equivalent copper section of 0·175 sq. in. These will be carried on lattice steel towers about 66 ft. high and 16 ft. square at the base, the normal span being 900 ft. The insulators will consist of a single string of 8 units. The contract will be carried out by the General Electric Co., with the assistance of the associated company, Pirelli-General Cable Works, Ltd., which latter company will carry out all the erection work. The work of erection will take three years. The whole of the material will be manufactured in Great Britain.

The contract for the transmission lines comprised in the southern portion of the scheme, and which amounts to approximately the same value as that for the northern portion, has been placed with Callender's Cable and Construction Co., Ltd. The technical details relating to the types and sizes of cables, conductors, etc., to be used are the same in both cases. The places connected by the transmission lines in the southern area include Brighton, Eastbourne and Hastings in the south; Ramsgate, Canterbury, and Folkestone ni East Kent; Wimbledon, Woking and Croydon in Surrey, and Barking, Gravesend and Chatham in the north.

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## REDUCTIONS OF CHARGES.

The following reduced charges for supplies of electricity are announced:—*Sheffield:* domestic lighting, 4d. per kWh, heating, 1d.; factory and works lighting and power, 1d.; domestic rate, 10 per cent. of rateable value, plus ½d. per kWh for light, heating, cooking and power; shop window lighting, 2d. *Preston:* lighting flat rate, 6d., instead of 6½d. *Pwllheli* (Electricity Distribution of North Wales): lighting 8d., instead of 9d.; power 4d., instead of 5d. *Malvern:* lighting, first 200 kWh per quarter, 6½d. per kWh, next 200, 6¼d., and so on, decreasing by ¼d. per kWh for each successive 200; beyond 2 000, 4d.; power, heating and cooking, first 500 kWh per quarter, 2d. per kWh; next 500, 1¾d., next 1½d., beyond 1 500, 1¼d., all less 7½ per cent. for prompt payment. *Colchester:* power, for consumption above 150 kWh per quarter, first 2 000 kWh, 1¾d. per kWh, beyond 1⅛d., less 2½ per cent. for prompt payment; lighting, not exceeding 25 per cent. of total at same rates when over 50 000 kW hper annum are consumed; alternative two-part tariff to consumers whose maximum load is not less than 10 kVA, £4 10s. per annum per kVA, plus 0·6d. per kWh for first 10 000 per quarter, 0·56d. for next 20 000, 0·52d., for next 30 000, 5d. beyond 60 000, less 2½ per cent. for prompt payment; lighting at same rates if not exceeding 25 per cent. of total load; assisted wiring, maximum 5 points, 8d. per kWh for lighting, 1d. for power, all consumption over 1 200 kWh per annum for cooking allowed rebate of ¼d. per kWh. *Paisley:* lighting, 5½d.; heating and domestic purposes, ¾d., a reduction of 32 per cent. *Dumfries:* lighting 6d., instead of 7½d.; power 3d., instead of 3½d., with discounts ranging from 2½ per cent. for over 500 kWh per quarter to 10 per cent. for over 1 000 kWh. *Spalding:* power, up to 450 kWh per quarter, 3d. per kWh; over 450 and up to 900, 2½d., beyond 2d. *Seaham Harbour:* lighting 6d., instead of 7d. *Tewkesbury Electric Light Co.:* lighting 7d., cooking and heating 1½d., power 2d. *Hawarden:* lighting 7½d., instead of 8d., less 5 per cent.; power, 2¼d., instead of 2½d., less 5 per cent. *Wigan:* power, first 500 kWh per quarter, 2d. per kWh; next 500, 1¾d., next 1 000, 1½d., beyond 1¼d. *Brighton:* power, heating and cooking in the borough, for minimum of 200 kWh per installation per summer quarter and 400 kWh per winter quarter, 1d. per kWh, all in excess ¾d. per kWh. *Wycombe Electric Light and Power Co.:* first 3 000 kWh per quarter, 3d. per kWh; next 5 000, 2d.; beyond, 1½d.

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# AUTUMN TRADE PROMOTION.

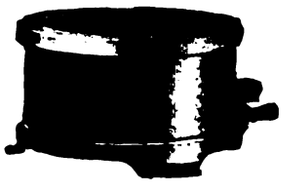
## Some Details of New Domestic Apparatus Developed by Manufacturers for the Coming Season—Many Cookers and Fires Added to Existing Ranges.

THE trade interests of electrical contractors for the next few weeks will be largely centred on domestic appliances with special appeal during the winter. In that range falls such equipment as fires, heaters, cookers, etc., and alive to the possibilities of this approaching demand, manufacturers have developed a number of entirely new lines, in addition to improving many of the old. As an instance of this fact, the General Electric Co., Ltd., has increased its already wide range of cookers with several models specially designed for the 1928-29 season, having a variety of oven-heating arrangements. As regards electrical equipment, all the cookers are designed and arranged with a view to minimum maintenance costs. The elements are made easily accessible, and in all models totally enclosed quick-boiling plates and reciprocating three-heat switches controlling all circuits are incorporated. Wherever possible, too, the wiring is concentrated at the sides of the cooker, an arrangement which serves the double purpose of rendering every circuit easy of access and of providing under the hob a warming cupboard of liberal dimensions. Replaceable units, such as hotplates, etc., are connected to thumbscrew terminals. Efficient earthing facilities are provided close to the main terminals, and care is taken to ensure good continuity throughout the entire frame of each cooker. Plugs and sockets, where fitted, conform to British standard specifications, and are of the three-pin earthing type. In mechanical construction the new cookers have rounded corners to facilitate cleaning, in most cases oven interiors are completely withdrawable, and each oven is lagged with heat-insulating material on all six faces. We are given to understand that two among the models represent the only all-pressed steel electric cookers manufactured in England.

The General Electric Co. has also added to its range of fires. Among these the three to be marketed under the appelation "Cosy-Glow" fires are somewhat similar in external appearance to other fires of the same make, but incorporate a principle which permits them to diffuse a glow similar to that of a coal fire. In addition to two panel elements on the front of each of these fires the heat projected is supplemented by a Robertson type flame-colour lamp affixed behind the elements, the glow from the lamp being reflected by a hammered copper reflector. These "Cosy-Glow" fires are controlled by two switches and are finished in antique brass or real bronze colour. Another new model is designed for semi-permanent fixing. The wattage of this model is 3 000 and three elements are fitted, two being controlled by switches mounted on the body of the fire and the other connected direct to the main terminals. This arrangement is in accordance with the recommendations of the Institution of Electrical Engineers, and is for the purpose of preventing all the elements being switched off by switches on the fire, and thereby leaving a live flexible cord. The new wall mounting radiator is a model specially designed for use in bathrooms, halls, passages, etc. It is constructed in cast iron and finished in black stove, with alternative finishes in white, brown and grey vitreous enamel. This fire is fitted with a 1 000 W element, controlled by a switch mounted on the front.

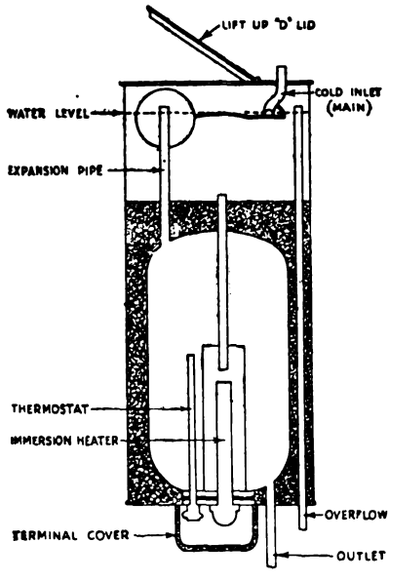
New fires have also been added to the range offered by Metro-Vick Supplies, Ltd., including a series of flat bar fires in oxidised copper or stove enamelled finish. On the domestic appliances side the recently introduced safety kettle and Gyratory washer will play important parts, while the already widely known range of Cosmos cookers has also received attention. Many of the models have been improved in some way or other, the cookers offered being of such diversity in design as to fulfil every possible requirement. Reverting to the flat bar fires, we show on page 357 pictures of the one, two and three kW models, indicating their general design and attractive appearance. Another interesting line is the small model cooker designed for use in flats, bungalows, etc. This is made in two types with one 8 in. diameter boiling plate, or with one 6¼ in., and one 4¼ in. boiling plates; extra

## NEW AUTUMN TRADE ITEMS.



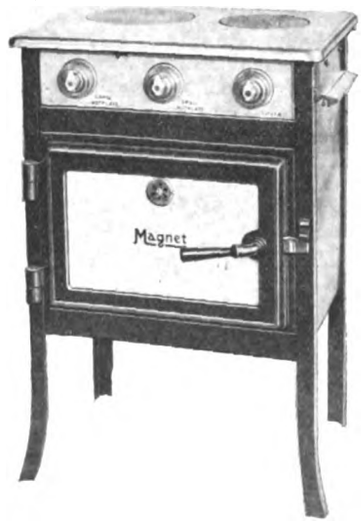
A boiling ring by the Electric Heating Co., Ltd.

A new cooker by the General Electric Co., Ltd.




Illustrating the internal arrangement of the new water heater by the Jackson Electric Stove Co., Ltd.

A single bar "Inventum" fire.




A further new cooker by the General Electric Co., Ltd.

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rapid boiling and totally enclosed tubular elements are fitted. The "Cosmos" table model boiling plate is also a recent development, and this is mounted on a suitable stand with nickel-plated lag plate and fitted with either a 6¼ in. boiling ring rated at 1 200 W, or with an 8 in. plate of 2 000 W rating. Metro-Vick Supplies, Ltd., have also introduced a number of new Silverstone glassware fittings.

## Further Fires.

The most important improvement introduced into the range of fires offered by the Arora Co. (Messenger and Co., Ltd.), is the incorporation of the new type C fire bar. This honeycomb bar, as it is termed, is now included as a standard fitting to a number of models, and produces a most pleasing effect. The original patented Arora winding is employed in this honeycomb bar, and the makers claim that radiation is given by practically the whole area. Another improvement is the introduction of entirely British-made switches, which can be operated by a slight pressure of the foot. A further improvement in the construction is the new porcelain insulated 3-part terminal which permits of the apparatus being earthed wherever desirable. Certain fire models have been completely redesigned, while in one direction or another each model has been improved from both practical and artistic standards.

A number of new fires have also been introduced by Belling and Co., including the junior Bungalow model. This is similar to the senior model bearing the same name, except that it is fitted with 600 W multi-parabola firebars. The overall dimensions are 17 in. high, 8 in. deep and 13 in. wide. Another new fire is the Villa, in bronze finish, with a consumption of two or one kWh. The top of the metal work is ventilated and a fixed trivet is provided upon which plates, etc., may be kept warm. The Rotunda is another new model, and this, designed in grain cast iron, is fitted with sectional firebars curved in plan for distributing the heat, in semi-circular radiation. Being intended for use as a fixture, it is designed to cover existing fireplaces. The overall dimensions are 16¾ in. wide by 24½ in. high and 7½ in. deep. New "coal" grates which have been added to the Belling range are the Georgian in steel finish, the Celtic in bright antique, and the Classic in bright relieved. All three fires may be fitted with the flickering flame effect if desired

The Jackson Electric Stove Co., Ltd., are, in addition to many improvements in their fire range, also introducing a series of new electric water heaters. These heaters are ten in number, and have loadings from 500 to 5 000 W as desired, fitted with or without thermostat control. Their capacities range from 2½ to 25 gallons and are constructed in galvanised iron or copper finished in white japan.

Credenda Conduits, Ltd., are now manufacturing a range of kettles having extra heavy bodies, handles and feet, large diameter lids and swan-neck spouts. Each kettle is supplied with 6 ft. of connecting cord, and in the case of the 2 pint 650 W and 3 pint 650 W models, lamp adaptors are provided. These models are each fitted with two elements, while other models are 3 pints, 975 W; 4 pints, 975 W; 6 pints, 1 300 W and 8 pints, 1 300 W; these have 3, 3, 4 and 4 elements respectively. A 2½ pint kettle with a rating of 500 W and a whistling model in 2 and 3 pint sizes, with loadings of 650 and 975 W respectively, are other interesting items offered in the domestic range. A wide selection of cookers and fires is offered as well as tubular and pedestal heaters. Among the Creda series of coal-type fires is one bearing the name "Adjustocoal"; the heating elements behind the shutters which form the front are adjustable by means of a lever at the side of the fire, thus allowing the heat to be projected upwards, downwards or horizontally as may be required. The finish is armour bright and the consumption 3 kWh.

Progression is also featured in the programme for the coming season of the Wholesale Fittings Co., Ltd., in that a number of new lines have been added to this firm's "Altolite" range of glassware, for which there has been an increasing demand. The special feature claimed for this glassware, is that, as it is less dense, it gives better light. Its surfaces are polished, while the makers state that it does not crack, mark nor burn when used with gasfilled lamps. A large variety of bowls, globes and lanterns in many shapes and sizes, with pink or brown veins, are offered. A flaked white bowl of artistic design decorated with black lines is now included in the "Altolite" series, as well as a line of hand-painted bowls. A range of French pendants and side brackets with pressed glassware has been added to the season's programme, while a special feature is also made of French mottled glass bowls, shades and half bowl brackets in a variety of colours. Many new lines have been introduced in painted globes in sizes ranging from 6 in. to 13 in. diameter, as well as a line of coloured glass bowls with leaded panels which are highly decorative. There is a wide variety of hall lanterns and floor standards, a good selection of vellum shades in various sizes, including many new designs, while there is also a new line of bedrail light shades in vellum and silk. In the heating section, the firm has put on the market a new electric fire called the "Alto-Model." The elements are visible, but protected by a wire guard, and are set in concave copper reflectors. A feature of this heater from the point of view of the housewife is that the elements are easily removable from the front without undoing any nuts or screws, so that the heater can be easily cleaned. The heater is supplied in three sizes, having 1, 2 or 3 bars, each bar consuming 750 W. The carrying handle can also be used as a trivet.

The new "Universal" auto-electric cleaner by L. G. Hawkins and Co., Ltd., is another attractive proposition. Not only will motor car owners welcome this device, but in these days of charabancs it will probably become a recognised cleaning tool for keeping the upholstery, mats, etc., clean and sanitary. Railways, omnibus companies, tramway departments, and others should be in the list of large commercial users. "Peter-the-Heater" is also mainly for use of car owners. This practical device is claimed to be an efficient car insurance, for it prevents harm by frost to the engine, or circulating system—it ensures easy starting, and has many other uses. The new range of electric fires by L. G. Hawkins and Co. is also worthy of note. There is a suitable design to meet every requirement, from bowl fires with screw-in elements, to elaborate open grate dog fires with live glowing-fire effect. This company have now on display at their London and Glasgow showrooms a complete new range of lighting equipment for all purposes, including that required for factories, and other industrial centres; commercial lighting including office buildings; shop and shop window lighting, daylight and atmospheric effects. They have also developed in their Birmingham works a large number of residential pieces suitable for both large and small houses.

## Hot-Water Circulators.

The British Resistor Co., Ltd., has added to its list of domestic appliances a Whitehouse hot-water circulator, fitted with two or three heat control, a photograph of which is reproduced on page 357. The Electric Heating Co., of George Street, Croydon, is putting several new fires on the market this season, in addition to a boiling-ring. The No. 53/528 screen fire is of handsome design, the ornamental surround being embossed in the sheet metal during the process of blanking, This can be supplied in any finish. satin brass, oxidised copper and oxidised silver, the loading being 650 or 750 W. A less expensive model, No. 53/628, has been designed to meet the demand for a good screen fire at a moderate cost, the finish and loading being the same as the expensive one. The "Elect" bungalow fire is made in three sizes suitable for rooms of various dimensions. The finish is of bright art black, and a trivet at the top of the fire adds to its utility. A more elaborate fire is the "Elect" reflector fire, constructed on graceful lines and designed to give a maximum of radiant heat.

The Electric Heating and Hardware Co., Ltd., are putting on the market a range of four new coal fires called the "Boomeranglo" series, which are designed on the same lines as the well-known "Boomerang" fires. This new series is fitted with a special patented coal container or carton, which is completely fitted when it leaves the works. The purchaser of these models does not, therefore, have to trouble with placing pieces of coal in position to obtain the true effect, but it is only necessary to place the carton in its position in the front of the fire, and this being fitted with flat spring clips engages with a stop on the inside of the fire. When pressed home it is held in a rigid position and cannot be released, unless it is definitely desired to withdraw the carton for access to the lamp, wiring and switch compartment. Attention to all these points if necessary can be given from the front of the fire when the complete carton has been removed, which it is possible to do by a sharp light pull on the ornamental portion provided for this purpose, and which is sufficient to release the spring engagement. In addition to these fires there is a one unit "Boomerang" with "plug-in" element of the same construction and outline as the 2 and 3 units, but reduced in proportion.

To meet the requirement of maintenance, Girlings, Ltd.,

(continued on page 350.)

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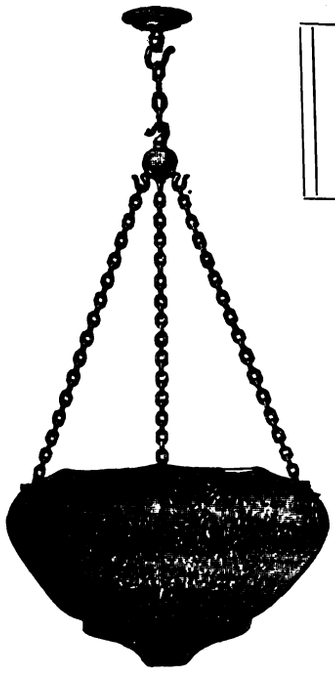
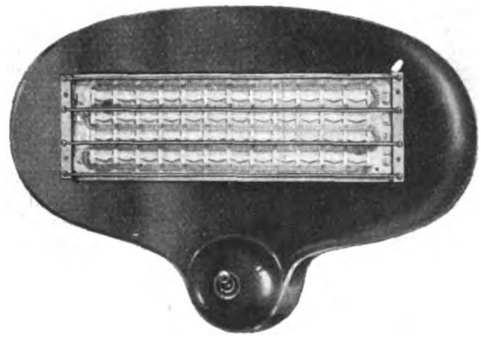
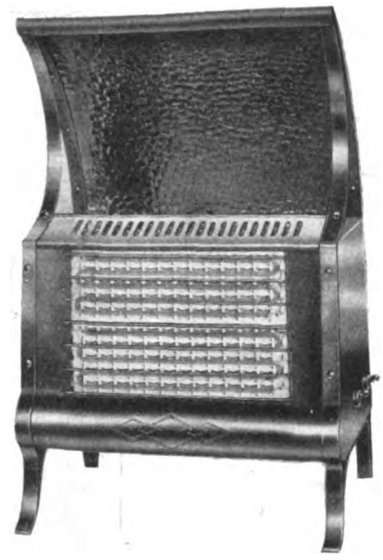
# AUTUMN SEASON TRADE PROMOTION.



A suggestion by Wholesale Fittings Ltd.

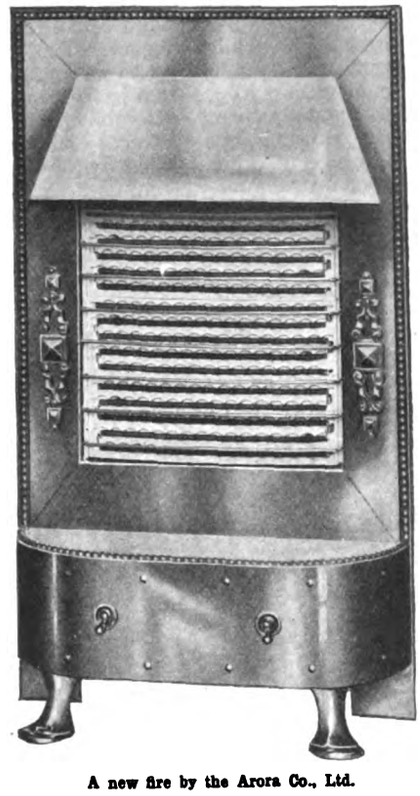


A wall-mounting radiator by the General Electric Co., Ltd.

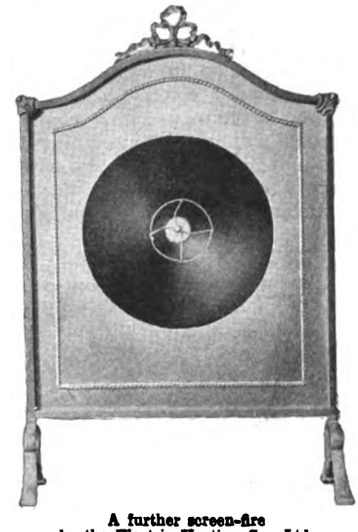


Another line by the General Electric Co., Ltd.

A screen-fire by the Electric Heating Co., Ltd.

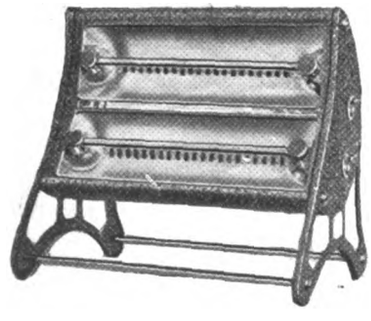


A new fire by the Arora Co., Ltd.



A further screen-fire by the Electric Heating Co., Ltd.

A good design by Electric Heating and Hardware, Ltd.



A two-bar fire by Mr. Alan Wright.

A new product of Wholesale Fittings Ltd.

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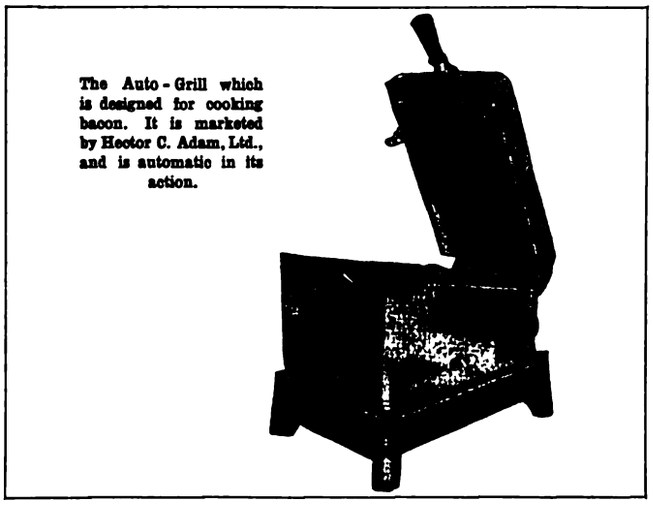
are continuing to manufacture their well-known mosaic fires, and have patented a type in which a burnt-out spiral can be replaced by an inexperienced person. Both the old lamp type and modern electric fires can readily be converted to accommodate this type of element, which is in rosette form and made under the trade name of Mosaic owing to the ease with which a number of them can be arranged in fancy pattern.

William Geipel, Ltd., have added two new fires to their selection, the references for these being Q.130 and Q.90. The



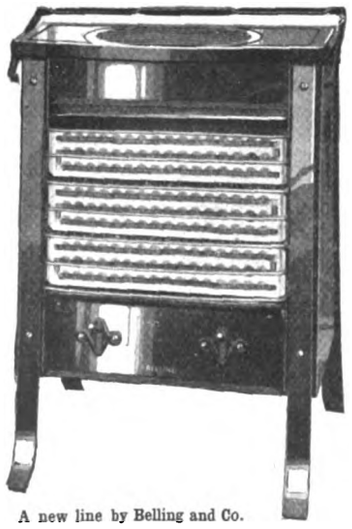
**The Auto-Grill which is designed for cooking bacon. It is marketed by Hector C. Adam, Ltd., and is automatic in its action.**

former has a loading of 2 or 3 kW and the latter 4 kW, while the area dimensions of the fires are 23 in. wide, 26 in. high. Both these models are curb fires and are made of cast iron, supplied in two grades of black with nickel-plated curb. The "Quead" electric cooker has also been considerably added to in the way of improvement, while the range of other domestic appliances also offers a number of attractions. Willis and Bates, Ltd., have extended their range of Pellon radiators, one of which is illustrated on page 357. These appliances work on a principle of down and outward radiation of heat, while the luminous dome becomes incandescent by its proximity to the element. These radiators are offered in a number of loadings in either brass or copper or oxidised silver finish. A somewhat novel device is the Auto-Grill for the cooking of bacon. This apparatus is marketed by Hector C. Adam, Ltd., and is so constructed that it needs no attention, as the current is switched off and the cover raised directly the bacon is properly grilled. The A.E.G. Electric Co., Ltd., is introducing an electric warming-bottle as a substitute to the older hot-water bottle. The loading is 110 W. H.W. Sullivan, Ltd., have added five new fires to their selection, these being the Glow 2 kW model, the Popula 1, 2 and 3 kW loadings, the Attracta with either 2 or 3 kW loading, the Lumina also of 2 kW rating, and the Winna in $\frac{3}{4}$ and $1\frac{1}{2}$ kW sizes.

Rose fires, which have already been described in these pages, will again be the centre of the fire sales campaign of Electrical Utilities, Ltd. It will be remembered that these are made in sizes ranging from 1 to 3 kW. The fires of Carron Company embrace four distinct varieties: the "Carreflex" series, incorporating a patented reflector element; the "Cathedral" series, with frames of sheet metal; the "Carcole" series of imitation live coal fires; and the "Stella" series, comprising cast iron and sheet metal frames, with the new "Stella" refractory element. The whole four series embody many exclusive and unique devices. The first series is made up of five different types of fires of a maximum loading of 3 kW, while the second series comprises three models of 2 and 3 kW loadings. The "Stella" fires are seven in number, with loadings of 2 or 3 kW according to type.

Several appliances have been recently introduced by the Hotpoint Electric Appliance Co., Ltd., including a table model cooker. This is a compact model suitable for a household of six to seven persons, and comprises an oven, with side and bottom heating elements, and a special refractory type element fitted on the inside top of the oven for griller purposes; this latter is also useful for speeding up the pre-heating of the oven when required for roasting, baking, etc. The boiling hob comprises three totally enclosed circular boiling plates, and the cooker may be obtained in various finishes. Other models recently introduced are specially constructed for hiring and housing schemes, and all models are now supplied with

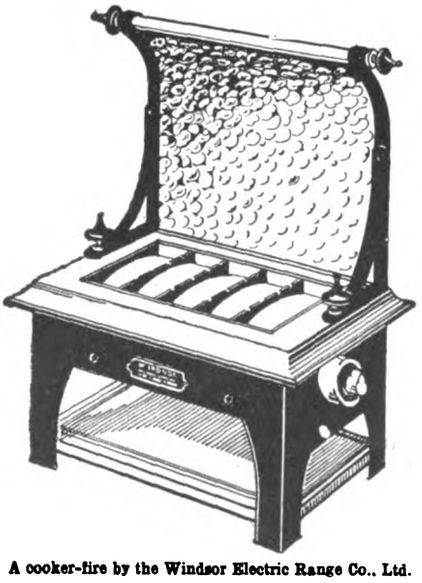
## MORE DOMESTIC APPLIANCES FOR 1928-29.



A new line by Belling and Co.

The "Welsbach" electric kettle.

A suggestion by the Welsbach Light Co., Ltd.



A cooker-fire by the Windsor Electric Range Co., Ltd.

A new line by H. W. Sullivan, Ltd.

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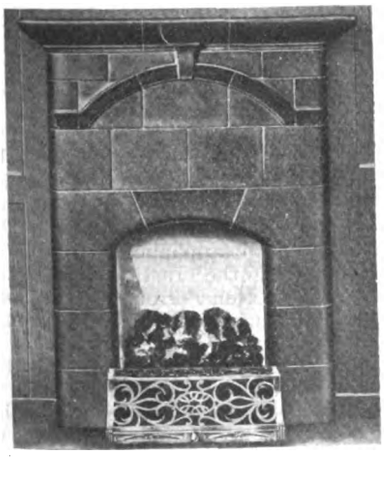
the one-piece removable type oven interior, having rounded corners and round wire runners. The hobs may be supplied either standard ground finish, polished nickel-plated, dull nickel-plated, or vitreous enamelled in either blue-black or blue-grey finish. A new catalogue of water-heating apparatus has been issued, and Section 1 is devoted to small size immersion heaters, portable type, for heating up hot drinks or for small quantities of liquid. Section 2 gives full particulars of the sheathed wire immersion heaters which are suitable for fixing in existing tanks, etc. There are also hand-basin and bath water heaters, or local storage type, and complete domestic hot-water supply tanks, electric radiators, towel rails and wash boilers. The Hotpoint Premier Pic-up electric vacuum cleaner is an entirely new model, built on similar lines to the Premier Junior, but, being of a hand type, can be used in a similar way to the electric iron.

Siemens Electric Lamps and Supplies, Ltd., is, in addition to its already popular lines, concentrating its autumn trade campaign upon the following new designs and improved appliances: electric safety kettle; new "Cosyglo" fires with moving flame and smoke effect, reflector fires, screen and well fires, milk or egg boilers and warming plates, improved designs of electric towel rails, and electric hot-water radiators. Details of the new "Cosyglo" fire are not yet available for publication, but we understand that special literature is now in course of production. The reflector fires are made in a number of types, the newest having a loading of 750 W. The screen fires offered are obtainable with loadings from 600 W to 1 000 W to order. The 2 kW well fires, and "Xcel" coal fires are also attractive lines, while the other domestic ranges, such as boiling plates, cookers and smaller domestic equipment, offer innumerable opportunities for quick sales. Two-bar towel rails, low temperature floor type radiators and a new design of water heater are classed by Electric Fires, Ltd., as "three extremely popular lines." With regard to the water heater, this is made in sizes ranging from 2 to 30 gallons, with loadings from 750 (or lower) to 2 000 W. Heatrae thermal storage tanks are fitted with a swan neck outlet spout, attached by means of a union so that the spout can be turned to the most convenient position to suit the basin or sink to be supplied. The water heaters are made in two general types: type R.T.A. provides for the water inlet at the bottom, and is suitable for use in conjunction with an existing ball valve system. If, however, there is no ball valve tank available and the water supply has to be taken direct from the main, the pattern to use is type R.T.B., which can be connected directly to the cold water supply mains, the water being delivered into the tank through an overhead pipe and funnel.



**The new "Slocom" fire by Berry's Electric, Ltd.**

No new designs have been introduced by Mr. Alan Wright, as it is thought better to concentrate upon four or five well-established and proved popular lines than to introduce a multiplicity of new designs each season. He contends that his policy helps the trader from the point of view of stocking, as, with a comparatively small stock of frames and spare bars for various voltages, he is enabled to deliver any pattern of any voltage at short notice, owing to the "plug-in" bar. The only new development as regards Inventum fires for this season is in the matter of chromium plated reflectors. Tests, says Mr. Wright, show that this finish is unaffected by heat, and practically untarnishable under even the worst conditions of misuse. Inventum water heaters have been reduced in price in many instances, and these are now fitted with ball taps on the surface of the water, which comply in all respects with the requirements of the British Water Boards Association.

The Windsor Electric Range Co. is again concentrating on the Windsor electric oven, and on the company's radiator.

**Another addition by Berry's Electric, Ltd. to the Magicoal range**

The latter is made in two types, namely, single heat element of a loading of 800 W, and a three-heat element of 400, 800 and 1 200 W. The apparatus is so constructed that by removing the reflecting screen the device may be used as a cooker. The oven is made in two types, with dimensions of 13 in. by 10½ in. by 12 in. and 15 in. by 12 in. by 14 in. respectively. The heating element is of the open protected type, controlled by a three-heat switch, giving 400, 800, or 1 200 W.

Chesterton Jones and Co., Ltd., have introduced a new iron which forms the first of a series of "David" appliances which they are putting on the market. Particular features of the iron are permanent connections between element and terminals which can be inspected before the top cover is fitted, obviating the risk of arcing, which sometimes occurs with "pressed-on contacts" and reducing the danger of earths when permanent contacts are used and terminals are fitted into the top cover. The back rest is formed in one piece with the cover, which, the makers believe, is original, and it is covered by provisional patent. This gives a neatness in appearance, and also overcomes the difficulty of the back rest working loose. The wood grip is smaller at the front than at the back, and this shape was adopted after trying out several forms in actual practice, it being found by the company that this was the most comfortable in use. The grip is fixed by means of a fin-headed bolt which engages with the slot in the handle bracket and prevents turning or splitting. The erinoid thumb rest is fixed by closing the metal round it, so that there is no danger of screws or eyelets working loose. The handle bracket is nose-shaped at the front, which not only gives a good appearance but also reduces the danger of catching the first finger against the hot handle bracket. The handle is also tilted slightly away from the front.

The Welsbach Light Co., Ltd., has extended in many ways the range for domestic appliances offered, while its lighting fittings have also been added to. Included in the latter are a number of cut crystal fittings, one and five lights and two and three lights. These have diameters ranging from 10 in. to 15 in. and are particularly attractive. Shades and bowls also feature among the new lines, which, in addition to the cooker section of the company's business, offer many opportunities for selection.

The "Slocom" fire by Berry's Electric, Ltd., is a new model introduced this year, designed to fit into all the standard openings of the slow combustion type. The heat is obtained from a trivet heater which stands in the front of the fire; arranged with a large circular element upon which is wound three separate windings, each of which can be controlled separately from a concealed switch. Another addition is a register type Magicoal fire. The heat in this case is projected down from the chimney. Here again the heater is of circular form and of 3 kW capacity. The control is concealed behind the fret, which lifts up on a hinge. Sadia, Ltd., are about to introduce a drying stand for domestic purposes with a loading of 750 W. The company's boiling plates are now made in sixteen different sizes, and there is a size to fit any cooker on the market. A new design of mercury thermostat will shortly be offered on the market.

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# NEWS IN BRIEF.

## Leeds Electrical Club—The Opening of the Lecture Season—Cable Subway Fires—Lichfield and Assisted Wiring—New York's New Plant—The G.W.R. and Electric Pumps—Dundee and Foreign Tenders.

THE Social Sub-committee of the Electrical Association for Women will hold an "At Home" on October 2nd at Kensington Court, from 7–9.30 p.m., as an opening to the 1928/29 winter activities.

At the first meeting of the Diesel Engine Users' Association which is to be held at 5.30 p.m. on October 12th, a paper entitled "Marine Oil Engines" is to be read by Mr. Sterry B. Freeman.

In connection with the Wireless Courses referred to on page 294 of our September 14th issue, these are being held at The Polytechnic School of Electrical Engineering, Regent Street, London.

The opening meeting of the 1928/29 session of the Electrical Society of Glasgow will be held in Reid's Tea-Rooms on October 2nd, at 7.30 p.m., when Mr. W. Wilson will deliver a paper entitled "Research Applied to Electrical Engineering."

The Bexhill-on-Sea Chamber of Trade has enlisted the co-operation of the Empire Marketing Board in connection with an Empire Shopping Week which will commence on November 5th. The E.M.B. has arranged to support an advertising programme, and to contribute towards the cost of prizes.

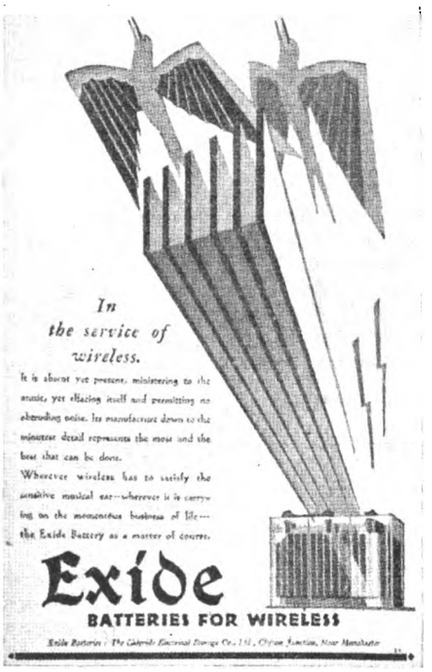
The newly-formed Leeds Electrical Club has accepted an offer of the Leeds and County Liberal Club of part use of its premises as headquarters. Members must not be under 21 years of age, and must be actively connected with the electrical trade. The secretary is Mr. S. T. Needham, 10, York Place, Leeds.

An inquiry into the cause of the recent fires in cable subways on the Victoria Embankment was opened by Dr. F. J. Waldo, the City of London and Southwark Coroner, on Monday. Evidence was given by Mr. C. A. Baker, divisional engineer, L.C.C., Engineer-in-Chief's Department, and by several fire brigade officers and others. The inquiry was adjourned until Thursday.

A new Edison power plant in New York, which is intended to supply electricity to about 300 000 of the city's apartment dwellers, was put into operation last Sunday. The plant is controlled from another station three miles away, and, except during a weekly inspection, no officials or employees will be engaged at the new station.

Dundee Electricity Committee on September 17th accepted foreign offers for cable amounting to £1,967, against British offers totalling £2 295. The engineer reported that one of the clauses in a British offer was to the effect that it was subject to increase in the cost of raw materials, labour, transport coming into effect before the Corporation's offer was placed and also should such increase take place during the execution of the contract the contract price would be increased accordingly.

The 1928/29 session opens at University College, London, on October 1st. Among the fixtures which have been arranged for the first term are a course of five lectures on "High Tension Transmission of Power," by Mr. P. Dunsheath; on Tuesdays at 6.30 p.m., beginning November 13th; three lectures on "Historical Factors of the Problem of London Traffic," by Miss E. Jeffries Davis, on October 11th, 18th and 25th, at 5.30 p.m.; three lectures on "Smoke Pollution of the Air and Public Health," by Dr. John Owens, on November 2nd, 9th and 14th, at 5.30 p.m.; and "The British Coal Industry," by Mr. W. L. Cook, November 9th, at 5.30 p.m.




*THE symbolic style of advertising which is now being used in many different types of appeal to the general public, is exemplified in the above miniature reproduction of a striking newspaper announcement issued during the last few days. The battery is cleverly subjugated to the service which it performs. Its employment in the receiving set is suggested by the elongated condenser vanes, and the product of battery and set is imaginatively illustrated by the pure song of the soaring birds.*

The Great Western Railway Co. is to instal modern electrically-driven pumping plants at its works at Caerphilly and Dinas.

Another attempt is being made at Liverpool to create separate committees for the administration of the Corporation's electricity and tramways undertakings respectively.

The coming session of the Junior Institution of Engineers commences on October 5th with a lecture entitled "Interesting Details of Swiss Alpine Railways," by Mr. A. J. Simpson.

Intending competitors for the Cooper's Hill War Memorial Prize and Medal are reminded that the latest date for submitting entries is October 1st next. The award is limited to corporate members of the Institute of Electrical Engineers who were under 30 years of age on January 1st, 1928.

Chorley Board of Guardians has had under consideration the alteration of certain plant at the Eaves Lane Institution. One member urged the Guardians to obtain a bulk supply of electricity from the Lancashire Electric Power Co. which, he said, was a cheaper method.

Excavations have been commenced on the site of the Steatite and Porcelain Products Co.'s factory at Stourport. In the first section of the buildings, which are for the manufacture of electrical accessories, 200 men and 300 women will be employed, and the complete factory is expected to employ nearly 1 000 people.

An exhibit at the Chemists' Trade Exhibition, held recently at Leeds Town Hall on Monday, consisted of electro-radiant Themega blankets, which are made by disabled ex-Service men at the Frederick Milner Industrial Colony at Leatherhead, where about 280 such blankets are turned out weekly.

Lichfield City Council has adopted a scheme for assisted wiring, to apply to residential property on the route of existing supply mains, but not to new property in course of erection. The minimum number of lights allowed is to be three and the maximum eight, with a 5 A switch plug for small electric appliance.

At the recent conference of the Institute of Metals, Mr. F. G. Martin, in a paper on "Non Ferrous Metals," made reference to electric cable manufacture. In the ordinary ships' electric cable, he said, rubber was employed as an insulating medium for the internal core of copper, and to protect the copper from the action of fillers in the rubber the copper strand had to be tinned. Two Liverpool men had devised a method of substituting a cellulose product for the rubber, the advantages being that it was not necessary to tin the copper, nor to use lead sheathing. The cable was more flexible and was particularly resistant to the action of fuel oil.

The seventh National Cost Conference of the Institute of Cost and Works Accountants will be held at the Queen's Hotel, Birmingham, to-day, September 28th. At the morning session, Mr. A. Ramsay (chairman of the Birmingham and District Engineering and Allied Trades Employers' Association) will preside, and the subject of "Cost Accounting and the Industrial Future" will be introduced by Messrs. J. A. Lacey and J. Wardropper. The subject of "The Standardisation of Cost Accounts" will be introduced by Mr. B. Thistlethwaite at the afternoon session at 2.30 p.m., when Sir Holberry Mensforth will preside. The annual dinner will take place at 7.15 p.m. on the same day at the Queen's Hotel.

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# RADIO EXHIBITION DINNER.

## Number of Licences Now Over 2½ Million —"One House in Three" with Wireless.

THE Radio Manufacturers' Association, on the eve of the opening of the National Radio Exhibition, held a dinner at Olympia, on Friday, September 21st. Sir William Bull, M.P., the president of the Association, was in the chair.

MAJOR GLADSTONE MURRAY, of the British Broadcasting Corporation, proposing the toast of "The National Radio Exhibition," said it represented very important developments in the industry. They were engaged in a great enterprise, and the new spirit of co-operation manifested in the trade should be productive of much good. Cheaper and better apparatus was available. He believed that the exhibition would usher in an era of unexampled prosperity. It had been assumed by some that the saturation point had been reached with regard to the sale of licences, but actually that was not so.

### Stands and Exhibitions.

MR. A. E. BOWYER-LOWE, chairman R.M.A. and chairman Exhibition Committee, replying, described the exhibition as the largest ever held in this country in connection with the radio industry. The Committee were, in the earlier months of the year, doubtful whether they were justified in increasing the space for this year's show, but subsequent happenings showed that, not only were their doubts misplaced, but applications even exceeded the space available. In all there were 277 stands and over 180 exhibitors, figures which indicated the unqualified enthusiasm displayed for the Exhibition and a compliment to its business-pulling possibilities.

The CHAIRMAN said that more than 2 500 000 families in this country had taken out wireless licences. This meant that at least one house in three had a wireless receiver. In the United States of America the corresponding proportion was one house in five. It could be taken that 20 000 000 people listened regularly or occasionally to wireless programmes.

Good hearing required efficient radio receiving apparatus, well marketed and intelligently demonstrated. The British radio industry, after many vicissitudes, was now beginning to reap the reward of patient endeavour and difficulty. The industry, now at last centralised and united, was giving for the first time a really comprehensive and practical exhibition of all the machinery, instruments and accessories that were available for good hearing; not only was there a great improvement in the quality and design of radio apparatus, but there was a great increase in variety. Primarily, owing to the initiative of the Radio Manufacturers' Association in working for an abatement of royalty charges, there was this year a great reduction in price, with the result that the more efficient and elaborate apparatus was now within the reach of a much wider public.

Another thing which would be discovered at Olympia was that radio manufacturers had realised that the wireless receiver was an essential part of the equipment of every up-to-date home and should be enclosed in a cabinet. Concluding, he announced that the Association had decided to supplement and develop its exhibition work by repeating in other large cities what was now being done in London. They were taking a leading part in connection with the exhibition at Manchester to be held this year from October 22nd to November 3rd.

SENATORE G. MARCONI said the fullest development of wireless lay before them, and the future was full of promise. He thought also that it would be full of surprises. We were a long way from being able to utilise the electric wave to anything like the fullest extent. We were gradually learning how to employ it and the most useful applications had yet to be found out.

MR. ELLIS proposed the toast of "The Press," and Earl Russell replied. Mr. W. H. Goodman proposed "The Chairman."

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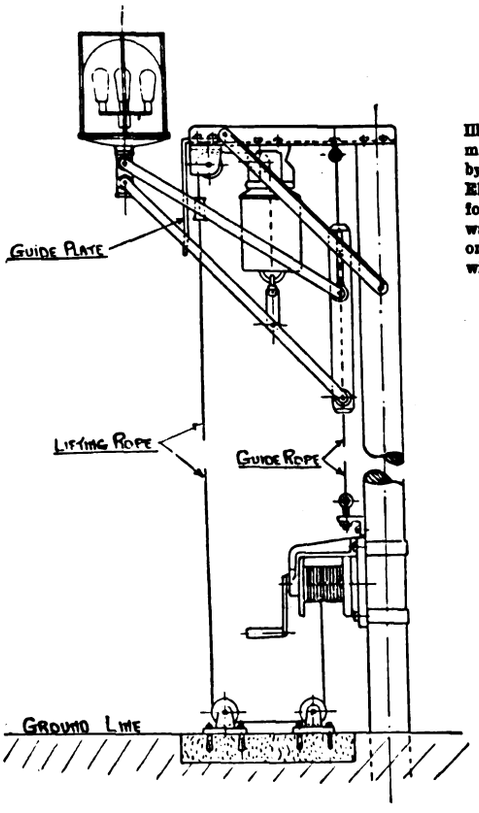
The Committee of Experts have prepared a report expressing the wishes of the League of Nations regarding the construction of a wireless station at Geneva, for the use of the League, capable of communicating directly with other countries. Plans for the construction of the station have been made by Radio Suisse. The report stipulates that when necessary the station should be put at the disposal of the League, but should continue to deal as far as possible with private Swiss business.

# LAMP SUSPENSION.

## Novel Application of Lamp Suspension Equipment for Wireless Stations.

A NOVEL application of lamp suspension equipment is illustrated in the accompanying drawing. The problem was to fix a lamp to a wireless mast, the lantern being higher than the top of the mast, so as to show a warning light to aviators to prevent collision with the structure, and also to lower the lantern to the ground for cleaning and maintenance purposes, missing the numerous stay wires and collars on the post, and to provide the necessary steadying lines and guides to prevent the lamp from being unduly deflected by the wind while being lowered.




**Illustrating the method adopted by the London Electric Firm for installing warning lights on the top of wireless masts.**

The lamp, which is over 140 ft. above the ground level, is supported by a London Electric Firm's directional contact suspension gear, having knife contacts of a substantial size, and there is a positive weight relieving device which transfers the weight of the fitting to the fixed gear when in its normal working position, so that the wire rope only comes into action during the process of raising and lowering. The lowering rope also acts as a guide. A standard winch, one of the firm's larger sizes having the usual self-sustaining motion, is used for operating the gear.

The work has been carried out by the London Electric Firm for, and in collaboration with, Siemens Brothers and Co., Ltd., for use with their tubular steel masts supplied for a Colonial Government wireless station.

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## ELECTRICAL GOLFERS.

THE first golf match held in connection with the Benevolent Fund Cup recently presented to the Scottish Centre of the I.E.E. took place on September 11th, at the East Renfrewshire Course. The trophy was won by Mr. H. W. Bewsher with a score of 2 up on bogey, Mr. W. Sutcliffe being the runner-up with 3 down on bogey. Mr. D. M. Macleod, chairman of the Scottish Centre, in making the presentation, expressed the hope that this cup, so kindly given by Messrs. W. Winning and A. Hutcheson, would year by year increasingly aid the Benevolent Fund. This being the final social meeting of the Centre for the present session, Mr. J. Campbell Murray was awarded a vote of thanks as convener of the Entertainments Committee for the efficient way he had carried out the duties during a very arduous year.

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# PERSONAL.

MAJOR E. H. W. Partridge has been appointed an associate member of the Mechanical Warfare Board.

Mr. F. Harding, manager of the Derby Corporation tramways, is shortly retiring on superannuation.

The late Mr. T. R. Smith, city electrical and tramways engineer at Leicester, left £15 864; net personalty, £13 377.

**Mr. J. Scott, who, as announced last week, has accepted the invitation to become Mayor of Bootle.**

The late Mr. Claud Thornton Cayley, a director of the English Electric Co., Ltd., left £140 826.

As announced in THE ELECTRICIAN last week, Mr. James Scott has accepted nomination for the mayoralty of Bootle. The acceptance is of particular interest to the supply industry, for Mr. Scott is engineer to the West Lancs. U.D.C., the Formby U.D.C., and holds appointments on the Westmorland Electricity Power Committee and Mersey and West Lancs. Joint Authority.

The staff of Rotherham Electricity Department have presented a cabinet of stainless steel cutlery to Mr. J. S. Dargavel on his marriage.

The "New Zealand Electrical Journal" reports that Mr. C. W. G. Bearman, from the Illuminating Engineering Dperatment of the G.E.C., has joined the staff of the British General Electric Co., at Wellington.

Mr. F. B. Ogan, who for many years was associated with Veritys, Ltd., of Covent Garden, London, has recently joined the outside staff of the London Electric Wire Co. and Smiths, Ltd., and is representing them in the London area for the sale of Lewcos wires and cables.

The marriage of Mr. William Ronald Hall, eldest son of Mr. Percy B. Hall, director of Erskine, Heap and Co., Ltd., manufacturing electrical engineers, of Manchester, and Miss Amy Marion Hunt, was solemnised at St. Mary's Church, Prestwich, on September 12th.

Perth Corporation has agreed to the appointment of Mr. W. J. H. Penham, interim manager of Perth tramway undertaking, as manager. Mr. Penham was loaned to Perth Corporation some six months ago by Mr. Pilcher, of the Edinburgh tramways, for the purpose of reconstructing the Perth system.

Lieut.-Col. J. T. C. Moore-Brabazon, M.P., has accepted the invitation of the Council to become president of the Junior Institution of Engineers, in succession to Sir Murdoch MacDonald, M.P. His induction will take place at a meeting to be held at the Royal Society of Arts on December 7th, when he will deliver his address.

Mr. Colin H. Gardner, who has been appointed technical consultant to the wireless department of the Eagle Engineering Co., Ltd., Warwick, is well-known in electrical and wireless trade circles in the Midlands. He gave a series of talks on technical radio matters from the Birmingham broadcasting station over a period of two years.

Mr. J. G. Pearce, director of the British Cast Iron Research Association, received on September 4th from the Lord Provost of Glasgow, Sir Daniel Mason, the award of 100 guineas for proposals relating to "Goodwill in Industry." The ceremony took place in the City Chambers, Glasgow, before a representative gathering of Clyde industrialists. The Lord Provost also presented other prizes.

Mr. S. B. Donkin has accepted the position of president of the Association of Supervising Electrical Engineers, and will deliver his presidential address at the opening meeting of the session, at the Junior Institution of Engineers, on October 2nd, at 7.15 p.m. In addition, certificates will be presented to the winners of prizes in the Economic Premiums Competition, and certificates and prizes will be presented to the winners in the W. E. Highfield Shield Competition of 1928.

## Obituary.

DR. ROBERT KNOX, on September 21st, in his 61st year. Dr. Knox was a pioneer among British radiographers, president of the electro-therapeutic section of the Royal Society of Medicine, president of the Röntgen Society, vice-president of the British Institute of Radiology, a member of the Institution of Electrical Engineers, an honorary member of the American and Scandinavian Röntgen Societies and editor of the "British Journal of Radiology."

# ELECTRICAL WOMEN.

## Extensive Programme of Visits and Lectures for the Coming Session.

AN extensive programme of fixtures for the autumn and winter of 1928-29 has been drawn up by the Electrical Association for Women, and, to open the activities of the Association, the Social Sub-Committee will hold an "At Home," at 46, Kensington Court, on October 2nd, from 7 to 9.30 p.m. A meeting has been arranged by the Mayoress of Kensington (Mrs. R. Dudley Baxter), at 18, Stanley Crescent, Notting Hill Gate, on October 5th, for members to meet representative women of Kensington. The party for this meeting will be limited to 40. Other items in the programme include on October 23rd a visit to the dairies of the London Wholesale Dairies, Ltd., while on November 7th, a lecture on "The Electricity Supply Act, 1926," will be delivered by Mr. E. E. Hoadley. The Social Sub-Committee will hold further "At Homes" on November 15th and December 20th. On November 21st Mrs. E. M. Barnett will demonstrate electric cooking methods, and on November 28th Mr. R. W. Kennedy will give a lecture entitled "The Common handling of Domestic Electrical Equipment." On December 5th, Mr. S. C. Hurry will give an address devoted to domestic water heating in old and new houses by electrical methods, and on December 17th a visit will be paid to the showrooms of the Battersea electricity department.

### Evening Lectures.

A course of evening lectures has also been arranged to take place at the offices of the E.L.M.A. Lighting Service Bureau on Monday and Tuesday at 7 p.m. The date for these and the subjects, together with the names of the speakers are:—October 2nd, social evening; October 15th, electric light in factories as it affects production and hygiene, Mr. W. J. Jones; October 30th, the study of personal salesmanship, Miss Gladys Burlton; November 12th, a descriptive demonstration for a complete electric radio-gramophone equipment, Mr. H. W. Gambrell; November 26th, a national advertising campaign for the sale of electric lamps, Miss Nora Miller; and December 10th, safety-first methods in the electric home, Lt.-Col. W. A. Vignoles. These lectures have been arranged by the Committee of Women demonstrators, and have been specially designed to help those engaged in the electrical industry and also those engaged in teaching domestic science.

A North Wales Branch of the Association is to be formed early in October. Two meetings will be held, one at the Church House, Wrexham, on October 5th, and one at the Town Hall, Llandudno, on October 6th. The first meeting will be addressed by Dr. S. Z. de Ferranti, and the second by Miss Haslett. Both meetings are open to the public, and further particulars may be obtained from the Honorary Secretary, Mrs. E. H. Klitz, "Beechley," Wrexham.

The Manchester District Branch has also arranged an extensive programme, the opening meeting being held on October 4th. The Lord Mayor has promised to preside, and Mr. Llewelyn has agreed to address the meeting on the New Electricity (Supply) Act, 1926. It is hoped that Lt.-Col. W. A. Vignoles will also be present. Lack of space prevents us giving a detailed list of the fixtures, but among the items arranged may be mentioned the Electric Outlet Campaign meeting on October 23rd; a visit to the Metropolitan-Vickers Electrical Co.'s works, at Trafford Park, on November 7th; a lecture by Mrs. Flack, entitled "Electric Appliances and their Uses in the Home," on November 23rd; a lecture on refrigeration on December 5th; an address on "Electricity and Musical Reproduction," by Mr. A. Hall, on December 18th; a visit to the showrooms of Salford Electricity Department on January 15th; a lecture by Mr. A. P. M. Fleming entitled "Milestones in the Progress of Electricity," on January 30th; and an address devoted to the elementary facts about Electricity by Miss G. L. Entwistle on April 9th. Arrangements have been made for members to visit Barton power station on February 7th; the studio of 2ZY on two dates to be announced later, while the Hyde Road Tramway Depot will be visited on March 18th. The annual meeting will be held some time in February, but the date is not yet announced.

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A Fleet order has been issued to the effect that Navy telegraphists who passed professionally in the Signal School for advancement to leading telegraphist before July 16th, 1926, are not required to obtain educational certificate, Part I., as a condition of advancement to leading telegraphist.

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# BUSINESS ITEMS.

IT is announced that a £60 000 order for bronze wire has been given by the General Post Office to Continental firms. The order has been divided between a French and a German firm, who quoted prices substantially below the prices of British tenderers.

The Electric and Railway Finance Corporation announces that from October 1st the registered office will be at 10, Mayfair Place, London, W.1. Telephone numbers: Grosvenor 1693-1694. Telegraphic address: "Elrafin, Piccy, London."

The Igranic Electric Co., Ltd., gave a luncheon to stockists of the company's radio components, at Olympia, on Tuesday, when Mr. T. J. Mould, sales manager, spoke of the developments which have recently taken place at the Bedford works. The future policy of the company with respect to radio was outlined, and it was explained that a special radio sales manager, and, in addition, district managers had just been appointed. Among the new components which had been developed, stress was laid upon the "Igranikit" outfit, the universal 5-valve set, the J. and G. transformers, and the Phonovox-de-luxe electrical pick-up. In the matter of service which the company offered to the trade, Mr. Mould stated that new advertising methods had been adopted, and whereas last year Igranic components were strangely absent in the popular circuits of the season, arrangements had now been made whereby Igranic goods would feature in the designs to a large extent. In the new "mystery" 6-60 circuit, for instance, Igranic components played a not inconsiderable part. As an additional aid to the sale of Igranic components, a new booklet had been prepared which was free upon application, the title being "Radio—How It Works." Mr. Will Day thanked the company for their hospitality and consideration.

Messrs. George Ellison, switchgear manufacturers, of Wellhead Lane Works, Perry Barr, Birmingham, have recently adopted a somewhat novel but enterprising method of making their products better known. A large saloon motor-coach on pneumatic wheels has been equipped with working specimens of the firm's products, arranged for demonstration. The coach thus represents an exhibition in miniature and is now "on the road."

From October 1st the office and stores of the Macintosh Cable Co., Ltd., in Birmingham, will be situated at 26, Livery Street.

The sales office for the London district of Callender's Cable and Construction Co., Ltd., has been moved to 2, Surrey Street, Strand. The registered office and headquarters will remain as hitherto at Hamilton House, Victoria Embankment, E.C.4.

The head office building of the London Power Co. in Horseferry Road, Westminster, has been named "Ergon House."

**A striking window display for Cosmos lamps at Metro-Vick House.**

With reference to the paragraph in our last issue regarding a rumour that the business of J. H. Holmes and Co. was to be taken over by a new company, the trustees under the deed of assignment for the benefit of creditors, with the approval of the parties interested in the purchase of the business, have now issued an announcement that "a company is now being formed with a substantial backing to take over the business of J. H. Holmes and Co., electrical engineers, Newcastle-upon-Tyne, and arrangements have been made whereby, in the meantime, manufacture will be continued and all customers' requirements dealt with.

It is interesting to note that at the Electrical Exhibition at Neston, promoted by the Birkenhead Corporation Electricity Supply Department, each stand is controlled by a 30 A d.p. ironclad Tucker switch-fuse, and show-boards are being exhibited on the Corporation stand.

**The window of the Croydon Electricity Dept. during a special display of "Xcel" appliances.**

The English Electric Co., Ltd., point out that the principle of dividing the steam end of power station units into two or more cylinders in one line marks a definite advance in economy and reliability which is being widely welcomed by supply engineers. We are given to understand that the first two-cylinder machine set to work in this country was the 20 000 kW turbine installed at the Valley Road power station of the Bradford Corporation. The machine was the result of a deliberate attempt by the makers, the English Electric Co., to carry the evolution of central station turbines another step forward, and the success which has attended their efforts has been remarkable. The Bradford 20 000 kW unit has been notably successful in maintaining the public supply under normal and abnormal conditions, and following a long series of orders for similar machines in sizes from 6 000 to 30 000 kW, a repeat order has now been received by the company. The new turbine which has been put in hand to the specification of Mr. Thomas Roles, the chief engineer and manager of the Bradford undertaking, will be for 30 000 kW, and will embody the latest features of the English Electric multi-cylinder design. It will be generally similar to a unit of the same output now under construction for the West Ham Corporation. Another repeat order for a two-cylinder turbo-alternator set has just been entrusted to the same company by Messsrs Edward Lloyd, the newsprint manufacturers. Like the first machine installed in the Kemsley power house, the new set will be of 12 500 kW, and will run at 3 000 revs. per min. The extent to which multi-cylinder machines are now being adopted is indicated by the fact that within the past few months new units of this design have been started up at Peterborough and at Huddersfield, while a 25 000 kW unit is under construction for Leicester. Where the steam plant has to satisfy certain special conditions such as arise in industrial service, it is not always appropriate to sub-divide the steam end. A particularly interesting case is that of the two 10 000 kW sets recently ordered by the State Electricity Commission of Victoria for the Yallourn briquetting plant. The original plant was steam driven, but the new extensions are being designed for electrical driving of the presses, utilising exhaust steam from the turbines for drying out the brown coal before it is pressed; there will be a large surplus of electrical energy, which will be fed into the public mains. It is anticipated that the output of briquettes will be quadruplicated for an increase in capital expenditure of only some 16 per cent., and, as a consequence, the fuel will be produced at a price which will result in a greatly increased demand. The turbines, which will be of the company's impulse type, running at 3 000 revs. per min., will operate at a steam pressure of 565 lb. per sq. in., with a total temperature of 750 deg. F., and will supply steam for drying at a pressure of 55 lb. per sq. in. No fewer than 25 tenders were submitted for the plant, including seven from continental manufacturers. The total value of the contracts referred to above is about £250 000.

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# BUSINESS OPENINGS.

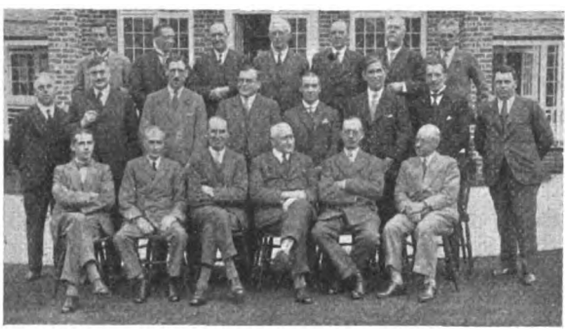
## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

ALVA CORPORATION.—Electric light installation at Cochrane Park Pavilion. Particulars from the architects, Messrs. John Melvin and Son, Mar Street, Alva.

WALSALL AND WEST BROMWICH UNIONS JOINT COMMITTEE, September 28th.—Supply of electrical fittings. Forms of tender, etc., from the Clerk, 22, Lombard Street, West Bromwich.

BRIDPORT (DORSET) TOWN COUNCIL, September 29th.—Supply of power station equipment (section 2), including three



*ACCOMPANIED by Lt.-Col. W. A. Vignoles and Mr R. A. Chattock, their chairman, members of the South Midland Area Committee of the E.D.A. recently visited the new head offices of the Shropshire, Worcestershire and Staffordshire Electric Power Co. at Mucklows Hill, Halesowen. After inspecting the offices, they were entertained to lunch by the company and then held their ordinary committee meeting in the board room. The party afterwards assembled for the group photograph shown above.*

generating units totalling 600 kW, complete with switchgear and auxiliaries. Specifications, etc., from the Town Clerk; deposit £2 10s.

LANCASTER GUARDIANS, September 29th.—Electric light installation in the institution and children's home, Quernmore Road, Lancaster. Specification from the Clerk, 5, Dalton Square, Manchester; deposit £2 2s.

LEEDS CORPORATION, September 29th.—Supply and erection of three-phase switchgear for Kirkstall generating station. Specification, etc., from Mr. C. N. Hefford, Electricity Department, 1, Whitehall Road, Leeds; deposit £2 2s.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 29th.—Six months' supply of electrical fittings, etc. Forms of tender from the Clerk and Treasurer, 19, Heriot Row, Edinburgh.

ST. ALBANS CORPORATION, September 29th.—Electric light installation at the Sisters' Infectious Hospital, Folly Mead, St. Albans. Forms of tender from the City Engineer, 38, St. Peter's Street, St. Albans.

GREENWICH (LONDON) BOROUGH COUNCIL, October 1st.—Three ton travelling crane, steam or electric (a.c., 200 V, 50 cycles, d.c., 210 V), and self-acting grab. Particulars from Borough Engineer.

MANCHESTER GUARDIANS, October 1st.—One year's supply of electric lamps. Forms of tender from the Clerk, Union Offices, All Saints, Manchester.

DEVON MENTAL HOSPITAL, October 2nd.—Six months' supply of electric lamps, etc. Tender forms from the clerk, Mr. Cecil Masters, Exminster.

METROPOLITAN ASYLUMS BOARD, October 3rd.—Installation of automatic telephones at Princess Mary's Hospital, Cliftonville, Margate (specification G); and wiring or outside supply of electricity at Colindale Hospital (specification H). Specifications, etc., from the Board's office, Victoria Embankment, London, E.C.4; deposit £1 for each.

CENTRAL ELECTRICITY BOARD, October 5th.—Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2; deposit £2 2s.

WATFORD CORPORATION, October 5th.—Two 750 gal. per min. sewage ejectors, with electrically driven air compressors. Specification from Borough Surveyor; deposit £2 2s.

BRADFORD CORPORATION, October 6th.—Electrical installation at City Hospital. Specification, etc., from City Architect.

ISLINGTON (LONDON) BOROUGH COUNCIL, October 8th.—Supply and installation of two new lead batteries, for driving two Edison refuse collecting vehicles, having carrying capacity of 2½-3 tons. Further particulars from the Cleansing Superintendent, Liverpool Road, London, N.1.

NORWICH CORPORATION, October 8th.—Supply and erection of 12 500 kW turbo generator and condensing plant at Thorpe power station. Specification, etc., from Mr. F. M. Long, city electrical engineer, Duke Street, Norwich; deposit £1.

GREAT WESTERN RAILWAY, October 9th.—Supply of telegraph instruments (list 18), electrical apparatus (list 19), lamps and fittings (list 23) and electric lamps (list 24). Forms of tender from Stores Superintendent, Swindon.

DUNDEE CORPORATION, October 10th.—Supply of e.h.t. and l.t. paper, insulated, lead covered and armoured cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HAWARDEN RURAL DISTRICT COUNCIL, October 10th.—Electric light wiring of isolation hospital, Pentrobin, Buckley, near Chester. Particulars from Mr. Arnold K. Wroe, clerk, Carlton House, Hawarden, Chester.

SIDMOUTH URBAN DISTRICT COUNCIL, October 11th.—Erection of l.t. overhead electricity main about 1½ miles in length from the electricity works to Sidford. Details from the engineer and manager, Mr. Henry Burgess.

DARLINGTON CORPORATION, October 15th.—Cooling tower, with foundations and tank. Specification, etc., from the Borough Electrical Engineer, Houghton Road, Darlington; deposit £1 1s.

EDINBURGH CORPORATION, October 15th.—Coal and ash plant, for Portobello generating station, including weighbridge, truck tippler, three electric capstans, belt conveyors and elevators and two ash telpher hoists. Specification, etc., from Mr. E. Seddon, city electrical engineer and manager; deposit £2 2s.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 23rd.—Supply of electric cables during 12 months ending November 30th, 1929. Further particulars from the Electrical Engineer, Electricity Works, Penrose Street, Walworth Road, S.E.17.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

OTAGO (N.Z.) HARBOUR BOARD, September 28th.—Supply of two 3-ton electric wharf cranes, for Victoria Wharf, Dunedin. (Reference A.X. 6 221.)

STATE ELECTRICITY WORKS, MONTEVIDEO, September 28th.—Supply of rubber insulated wires and cables for indoor installations. (Reference B.X. 4 651.)

CAROLINA (SOUTH AFRICA) MUNICIPALITY, October 1st.—Supply of plant for the electric lighting of the town; and supply of electrically-driven pump.

CONSTANTZA (ROUMANIA) PORT AUTHORITIES, October 1st.—Supply of one electric portal crane and two goods lifts. (Reference A.X. 6 797.)

IRISH FREE STATE ELECTRICITY BOARD, October 1st.—Supply and erection of complete electrical equipment, including switchgear and three transformers, each 12 000 kVA (38 000/5 000 V), for Shannon transformer station at Fleet Street, Dublin. Specification, etc., from the Secretary to the Board, 60–62, Upper Mount Street, Dublin; deposit £5, returnable.

SALISBURY (RHODESIA) MUNICIPALITY, October 1st.—Supply and erection of h.t. transmission lines and transformers. (Reference B.X. 4 669.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 1st.—Supply of porcelain insulators. (Reference B.X. 4 643.)

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TANZIM DEPARTMENT OF THE EGYPTIAN MINISTRY OF PUBLIC WORKS, October 1st.—Supply and delivery of 250 ornamental electric lamp standards to support electric public clocks. (Reference B.X. 4 635.)

LYTTELTON (N.Z.) HARBOUR BOARD, October 2nd (extension of date).—Supply of four 5-ton electrically-operated luffing cranes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Supply of switchboard cords (schedule C. 349). (Reference B.X. 4 621.)

POSTMASTER GENERAL'S DEPARTMENT, MELBOURNE, October 2nd.—Switchboard jacks. (Reference B.X. 4 750.)

ANGORA POSTS AND TELEGRAPHS, October 3rd.—Copper wire. (Reference A.X. 6 761.)

EGYPTIAN POSTS AND TELEGRAPHS, October 3rd.—Telephone trunk cable from Cairo to Alexandria. Specifications from Chief Inspecting Engineer, Queen Anne's Chambers, Westminster, London, S.W.1.

MELBOURNE CITY COUNCIL, October 3rd.—Supply of ten 1 500 kVA and four 500 kVA three-phase transformers. (Reference B.X. 4 754.)

INDIA STORE DEPARTMENT, October 4th.—Supply of 24 electric ceiling fans. Form of tender (5s.) from Director-General, Belvedere Road, London, S.E.1.

ROYAL SCHOOL OF ENGINEERING, GIZA, EGYPT, October 4th.—Electrical plant, etc. (Reference B.X. 4 703.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, October 4th.—Supply of telegraph line material. Reference B.X. 4 655.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, October 4th.—Supply of copper wire and lead-covered cable. (Reference B.X. 4 657.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 4th.—Supply and delivery of electrical wires and cables. (Reference B.X. 4 667.)

ARGENTINE DEPARTMENT OF NAVIGATION AND PORTS, October 5th.—Supply of one electric transporter for moving blocks of 20 tons weight. (Reference A.X. 6 694.*)

INDIA STORE DEPT., October 5th.—Supply of 37 000 yards of armoured, dry core telephone cable. Forms of tender (5s.) from Director General, Belvedere Road, London, S.E.1.

MONTEVIDEO STATE ELECTRICITY SUPPLY WORKS, October 5th.—Supply of lead fuse wire, silver fuse wire, copper wire for bell installation, insulating tape, porcelain counter-weights, quick-break lever switches (single pole, double pole and triple pole), tumbler switches (single pole), switches (single pole and double pole), rotary combination switches for staircases (3-way and 4-way), rotary switches for indoor use (single pole and double pole), switches (double pole) for flush mounting. rotary combination switches (3-way) for flush mounting, rotary switches (single pole) for flush mounting, normal Edison screw lampholders, without key switch, enamelled lampshades, porcelains for sockets and plugs for double pole fittings, insulating compound, transformers for bell installations, hard vulcanised rubber tubing, cast-iron cable boxes, glass globes for arc lamps, etc.

ANGORA POSTS AND TELEGRAPHS, October 6th.—Bronze wire and sleeves. (Reference A.X. 6 754.)

DIRECTION GENERALE DES FABRIQUES MILITAIRES, ANGORA, October 8th.—Supply of electrolytic copper. (Reference A.X. 6 807.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, October 10th.—Ironclad switchgear for Sefton sub-station. Specifications (2s. 6d.) from Chief Electrical Engineer.

SASKATOON (CANADA) MUNICIPALITY, October 10th.—Supply of 10 000 kW steam turbo-alternator, condenser and auxiliary equipment, or, alternatively, a 7 500 kW unit. (Reference B.X. 4 721.)

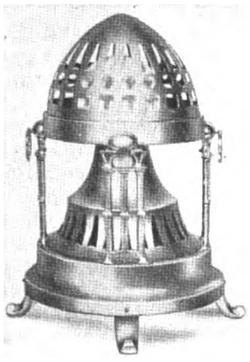
INDIA STORE DEPARTMENT, October 11th.—Supply of push-button control passenger lift. (Reference A.X. 6 845.)

PORT ELIZABETH MUNICIPALITY, October 11th.—Supply of cables and wires (specification No. 5). ((Reference B.X. 4 755).

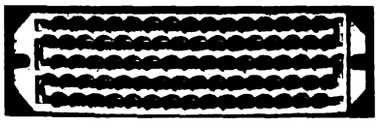
PORT ELIZABETH MUNICIPALITY, October 11th.—Supply of electricity meters, demand indicators and time switches (specification No. 6). (Reference B.X. 4 756.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 11th.—Supply and delivery of a private automatic telephone exchange for Cape Town. (Reference B.X. 4 670.)

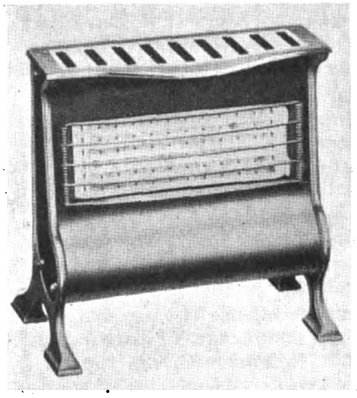

## AUTUMN TRADE SUGGESTIONS.



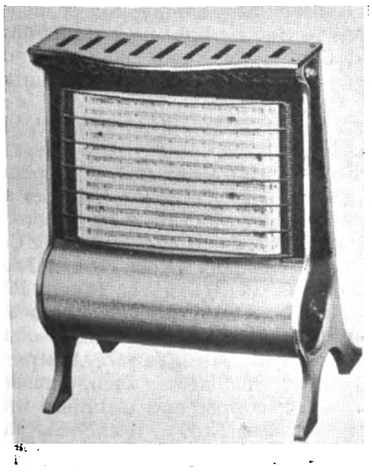
An attractive radiator by Willis and Bates, Ltd.



Illustrating the "honeycomb" heater coils used by the Arora Co., Ltd.



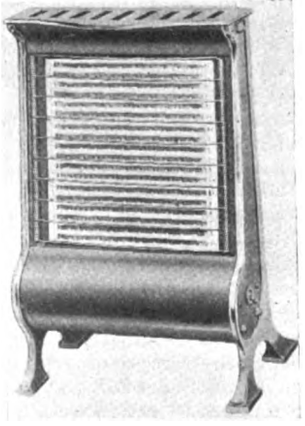
A flat bar fire by Metro-Vick Supplies, Ltd.



A further Metro-Vick suggestion.

The Metro-Vick electric washer and wringer, also possesses many attractive features.

The Whitehouse electric circulator, by the British Resistor Co., Ltd.



A 3 kW Cosmos fire which is among the recent designs.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DUBLIN CITY COMMISSIONERS, October 13th.—(1) Supply and erection of transformers, (2) supply of h.t. oil immersed circuit breakers and (3) supply of flame arc carbons. Specifications (5s. for each) from the City Electrical Engineer.

STATE ELECTRICITY WORKS, MONTEVIDEO, October 15th.—Electrician's pliers, wire-drawing machines, etc. (Reference B.X. 4 702.)

INDIAN STORES DEPARTMENT, October 16th.—Supply of oil engine-driven alternator sets, and switchgear (order No. N.8 729), for Ahmednagar. (Reference B.X. 4 714.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

INDIAN STORES DEPARTMENT, October 17th.—Supply of water turbine and two oil engine driven generating sets, for Mardan power station. (Reference B.X. 4 733.)

STATE ELECTRICITY WORKS, MONTEVIDEO, October 17th.—Automatic voltage regulator. (Reference B.X. 4 699.)

PORT ELIZABETH'S MUNICIPALITY, October 25th.—Transformers. (Reference B.X. 4 760.)

DURBAN MUNICIPALITY, October 26th.—Supply of 10 single phase and two three phase transformers. (Reference B.X. 4 761.)

DURBAN MUNICIPALITY, October 26th.—Supply of a single phase transformer. (Reference B.X. 4 762.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water-tube boilers, with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353.) (Reference B.X. 4 638.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically-driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director General, Belvedere Road, London, S.E.1.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories, for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362). (Reference B.X. 4 396.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Supply of switchboard keys and parts (schedule C.362). (Reference B.X. 4 752.)

MELBOURNE CITY COUNCIL, November 14th.—Supply of totally enclosed, metalclad type switchgear and spares (specification 952). (Reference B.X. 4 748.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

POSTMASTER GENERALS' DEPARTMENT, MELBOURNE, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 740.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737.)

POSTMASTER-GENERAL'S DEPARTMENT, Melbourne, November 27th.—Supply of indicators (schedule C 371). (Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). (Reference B.X. 4 753.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus, for Pretoria. (Reference B.X. 4 757.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68).

## Tenders Accepted.

KINTORE CORPORATION.—J. B. Reid, electrical work in third block of houses.

MERSEY DOCKS AND HARBOUR BOARD.—Liverpool Electric Cable Co., Ltd., electric cables.

MANCHESTER CORPORATION.—Z. Electric Lamp and Supplies Co., Ltd., supply of electric lamps.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Siemens Bros. and Co., Ltd., supply of l.t. cable, £1 973.

GRIMSBY CORPORATION.—Crompton Parkinson, Ltd., motor converter, etc., £2 619; Tudor Accumulator Co., Ltd., storage battery, £1 114.

GLASGOW CORPORATION.—P. H. Cossar, installation of electric light, telephones and fire alarms at Knightswood Hospital, £340 3s.

BARNSLEY CORPORATION.—Metro-Vick Supplies, Ltd., wireless receiving set (excluding loud speakers) for Kendray Hospital, £108 15s. (Recommended.)

LEEDS CORPORATION.—T. Harding Churton and Co., Ltd., supply of 53 electric motors (aggregate about 2 900 H.P.), for the boiler house equipment of the new Kirkstall power station.

INDIAN STORES DEPARTMENT.—Metropolitan-Vickers Electrical Co., Ltd., transformer, Rs. 1 381; English Electric Co., Ltd., compressor head, Rs. 1 205; W. T. Henley's Telegraph Works Co., Ltd., wire, Rs. 1 167.

HASTINGS CORPORATION.—Ferguson, Pailin, Ltd., supply of switchgear for ten sub-stations, £711 6s. 8d.; Peter Lind and Co., Ltd., construction of reinforced concrete cooling tank, at power station £2 495 (in lieu of a previous tender).

BEDFORD CORPORATION.—British Thomson-Houston Co., Ltd., supply of ammeters and current transformers, for works sub-station, £16 0s. 3d.; Siemens Bros. and Co., Ltd., cables for auxiliary motors, £94 8s. 7d.; W. H. Allen, Sons and Co., Ltd., supply of rotary feed pump, £260.

MANCHESTER CORPORATION.—Seddon and Sons, alterations to electric lighting installation at Bangor Street School; Sudlow and Co., alterations to electric lighting installations at New Islington clinic and Claremont Road School; Sudlow and Co., electric light wiring, etc., at Horsfall Museum and branch art gallery.

AUSTRALIAN POSTMASTER GENERAL.—Underground and aerial cable, £38 138, British Insulated Cables Ltd.; telegraph instruments, £2 121, Siemens (Aust.) Pty., Ltd.; telephones and dials, £550, Siemens (Aust.) Pty., Ltd.; telephones and dials, £3 117, British General Electric Co., Ltd.; cordless switchboards, £1 759, Ericsson Telephone Manufacturing Co.; cordless switchboards, £4 249, Siemens (Aust.) Pty., Ltd.; transmitters and associated parts, £642, Siemens (Aust.) Pty., Ltd.; loading coil pots, £7 488, Standard Telephones and Cables (Aust.), Ltd.; insulators, £15 216, Firebrick Insulator and Pottery Co. Pty., Ltd.; insulators, £12 760, Australian Glass Manufacturers Co., Ltd.; insulators, £729, Sunshine Porcelain Potteries, Pty., Ltd.; copper and cadmium wire, £38 464, British Insulated Cables Ltd.; telephones and dials, £19 961, Automatic Telephones, Ltd.; copper tapes, £744, J. B. Wallis, Ltd.

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# WORK IN PROSPECT.

ALCESTER.—Housing scheme, Salford Priors, for the Rural Council. Particulars from Surveyor, Bleachfield Street.

BOGNOR.—Council offices, to cost over £18 000, for the Urban Council. Particulars from contractor, Mr. H. W. Seymour.

CAMBORNE.—Housing scheme (50), for the Urban Council. Particulars from Surveyor.

CANNOCK.—Nurses' home, to cost £6 500, for the Board of Guardians. Particulars from architect, Mr. Wormall.

DAVENTRY.—Houses, Byfield, for the Rural Council Particulars from architect, Mr. J. B. Williams, Moot Hall, Daventry.

EXETER.—Extensions to county offices, to cost £50 000, for Devon County Council. Particulars from County Architect, Exeter.

GREAT WYRLEY.—Church, for the Primitive Methodist Trustees, to cost £2 500. Particulars from contractor, Mr. H. Darrall, Chadsmoor, Staffs.

HEADINGTON (OXFORD).—Housing scheme (60), for the Urban Council. Particulars from Surveyor, Stile Road.

HENLEY-ON-THAMES.—Refuse destructor, etc., to cost £11 182, for the Town Council. Particulars from Borough Surveyor.

MALLING (KENT).—Houses, for the Rural Council. Particulars from contractors, Mr. Lewis Thorpe, Southborough, and Pickup and Earl, Maidstone.

MAYBOLE (AYRSHIRE).—Reconstruction of parish church. Particulars from Rev. D. Swan.

NEWBURY.—Conversion of Phœnix House into offices and council chamber, for the Rural Council. Particulars from contractor, Mr. A. G. H. Weaver.

NEW OLLERTON.—Church, to cost £10 000. Particulars from secretary, Mr. H. T. Shelton.

OLDHAM.—Church schools, Leesfield, to cost £13 340. Particulars from vicar, Rev. F. W. C. Woollett.

PETERBOROUGH.—Rebuilding "Fox and Hounds" Inn, Longthorpe, for Cutlack and Harlock, Phœnix Brewery.

PRESTWICK (AYRSHIRE).—Houses (17), for Mr. John Boyd, Cumnock.

RADCLIFFE (LANCS).—Additional 70 houses, for the Urban Council. Particulars from Surveyor.

READING.—Cinema theatre, Russell Street and Oxford Road, for Mr. H. S. Scott.

SALFORD.—Offices to cost £3 000, for the Town Council. Particulars from Borough Surveyor.

SHIFNAL.—Housing scheme (12), for the Rural Council. Particulars from Surveyor.

SUNDERLAND.—Block of 75 flats, for the Town Council. Particulars from Borough Surveyor.

SWANAGE.—Housing scheme (30), Herston, for the Urban Council. Particulars from Surveyor, Mr. F. Camble.

TILEHURST.—Hospital for the Royal Berkshire Hospital Governors. Particulars from architects, Charles Smith and Son, 164, Friar Street, Reading.

TROWBRIDGE.—Business premises, Fore Street, for F. W. Woolworth and Co., Ltd., Kingsway, London.—Creamery, for Messrs. Walden, Hilperton.

WALSALL.—Church, to cost £15 000, for the Wesleyan Trustees. Particulars from Secretary.

WHITBY.—Fire station, for the Urban Council. Particulars from contractors, Braim and Sons.

YEOVIL.—Housing scheme (120), for the Rural Council. Particulars from surveyor.

## JOHN BENN HOSTEL.

The national ballot on behalf of the John Benn Hostel, Stepney, will close on December 31st next. The competition has excited a remarkable amount of interest, not only in London, but throughout the country.

When Sir Ernest Benn announced, nearly six months ago, that it was his intention to run the Boys' Ballot to extricate the John Benn Hostel from its financial difficulties, his many trading friends responded with a generosity which can seldom have been exceeded. Almost at once a list of 350 prizes was forthcoming, some of them very valuable, and their total exceeds £1 500 in value. A shilling ticket carries with it the possible winning of prizes so varied as a Standard 14-28 H.P. four-cylinder and "Sherbourne" touring saloon, and a fortnight's winter sport in Switzerland.

Tickets for the ballot can be obtained from the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

# TRADE PUBLICATIONS.

THE Superheater Co., Ltd., has published a booklet devoted to superheating. The reference is S.4.

List R.C.F., by Domestic Electrification, Ltd., illustrates and describes the type R.C.F. 3 kW fire.

A special leaflet dealing with h.t. units and battery chargers has been published by Philips Lamps, Ltd.

The current blotter of Poynter, Griffiths and Co., Ltd., bears an illustration of the Maxim lamp poster.

The fifth edition of the book of Apex switch and fuse gear issued by the Foster Engineering Co., Ltd., has been received.

**The cover of a new lamp booklet by Philips Lamps, Ltd.**

The British Thomson-Houston Co., Ltd., has issued a circular letter concerning the Mazda-Nickel filament valve.

Messrs. Phillips and Turner have issued a new catalogue of electrical accessories, buckle clips, saddles, earth clips, etc.

A booklet entitled "The Care of the Ruston and Hornby 'Cold Starting Heavy Oil Engine" has been published by Sternol, Ltd.

The Parsons Oil Engine Co., Ltd., has issued a new edition of the book, "Parsons Industrial Installations." The object of the book is to put before intending purchasers examples of the diversity of purpose for which Parsons engines are now used.

A new catalogue concerning Lucifer electric portable lamps has been published by Falk Stadelmann and Co., Ltd. The reference is No. C.03.

The Maxim electric toaster is the subject of a special leaflet by British B.A.G., Ltd. The Maxim electric iron is also treated in the same way.

An abridged list of time switches, automatic switches, sign controllers and flashers has been published by the Enterprise Manufacturing Co., Ltd.

The General Electric Co., Ltd., has published leaflet No. D.M.4 771, giving fixing and operating instructions for the Magnet electric gramophone motor.

The Electrical Equipment and Carbon Co., Ltd., has sent us a copy of a number of spectograms of the various brands of Siemens carbons. In all, fourteen examples are given.

Scavenging blowers for two-stroke cycle Diesel engines are dealt with in a new publication by Brown Boveri and Co., Ltd. The reference number of this new issue is 1 070E—X—3.

British Insulated Cables, Ltd., have published leaflet P.241, dealing with cables supplied for a.c. working pressures of 66 kV and 33 kV, which in conjunction with P. 240 and P.226 replaces P.174.

British Insulated Cables, Ltd., have published a "document" bearing an official seal, drawing attention to the fact that they produce lead seals for the sealing of meters, cut-outs, lighting fixtures, etc.

The first edition of the 1928-29 catalogue of "M.K." Electric, Ltd., has been received and contains particulars of new ranges of plugs and sockets. A number of price reductions have also been made.

E.1. 68 and E.1.67 are two new leaflets dealing with "Pixy" bell pushes and "Auto Combination" ironclad switch and plug connectors with automatic release. Both leaflets are published by A. P. Lundberg and Sons, Ltd.

Ferranti, Ltd., has prepared booklet W.C.404, entitled "True Radio Reproduction," in order to serve as a special souvenir of the National Radio Exhibition. It is, of course, a sequel to "The Way to True Radio Reproduction." A number of technical details, curves, oscillograms, etc., are given, and many interesting facts about radio are discussed.

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# ELECTRICITY SUPPLY.

## New Power Station at Peterhead—Electric Light at Crowland—Derby's New Generating Plant—Domestic Apparatus at Barnsley—Wickford Electricity Undertaking—Bulk Supply for Blyth—Baghdad Lighting and Tramways.

CAPE TOWN Electricity Committee is to lay mains in the Plumstead district at a cost of about £1,000.

The Peterhead Electricity Co., Ltd., has been authorised by the T.C. to erect a new electric power station in Ugie Street.

Bangor T.C. decided last week to obtain a supply of electricity in bulk from Belfast.

Electric light was switched on at Crowland for the first time on September 14th by Coun. J. G. Bowditch, chairman of the Electricity Committee of Spalding U.D.C.

Derby T.C. has received from the Central Electricity Board permission to instal a 20,000 kW set with two boilers, instead of a 10,000 kW set with one boiler.

A scheme is being put in hand for the re-conditioning of the electric mains at Windsor. In the Eton area d.c. will shortly be changed over to a.c.

Wyre has withdrawn its opposition to the use of overhead mains by the Shropshire, Worcestershire and Staffordshire Electric Power Co. for the supply of electricity to the parish.

Barnsley T.C. has instructed the borough electrical engineer to prepare a scheme offering to consumers certain domestic electrical apparatus on a system of extended payments.

The Ascot and District Electricity Co. proposes to erect a sub-station at Brookside for the purpose of supplying the housing estate of Windsor R.D.C.

The Wickford (Essex) Electrical Supply Co., on September 19th, inaugurated its new generating plant, which consists of a 90 H.P. Petter crude oil engine, coupled to a 500 V 60 kW Crompton generator.

Col. T. C. Ekin, of the Electricity Commission, will open an inquiry at Crawley on October 16th in regard to the charges made by the Sussex Electricity Supply Co.

Islington (London) Electricity Committee has obtained sanction for loans of £20 000 for mains and £35 000 for sub-station equipment and switchgear.

Cape Town Corporation Electricity Committee has voted £1 500 for the provision of telephone cable required for the combined supervisory control and intercommunication system between sub-stations.

The ratepayers of Blyth (Notts) have decided to obtain electricity for public lighting from the supply given by Electrical Distribution of Yorkshire, Ltd., with which a contract has been entered into by Lord Barnby.

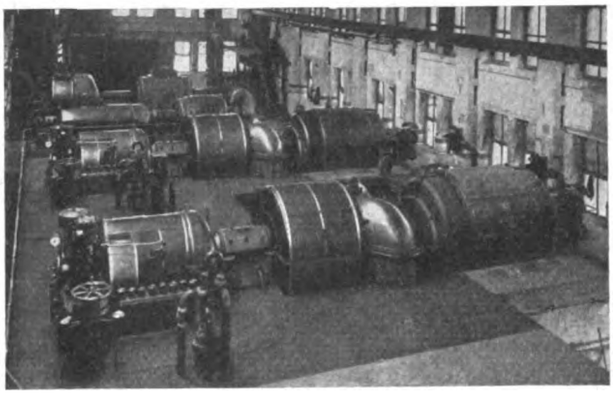
The erection of electric-lighting standards in connection with the Shannon scheme has been begun in Queenstown district. They consist of creosoted wooden poles, and their unsightly appearance has aroused adverse comment.

A bill granting a fifty-year concession to a British syndicate for the provision of electric lighting and the construction of tramways in Baghdad was passed by the Irak Chamber of Deputies last Friday.

Reporting upon complaints about the smoke nuisance at King's Road power station, St. Pancras (London) Electricity Committee states that smoke elimination apparatus is being fitted on the two pulverised fuel boilers and the two Niclausse boilers, and should shortly be in operation.

The opening of the extended electricity station at Peterborough, which had been fixed for September 13th, has been postponed indefinitely, but Sir John Duncan, chairman of the central electricity board, has agreed to perform the opening ceremony when it is arranged.

Aberdeen T.C. decided last week that certain streets be lit by electricity. Coun. Carry informed the Council that the maintenance of lighting the streets by electricity was cheaper by £172 2s. annually than gas.



*HUDDERSFIELD EXTENSIONS.*

*"FLORENCE" and "Alice," the two new 6 000 kW "English Electric" turbo-alternators which were formally started up at Huddersfield on Wednesday. The boiler plant has also been remodelled and brought up to date. The condensers of the new turbines were supplied by Hick, Hargreaves and Co., and the auxiliary pumps are driven by "Brook" motors, the whole of the switchgear being made and erected by the Metropolitan-Vickers Electrical Co. Capital expenditure on the Huddersfield undertaking, of which Mr. J. W. Turner is the chief electrical engineer, is claimed to be less than £12 per kW of plant installed. The turbine room, which now contains 23 500 kW of steam turbine plant, with room for expansion to 30 000 kW, is the identical building which, when erected in 1893, housed three Mordey-Victoria single-phase alternators aggregating 250 kW.*

The first 230,000 kWh were charged at 3d. per kWh and all above that quantity at 1d.

Bowland R.D.C. has approved a plan of a transformer station to be provided by Clitheroe T.C. in connection with the scheme to supply electricity to Waddington, West Bradford, and Grindleton.

Aylesbury T.C. has applied for a loan of £34,328 for prospective expenditure on mains, services, domestic apparatus and plant, transformers, etc.—The Council is to supply electricity for shop window lighting between 7 p.m. and 10 p.m. at 2d. per kWh.—Thame Urban Council has accepted the tender of the Corporation for electricity for street lighting purposes.

The proposal to use electricity for street lighting in Maryfield Crescent was considered at a recent meeting of Leslie T.C. The Clerk read a letter from the Fife Power Co., quoting 47s. 6d. for a 60 W and 57s. 6d. for a 100 W lamp for 1,500 hours. The ordinary gas standards are to be used, the power company supplying the necessary fitments at a cost of £4 per standard. The Council decided in favour of electric light.

Fordingbridge R.D.C. has decided to consent to the application of the Power Development Co. for a Special Order to supply electricity in the Council's area. A generating station will not be established in the Fordingbridge area, and a bulk supply will be obtained from a neighbouring authorised undertaking. The company states that this supply may be supplemented by electricity derived from the water power resources of the area.

A Ministry of Transport inquiry has been held relative to the application of Hastings Corporation for permission to erect overhead wires in a considerable area in East Sussex for the supply of electricity. The deputy town clerk said that the estimated cost of the whole scheme was £70 000, and with regard to opposition on the grounds of amenity the effect of erecting the poles would not be so objectionable as was suggested. Until the cost of the work has been met the tariff would be 3d. per kWh above that at Hastings, which was 8d. for lighting, and 1½d. for heating, cooking and power.

Blackburn Town Council has approved a special tariff for industrial baking on the following terms, subject to a minimum installation of 10 kW and a guaranteed consumption of 2 000 kWh per quarter: ¾d. per kWh from 8 p.m. to 4 p.m.; and 1¼d. from 4 p.m. to 8 p.m., subject to an emergency increase of 10 per cent.; and plus 9s. per quarter for time switch and meter rent.—The electrical engineer has been authorised to arrange terms for the supply of electricity to Livesey for street lighting purposes.—Application is to be made for a loan of £14 500 to meet the cost of two schemes for the supply and distribution of electricity to the Yew Tree Brow and Arterial Road districts.

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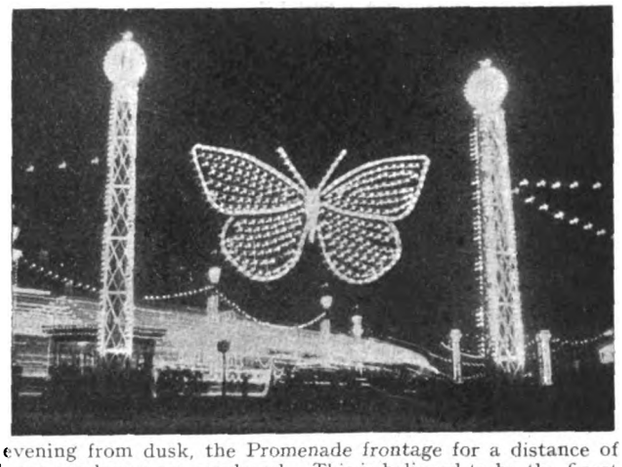
# ELECTRICAL NEWS IN PICTURES.

What is said to be the fastest cable in the world has just been laid between Bay Roberts, Newfoundland, and Horta, Azores, for the Western Union Cable Co., Ltd. Costing about £400 000, and capable of carrying five messages each way at the same time, it will enable use to be made of surplus cable capacity between the Azores, Southern Europe, and Northern Africa. The top left hand picture is of historical interest in that it shows the "Dominia" at anchor in St. John's harbour, with the point from which the first transatlantic wireless message was sent as a background. On the right is shown the spliced cable being dropped overboard after the joining of the shore end and deep sea portions.



The Blackpool illuminations season is now in full swing and each evening from dusk, the Promenade frontage for a distance of four miles from south shore to Bispham is a blaze of light in which 300 000 lamps are employed. This is believed to be the finest example of decorative lighting that has ever been witnessed in this country, and it has involved the use of ten miles of feeder cables and 16½ miles of wiring. From end to end, the Promenade is festooned with strips of multi-coloured lights, which are relieved at intervals by large electrically lighted pylons, colonnades and numerous decorative features such as a big windmill, a butterfly, electric fountains, etc. Some idea of the elaborate arrangements which have been made will be gathered from the two illustrations above.

Members of the Radio Manufacturers' Association and their friends at the National Radio Exhibition dinner which was held at Olympia on the eve of the opening of the show. Sir William Bull, president of the Association, was chairman, and among the guests was Senator Marconi. A brief report of the speeches will be found on page 353, while a review of the exhibition is given on p. 342.

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# SELLING LINES.

THE Hurley Machine Company has introduced a new Thor agitator washer, equipped with a No. o automatic electrically heated ironer, an illustration of which is given on this page.

**The new "Thor" electric washer.**

The finish of the machine is either East India buff or ebony trim according to choice. The tub, mounted on a heavy, pressed steel base, with four legs of the same metal, spot welded and riveted, is of cold drawn Armico iron, vitreous enamelled, and fitted with a pressed aluminium splash ring and cover. The capacity of the machine is 6 lb. and the whole of the mechanism is enclosed. A 12 in. wringer is fitted, and controls for operating either this or the washer are provided. The motor is an enclosed type ¼ H.P.

Philips Lamps, Ltd., a short time ago specially designed and introduced a variety of reflector fittings, bearing the description Types AK and AG, and NR and ND. The first of these fittings are manufactured of black enamelled sheet iron, and are intended for street and similar lighting. They are provided with a white enamelled reflector, which can be used either convex or concave, a special point being that they are fitted with a simple sliding system which facilitates correct adjustment of the lamp and holder. The type AK is recommended for lamps of 60-200 W, and type AG for lamps 300-800 W. Types NR and ND, for factory lighting, are manufactured of the same material as the types above, but, due to the inner surface being coated with white enamel, the use of a separate white enamelled reflector is rendered unnecessary. The ND type is also fitted with a sliding system for adjusting lamp and holder. For the NR fittings, no adjustment as used on the other named types is necessary, for in this type, the lamp holder is mounted in such a way that the difference between the light centre length of the various lamps is so small that adjustment is superfluous. For the different NR fittings, the greatest efficiency is obtained by using lamps with wattages as follow:—NR 30, 60 and 75 W; NR 35, 100 and 150 W; NR 40, 200 W; NR 45, 300-750 W. For the NR type 45 an extra weatherproof canopy is supplied. The NR type is specially recommended for the illumination of railway embankments, quays, sidings, and general indoor or outdoor factory lighting where wide distribution of light is required.

The Hart Manufacturing Co., of 76-76B, Rochester Row, S.W.1, is shortly introducing a new range of heavy duty rotary switches. These new switches are of very attractive design and excellent finish. They will be equipped with Bakelite shock-proof covers, the indications being sunk into the face, showing up in white filling against the black backgroud of the cover. The switches have been designed primarily for heavy duty commercial ranges and water heating work, and for special uses where long life and rigid construction are essential. The general appearance of the switch will be particularly striking, and care has been taken in the designing so that in addition to controlling heavy loads, the switch will also be capable of controlling high voltages up to 600. The following types will be available in a few weeks, in capacities ranging from 25 A 250 V to 45 A 250 V or 54 A at 125 V; single and double pole series parallel, single and double pole "on and off," and three point, or three circuit. In addition, the same design will be used for the production of triple pole rotary switches in similar capacities. We understand that samples will be available shortly, and, since supplies will be somewhat limited for the time being, those interested in this development are advised to communicate with the manufacturers.

A no-battery torch which we are informed has sold in large quantities in America is being introduced on the British market by Cunliffe, Hillstead, MacDonald and Co., Ltd., 6, Duke Street, London, S.W.1, in time for the Christmas trade. The torch has no lever, and continues to operate even when placed on the ground or elsewhere, and consequently the hands of a person using it can be absolutely free. The advantages of such an arrangement have been quickly recognised by motorists in America where the new torch is used as a "stand-by." The torch is cylindrical in shape, and a few turns of the stem wind a spring motor which, when switched on, drives a dynamo. By means of a small focussing pin, the bulb of ths lamp can be adjusted to spot or flood-light as desired.

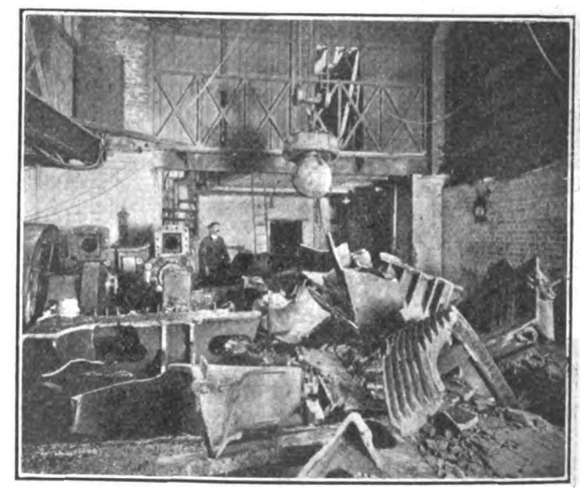
We have received particulars of a new type of electric radiator, an Australian invention, the world rights in which, it is understood, are being disposed of in the U.S.A. The radiator comprises two co-axial reflectors, spaced apart, one above the other, and a heating element fixed between them. The lower reflector is concave and the upper reflector is convex. The top of the structure is preferably cased over, and the unit is either suspended or mounted on an appropriate pedestal. The space between the reflectors is preferably enclosed by a wirework grille fixed marginally to the rims of the reflectors. The device is sponsored by the Simplex Radiator Co., 72, Pitt Street, Sydney, N.S.W.

## A NOVEL APPLICATION.

### The Use of Electric Lifting Magnets for Demolition Purposes.

THE electric lifting magnet, while chiefly employed for the handling of magnetic materials, is also useful when its properties are applied to the demolition of obsolete engineering plant which may have no further commercial value other than that of scrap material.

In this type of work the best results are obtained by using a breaker ball in conjunction with a circular type lifting magnet. The magnet is slung from the most convenient type of hoisting gear available, and as large a drop as possible is allowed between the breaker ball and the plant to be demolished. Work of this description has recently been undertaken in a large works in the Midlands, where an obsolete 1 000 H.P. triple expansion steam engine, previously used for driving workshop machinery, has been replaced by up-to-date electrical gear.



**Demolishing obsolete plant by means of Witton-Kramer lifting magnets.**

The whole of the plant used in demolishing this engine was manufactured and supplied by the Witton-Kramer Electric Tool and Hoist Works, of the General Electric Co., Ltd., Witton, Birmingham, and included a double drum worm geared hoist block, having a maximum capacity of 5 tons, a 36 in. diameter electro-lifting magnet, and a steel ball weighing 25 cwt. This equipment is shown in the photograph, the breaker ball (in this case a pear-shaped breaker was used) being held by the magnet directly above what was the 18-ton grooved flywheel of the engine. Upon switching off the current from the magnet, the breaker ball fell on the flywheel, and after a comparatively few blows caused the breakages shown. The magnet after releasing the ball was lowered off to reclaim the breaker ball, which was again released. This process was repeated until the whole of the engine was reduced to sufficiently small proportions for the metal to be handled conveniently.

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# COMPANY NEWS.

## Enhanced Prices of Electricity Supply and Telegraph Securities—General Electric Co.'s Resolutions to Maintain British Control—Baird International Television Statutory Meeting —Directors' Reports and Dividends.

THE principal change shown this week by our usual table of electrical share price quotations is a rise of 3s. 9d. in the ordinary shares of Newcastle-upon-Tyne Electric Supply Co. These, as the result of buying, have been marked up in the official list to 30s., which is the same figure as that for the Newcastle and District Co.'s shares, which have also recently risen. Eastern Telegraph stock has reached 260 and a rise of 6s. 3d. has brought Marconi's Wireless shares to 77s. 6d. International Marines have risen half a crown.

| Last Annl. Divd. | Description | This Week. | Last Week. | 1928 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*c*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 40/6 | 40/6 | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 20/6 | 20/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 28/- | 28/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 46/10½ | 48/1½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 30/- | 26/3 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops,Worcs&StaffsPowerB.Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 38/- | 37/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. .. | 129 | 126 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72 | 72 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. .. | 79 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. .. | 79½ | 80 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 68½ | 68½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 67½ | 67½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 79 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/- | 27/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 83/9 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 81/3 | 86/- | 22/- |
| 6½ | ,, ,, 6½ C.P. .. | 23/9 | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| — | Crompton Parkinson Pref. Ord. .. | 18/- | 18/- | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st. Pref. .. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 6/10½ | 6/10½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/-* | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/6 | 28/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. | 41/6 | 41/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 112/6 | 111/3 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 37/6 | 37/6 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 33/9 | 33/1½ | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 52/6 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 30/- | 30/- | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 260½ | 247½ | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. .. | 69½ | 69½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 21½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38½ | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 46½ | 46½ | 56¾ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 77/6 | 71/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 56/6 | 54/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25⅛ | 24⅛ | 23 | 11/3/6 |

(*a*) 1s. 7 ⅞d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus.

BURNDEPT WIRELESS (1928), LTD.—The recent issue was over-subscribed.

ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. at rate of 8 p.c. p.a. (same rate as last year) is announced.

SHAWINIGAN WATER AND POWER CO.—Div. of $1½ p. sh. has been declared on the common shs. for qrtr. endg. Sept. 30.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—Pref. and ord. sh. transfer books are closed until Sept. 29, inclusive.

WARD AND GOLDSTONE, LTD.—The div. of 4 p.c. recently announced was not an intm. div. as stated, but the fin. div., makg. 11 p.c. for the year 1927-8.

FOLKESTONE ELECTRICITY SUPPLY CO., LTD.—Intm. div. at rate of 8 p.c. p.a. (same rate as last year) on the ord. shs. for half-year will be payable on Oct. 1.

BRUCE PEEBLES AND CO., LTD.—Div. at rate of 7½ p.c. p.a., less tax. on 7½ p.c. cum. participatg. pref. shs., for half-year ended June 30, will be payable on Sept. 29.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Transfer books will be closed from Oct. 1 to 13, inclusive, for preparatn. of pref. and ord. div. warrants.

KAMINISTIQUIA POWER CO., LTD.—The co. will on Nov. 1, 1928, redeem all its outstanding 1st mtge, 25 year 5½ p.c. sinkg. fd. red. deb. stk. series A at 104 p.c., with accrued int.

SOCIETE INTERCOMMUNALE BELGE D'ELECTRICITE.—During the present week Messrs. M. Samuel and Co., Ltd., of 25 and 27, Bishopsgate, London, E.C.2, have offered for sale £500 000 35-year sinkg. fd. 5½ p.c. sterling bds. of this co. at 91 p.c.

POWER CORPORATION OF CANADA.—Gross earngs. for year ended June 30, 1928, $2 128 641, agst. $796 635 in previous year; net earngs. $1 624 186. After provisn. for divs., res., premiums on securities, etc., surplus was $1 681 932 agst. $545 245. Earngs. on common A stk. $5.67 agst. $2.77.

BERMUDA TRACTION CO.—Statutory rpt. states that 124 393 £1 ord. shs. have been issued as fully paid and 607 allotted wholly for cash. Total receipts to Sept. 12, 1928, £158 781, and after provisn. for various paymts., includg. £100 000 British Government Treasury bills, £98 986, blce. in bank on deposit and currt. accts. amt. to £13 861.

LIGHTING TRADES, LTD.—Pft. for year ended March 31, £12 304, agst. £11 637, plus income from investmnts. £5 052, and taxatn. and other reserves not now required, £4 725. After provisn. for depreciatn. and addg. blce. brt. in, there remains £20 262. After paying div. on pref. shs., £3 125 is carried fwd. Turnover has become more satisfactory since acquisitn. of business of J. and W. B. Smith.

COMPANIA DE ELECTRICIDAD DE LA PROVINCIA DE BUENOS AIRES, LTD.—Holders of coupons No. 34, attached to 5 p.c. 1st mtge. gold bds. payable on Oct. 1, 1928, will receive paymt. at rate of 8s. p. coupon, tax free, provided they are domiciled in the United Kingdom, and subject to British income tax, on presentatn. of such coupons (three days before paymt.) at the office of Binder, Hamlyn and Co., 80, Bishopsgate, London, E.C.2.

PACHUCA LIGHT AND POWER CO.—Coupon No. 36, due Oct. 1, 1928, on 5 p. c. 50-year 1st mtge. bds. will be paid on and after that date at Canadian Bank of Commerce, 2, Lombard Street, London, E.C., at their office in Toronto, Canada, or at the agency of the said Bank in New York, or at the Caisse Générale de Reports et de Dépôts, Brussels, or the Banque Commerciale de Basle, Basle, Switzerland. Coupons must be lodged three clear days previous to payment.

### Company Meetings.

GENERAL ELECTRIC CO., LTD.—In the absence of Sir Hugo Hirst, who is on his way to Australia, Mr. Ernest G. Byng, vice-chairman of the company, presided at an extraordinary general meeting on Monday, at which resolutions were confirmed altering the articles of association so that, in future, only British shareholders may vote, in order that no danger may arise of the control of the company passing out of the hands of British shareholders residing within the Empire. A report of the meeting at which the resolutions were passed appeared in our issue of September 14th.

CROMPTON PARKINSON, LTD.—Mr. Frank Parkinson, presiding at the annual meeting last week, said according to the

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terms of the articles of association only the holders of the deferred ordinary shares were entitled to attend and vote at the general meeting, except in circumstances which did not at present arise. The preference and preferred shareholders however, had been invited to attend. Mr. Colin Cooper, Mr. Albert Parkinson and he had been elected directors,

*A SECTION of the large party which gathered at the Jubilee celebrations and sports at the Sports Ground of the Social and Athletic Club of W. H. Willcox and Co., Ltd., Elmers End, on September 15th.*

and he was glad to inform the shareholders that Col. R. E. Crompton had consented to return to the board. The total profit earned during the period covered by the accounts was £70 826. Although the period was slightly over a year, the general state of trade in the period when their amalgamation negotiations were proceeding, combined with the detrimental effect of the inevitable rumour as to what was transpiring, so affected the general business of the company as to offset the additional period. As regards F. and A. Parkinson, Ltd., the period of trading was a normal year, and the extension of their period had been made solely to bring their closing date in line with that relating to their associated company. This profit compared very favourably with the previous combined earning capacities of the two companies, showing about 26 per cent. increase. The profit was sufficient to cover the dividend on the preference capital five times, and after such dividend had been met, the remaining profit would cover the preferred ordinary dividend at least three times. If the balance brought forward from last year were added and the dividends already paid were deducted, they arrived at a final distributable figure of £70 129. Their liquid resources had materially increased, and their cash position had changed from an overdraft of £37 336 to a credit of £54 018. They had created a capital reserve account, representing the difference between the purchase consideration for the shares in F. and A. Parkinson, Ltd., and the par value of the shares allotted for the satisfaction of such consideration. They had commenced to reap the advantages of the unification of control. The advantages referred to had only been available since September last, and in some directions their progress was necessarily slow. Their turnover had increased, and their order book showed more work in hand at both factories than was the case at the commencement of the financial periods now under review. So it would not appear to be unduly optimistic to look forward to even better results next year. It was proposed to subdivide the present deferred ordinary shares into 200 000 shares of 5s. each and to augment these by the creation of a further similar number issued to the existing holders as bonus shares. The report was adopted, and final dividends of 4 per cent. on the preference shares, making a total of 8 per cent., and of 7s. 6d. per share on the deferred ordinary shares, making a total of 10s. per share, were approved.

BAIRD INTERNATIONAL TELEVISION, LTD.—At the statutory meeting on Tuesday, Lord Ampthill presided, and gave particulars of the progress of the company since it was authorised to commence business on June 26th last. He said it would be remembered that, prior to the formation of that company, an American company was formed for manufacturing and marketing Baird transmitting and receiving apparatus in the United States, Canada and Mexico. Since the formation of Baird International Television, Ltd., further progress had been made by Television, Ltd., with regard to the exploitation of the American, Canadian and Mexican rights, and it had been successful in negotiating the formation of a powerful American company for that purpose. The whole of the American, Canadian and Mexican rights were vested by way of licence in the American parent company, which had a capital of 1 000 shares of no par value, 50 per cent. of which were held by Baird International Television, Ltd., together with its associated English company. The American parent company had caused to be formed a company named the Baird Television Corporation, U.S.A., which he would call the operating corporation. Its capital was 1 000 000 shares of no par value, 900 000 of which were "A" shares and the remainder "B" shares. The latter carried all the voting rights in the operating corporation, and they were held solely by the American parent company. Baird International Television, Ltd., had subscribed for 60 000 "A" shares in the operating corporation, and if in the immediate future further moneys were required they were to be permitted to subscribe for a further 40 000. In addition, they and their associated English company, through Television, Ltd., participated in an option granted to Television, Ltd., to call for, at any time during a period of five years from the date of incorporation, the allotment of 300 000 "A" shares in the operating corporation, at $2.50 per share. The shareholders might be surprised to hear that the radio industry was the third largest industry in the United States. Some little time ago, at the request of important radio interests in Holland, arrangements were made by that company for exhibiting there the types of the radio and television apparatus which were now being shown by the Baird Television Development Co., at Olympia. Operators were sent to Holland, and demonstrations have been given at the Rotterdam Exhibition of Stereoscopic Television. Apparatus similar to that now being demonstrated by the Baird Development Co. at their premises adjoining Olympia was about to be sent to Holland for the purpose of giving demonstrations at the Rotterdam Exhibition. They had been successful in obtaining from the Dutch Government the use of one of the broadcasting stations controlled by the Dutch Government in Holland. Negotiations were proceeding for the formation in Holland of a company to exploit the rights in that territory. In regard to Spain, they were in negotiation with interests there which controlled the present broadcasting in that country, and they had no reason to doubt that these negotiations would result in the formation of a Spanish company with adequate facilities for the broadcasting of television combined with music, singing and speech. Prominent business men and engineers from Buenos Aires recently visited this country and were given demonstrations of television at the laboratories of the Baird Development Co., and heads of agreement had been prepared for the formation in the Argentine of a company for the exploitation of the rights in the Baird inventions in the Argentine and such other South American States as they in their discretion might agree. They had no reason to doubt that the formation of a company in the Argentine would be accomplished within quite a short time. They had been in negotiation with a representative of a company in Australia which had the concession from the Government for broadcasting for advertising and for general purposes, as distinct from the usual broadcast programmes equivalent to our broadcast programmes here. The representative of the broadcasting company in Australia had demonstrations of the television apparatus at the Baird Development Co.'s laboratories, and he had already agreed with the basis upon which the company would pass over to a company to be formed in Australia the rights in the Baird inventions for the Commonwealth of Australia.

## New Companies.

RADIA ELECTRIC CO. (GLOUCESTER), LTD.—Cap., £100. To acquire business of electrical, telephone and radio engineer carried on by H. W. Haydon at Electra House, 158, Bristol Road, Gloucester.

EDISON BELL (INTERNATIONAL), LTD.—Cap., £300 000. Manufacturers of and dealers in telephones, wireless apparatus and accessories, etc. Reg. office: Edison Bell Works, 62, Glengall Road, Peckham, London, S.E.15. (Public Co.)

GRAHAM FARISH, LTD.—Cap., £5 000. Manufacturers of and dealers in wireless equipment, electrical engineers and contractors, manufacturers of and dealers in transformers, radiators, dynamos, motors and wireless instruments, insulating materials, etc. Reg. office: 17, Masons Hill, Bromley, Kent.

POYNTON'S, LTD.—Cap., £1 000. To acquire business now carried on at Newcastle-on-Tyne as Jas. Poynton and Co. and to carry on business of manufacturers of and dealers in telephones, telegraphs (wireless or otherwise), dynamos, accumulators and lamps. Solicitors:—Keenlyside and Forster, Newcastle-on-Tyne.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ANGERS, A., AND CO., 10 Hatton Garden, Liverpool, electrical engineers. £60 3s. 3d. August 21st.

BROWN, G. W., 173, Union Street, Dunstable, electrician. £16 8s. 10d. August 18th.

BYRN, A. H., 14, Queen Street Arcade, Cardiff, wireless dealer. £37 0s. 11d. August 8th; and £41 16s. 10d., August 4th.

ELECTRICAL CONTRACTING CO., 7, Christmas Street, Bristol, electrical engineers. £14 12s. 6d. August 17th.

EMBURY, H. and K., Kingskerswell, electricians. £20 1s. 2d. June 29th.

FITT, J., 8, Leybourne Terrace, Stockton, electrical contractor. £18 10s. 7d. August 14th.

FLETCHER, Charles, 35, Clematis Street, W.12, electrical engineer. £17 17s. 10d. August 17th.

HORTON AND MARCHANT, South Street, Tarring, West Worthing, electrical engineers. £13 10s. 9d. August 14th.

JACOBS, E. V., 3, Ashfield Court, The Grove, Ealing, wireless engineer. £22 10s. 5d. August 10th.

JONES, C. M., 11, Anerley Road, Upper Norwood, radio dealer. £20 2s. 8d. August 15th.

MONTGOMERY, — (late trading as BRUCE AND CO.), 37, Charville Road, W., electrical engineer. £28 13s. 3d. August 15th.

PARKINSON BROS., 127 Euston Road, Morecambe, electricians. £34 7s. 1d. August 14th.

SIGNS OF THE TIMES, LTD., 150, Moor Street, Birmingham, electric sign manufacturers. £16 17s. 3d. July 31st.

SINCLAIR, Stafford, 68, Gamage's Buildings, Holborn, E.C., electrical agent. £14 14s. August 22nd.

SMITHIES AND CO., 43, Horsethorpe Road, Crossgates, Leeds, electrical engineers. £20 2s. 1d. August 16th.

TAYLOR, F. A. (trading as KINGSTON RADIO STORES), 2, Station Approach, Kingston-on-Thames, electrical engineer. £11 10s. 9d. August 13th.

TAYLOR, Frank, 60–61, Victoria Arcade, Southend-on-Sea, electrical engineer. £10 15s. 6d. August 16th.

WOOD, George A., 148, Bark Street, Bolton, electrical engineer. £35 1s. 7d. August 9th.

## Deed of Arrangement.

MALPAS, Cyril Dudley, trading as C. DUDLEY AND CO., Carlton Street, Blyth, electrical engineer. Dated September 5th, filed September 12th. Trustee, T. M. Richardson, 54, Cloth Market, Newcastle-on-Tyne, accountant. Liabilities unsecured, £288; assets, less secured claims, £105.

## London Gazette, etc.

### Company Winding-up Voluntarily.

GENERAL DISTRIBUTION CO., LTD. By reason of its liabilities, September 17th. H. Miller, chartered accountant, 52 and 53, Cheapside, London, and Central Chambers, Slough, appointed as liquidator. Meeting of creditors at Room No. 6, Public Hall, Slough, on Friday, October 5th, at 11 a.m.; creditors' claims by October 4th.

### Bankruptcy Information.

EXCEL RADIO COMPONENTS, 53, Abington Street, Northampton, manufacturers of wireless sets and components. Receiving order, September 21st. Creditor's petition.

PERKINS, Sydney, 1, Lodge Lane, Beeston, Leeds, wireless dealer. First meeting, October 1st, 11 a.m., Official Receiver's Office, 24, Lower Bond Street, Leeds. Public examination, October 23rd, 10.30 a.m., County Court House, Albion Place, Leeds.

### Notice of Dividend.

SHORROCK, Harold Northrop, 79, Granville Road, Morecambe, and also at Holling's Yard, Heysham Road, Morecambe, electrical engineer. First and final dividend, 3s. 0½d. per £, payable September 28, Official Receiver's Offices, 9, Cannon Street, Preston.

### Notices of Intended Dividends.

DAVIES, Charles Harrison, 6, Stamford Arcade, Ashton-under-Lyne, electrical engineer and contractor. Last day for receiving proofs, September 29th. Trustee, J. D. Turner, Byrom Street, Manchester, official receiver.

DIXON, Leslie Arthur Nevett (trading as C. FORGHAM AND CO.), 23A, Princess Street, Shrewsbury, and Old Post Office Yard, Shrewsbury, electrical engineer. Last day for receiving proofs, October 10th. Trustee, C. J. Pyke, 22, Swan Hill, Shrewsbury, Official Receiver.

EDWARDS, Arthur Mansell, 111B, High Street, Blackwood, Monmouth, electrical engineer, trading as MANSELL EDWARDS AND CO. Last day for receiving proofs, October 10th. Trustee, E. Owen, 34, Park Place, Cardiff, Official Receiver.

WEEKES, Amos Lawrence, 13, Crescent Road, Luton, Bedford, electrical engineer. Last day for receiving proofs, October 2nd. Trustee, A. J. Rogers, The Parade, Northampton, Official Receiver.

### Partnerships Dissolved.

CLIFTON ELECTRICAL AND AUTOMOBILE ENGINEERS (Thomas THOMAS and Cyril Colvin TAYLOR), electrical and automobile engineers, 48, Broadway, Cardiff. By mutual consent as from September 20th, 1928.

JENKINS AND MORELAND (George JENKINS and Albert Edward MORELAND), Wokingham, electrical and wireless engineers, by mutual consent, September 10th, 1928. The business will be carried on by G. Jenkins, who will discharge debts and liabilities, and receive payments of all sums due.

JOSEPH WEBSTER (Joseph WEBSTER and John WEBSTER), electrical engineers, 65C, Moss Lane, Orrell Park, Liverpool. By mutual consent as from September 18th, 1928. Debts received or paid by J. Webster, who continues the business.

WARD AND ANDRESON (Charles Leonard WARD and John Caldwell Maitland ANDRESON), electrical engineers, 6, Station Road, Upminster, Essex, by mutual consent as from September 11th, 1928. Debts received and paid by C. L. Ward.

## Bankruptcy Proceedings.

N.K. (BRADFORD), LTD.—The statutory meetings of creditors and of shareholders in the compulsory liquidation of this company (see THE ELECTRICIAN, 4/5/28, p. 513) were held last week at the Board of Trade Offices, Carey Street, London. The winding-up order was made on July 2nd on the joint petition of the Armorduct Cable Co., Ltd., and the Vulcan Electrical and Mechanical Co., Ltd. A statement of affairs was submitted showing liabilities £11 750, of which £7 335 is returned as due to 112 unsecured creditors. The assets are valued at £4 476, of which £46 is required to pay the claims of preferential creditors and £4 368 that of the debenture holder, leaving net assets, £61, or a deficiency with regard to the creditors of £7 274. With regard to the shareholders a total deficiency of £9 274 is disclosed. The Official Receiver said that the company was incorporated on July 31st, 1926, for the purpose of carrying on business as manufacturers of and dealers in electrical lamps and fittings. The nominal capital was £2 000 in shares of £1 each, of which 1 998 had been issued as fully paid to the promoter, Arthur W. Kimber. In November, 1913, a company called Napier Kimber, Ltd., had been registered to carry on a similar business and to take over the branch of another company carrying on business in London as electrical engineers. Such company appeared afterwards to have conducted a branch business in Bradford. But on February 4th, 1925, a receiver for debenture holders was appointed and a resolution for voluntary liquidation was passed on February 19th, 1925. That company had issued debentures for £7 000 to Kimber and they were satisfied in June, 1923, apparently by means of a bank overdraft, fresh debentures being issued to the bank. In March, 1925, Kimber bought the Bradford business of that company from the receiver for £2 989, and in the following month he registered N.K. (Ltd.) to which he sold it, and it appeared that the company, in addition to carrying on business in Bradford, traded in London. Kimber said that it was considered advisable to separate the two businesses, and therefore N.K. (Bradford), Ltd., was formed in order that the Bradford business might be conducted by a separate company. The transaction, said the Official Receiver, began with the purchase in February, 1925, by Kimber, of the Bradford branch of Napier Kimber, Ltd., and concluded with the transfer of that business to another company, and appeared to have been carried through solely for the benefit of Kimber. The turnover during the twelve months ending December 31st, 1926, amounted to £10 681, on which there was a gross profit of £2 806 and a net profit of only £240. During the subsequent trading until April 4th last there was a turnover of £9 848, a gross loss in trading of £31, and a net loss of £3 580. In March last, the bank demanded repayment of its overdraft and interest, but the company failed to meet that demand, and the bank appointed a receiver and manager. He had since sold the property of the company and collected certain of the book debts. He had paid the debenture holder £2 550 and reported that the outstanding book debts amounted to £700. Therefore, commented the Official Receiver, there appeared to be no prospect that the debenture claim would be satisfied in full and consequently there was no likelihood of any surplus assets becoming available for distribution among the unsecured creditors. In the opinion of the Official Receiver, the company's goods after the end of 1926 were sold at an insufficient margin of profit, and the overhead expenses were much greater than were justified by the turnover. Mr. Dow (the Armorduct Co., Ltd.) asked that there should be a thorough investigation into the circumstances which led to the sale of the business to the company. There had already been the failure of one company, and it was felt that this should not be allowed to happen again. The meetings resulted in the liquidation remaining in the hands of the Official Receiver, no committee of inspection being appointed.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### September 6th.

25 584 FORTA INTREPRINDERI ELECTRO-MECANISE and A. SISMANOPOL. Secondary cells. (10/9/27, Roumania.)
25 646 G. J. A. and L. FULLER. Galvanic batteries.
25 618 F. M. VAN GELDEREN. Removing insulation from wire. (4/11/27, U.S.)
25 602 W. HAHN and H. WARNCKE. Telephone systems, etc.
25 597 INTERNATIONAL GENERAL ELECTRIC CO., INC. Floor polishing apparatus. (9/9/27, U.S.)
25 580 W. G. POETZSCH. Producing electrolytic deposits of chromium. (10/9/27, Germany.)
25 580 W. G. POETZSCH. Eliminating excess sulphuric acid from chromium electrolytic baths. (10/9/27, Germany.)
25 565 J. K. M. ROBERTS. Converting electric energy into heat.
25 644 SCHLOEMANN, A.G. Roller for conveying magnetisible articles. (17/9/27, U.S.)

### September 7th.

25 770 ASSOCIATED TELEPHONE AND TELEGRAPH CO. Electro-magnetic relays. (24/10/27, U.S.)
25 769 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and J. E. OSTLINE. Impulse generators for telephone systems, etc.
25 709 BRITISH THOMSON-HOUSTON CO., LTD., and G. O. WATSON. Electric ship propulsion systems.
25 706, 25 707 CIE FRANCAISE POUR L'EXPLOITATION DES PROCEDES THOMSON-HOUSTON. Electric converting apparatus.
25 748 J. T. CRENNELL, A. C. GOOLDEN, W. MCCLELLAND, H. WATERHOUSE and E. T. WILLIAMS. Secondary batteries.
25 768 EASTERN TELEGRAPH CO., LTD., and H. V. HIGGITT. Electrical relays.
25 723 FANSTEEL PRODUCTS CO., INC. Supply of current to thermionic valves. (6/10/27, U.S.)
25 733 C. E. FOSTER and H. C. OUGHTON. Sensitive electrical regulating devices.
25 705 GENERAL ELECTRIC CO., LTD., and F. M. JACKSON. Ventilation of electrical machines.
25 692 R. MADDISON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electric terminals.
25 727 NEWCOMBE-HAWLEY, INC. Acoustic device for transmitting sound. (12/3/28, U.S.)
25 728 NEWCOMBE-HAWLEY, INC. Electrostatic sound producers. (11/7/28, U.S.)
25 689 J. WALKER, and WALKER, HUNTER AND CO., LTD. Electrical heating elements.
25 676 J. WILSON. Carrier arms for magnetic pick-ups.

### September 8th.

25 854 AUTOMATIC TELEPONE MANUFACTURING CO., LTD., and T. BLASHILL. Telephone systems.
25 819 H. K. BATES. Telephone call boxes, etc.
25 820 H. K. BATES. Street boxes, etc. for electrical gear.
25 867 J. B. HANSELL and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Tanks for oil immersed electrical apparatus.
25 863 A. H. SEABROOK. Poles for supporting electric wires, etc.
25 881 J. SEEGMULLER. Electric meat, etc., roasters. (16/9/27, France.)
25 812 A. M. TAYLOR. Reducing induced currents in lead sheaths of cables.

### September 10th.

25 973 AKT.-GES. BROWN, BOVERI ET CIE. Electric rectifiers. (10/9/27, Germany.)
25 907 R. BOSCH AKT.-GES. Electric switch boxes. (12/9/27, Germany.)
25 951 BRITISH THOMSON-HOUSTON CO., LTD., and T. K. KINMAN. Radio apparatus.
25 952 BRITISH THOMSON-HOUSTON CO., LTD., and H. C. HEATH. Circuit breakers.
25 950 M. DIETERLEN and SIEMENS-SCHUCKERTWERKE A.G. Cooling device for electric machines.
25 903 DRYSDALE AND CO., LTD., and J. YOUNG. Electric heating apparatus.
25 916 F. A. EVENETT. Device for preventing crossing of electric cables, etc.
25 917 GENERAL ELECTRIC CO., LTD., and E. H. CRIBB. Signalling systems.
25 954 F. C. HACKETT and L. C. STANLEY. Electric relays, etc.
25 885 A. HENDERSON. Electric fire alarm systems for ships.
25 000 MARCONI'S WIRELESS TELEGRAPH CO., LTD. Circuits for high frequency communication systems. (10/9/27, U.S.)
25 979 L. H. PETER, and WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Amplification of electric currents.
26 001 PLZEN SKODA WORKS. Manufacture of closing wedges for electric machines, etc. (14/9/27, Czecho-Slovakia.)
25 983 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Light signals. (10/3/28, U.S.)
25 905 G. WILKINSON. Thermal electric switches.

### September 11th.

26 111 AKT.-GES. BROWN, BOVERI ET CIE. Electric leads for condensers. (27/3/28 Germany.)
26 098 ALLGEMEINE ELECTRICITATS GES. Apparatus for transmitting railway signals to trains. (12/9/27, Germany.)
26 089 ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Expansion vessels for transformers.
26 042 F. BAKER, and E. A. BRYAN. Electromagnetically-operated counting devices, etc.
26 119 P. BAXTER. Synchronous motors.
26 061 BRITISH THOMSON-HOUSTON CO., LTD. Preparing electrical apparatus. (12/9/27, U.S.)
26 062 BRITISH THOMSON-HOUSTON CO., LTD. Electric rectifying systems. (12/9/27, U.S.)
26 105 C. R. COOK. Electric terminals, etc.
26 073 C. HARDIE. Manufacture of Rontgen screens. (12/9/27, Germany.)
26 047 G. E. HEYL. Applying radio-active substances.
26 067 M. PAUL and P. WANGEMANN. Measuring electric quantities. (3/12/27, Germany.)
26 074 L. E. RYALL. Thermionic amplifiers.
26 034 N. SAMUEL, F. SCHULMAN and H. DES B. SIMS. Storage batteries. (9/7/28, U.S.)
26 042 SIEMENS BROS. AND CO., LTD. Electromagnetically operated counting devices, etc.
26 091 R. UNZEITIG. Electric regulator. (13/9/27, Austria.)

### September 12th.

26 212 AKT. GES. BROWN, BOVERI ET CIE. Polyphase protective apparatus, etc. (12/9/27, Germany.)
26 204 E. W. BAKER, and TYER AND CO., LTD. Operation of railway signal apparatus, etc.
26 203 E. BODER. District control system of electrical contact apparatus. (10/2/28, Germany.)
26 139 S. O. BOWKER. Electric junction boxes.
26 156 J. S. BURNS. Points for tramways, etc.
26 201 EDISON SWAN ELECTRIC CO., LTD. Bonding devices for electric conductors.
26 174 GENERAL ELECTRIC CO., LTD., and H. G. MCCLEAN. Motor control systems. (21/9/27, Germany.)
26 202 INTERNATIONAL GENERAL ELECTRIC CO., INC. Transformers. (14/9/27, Germany.)

# ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by GEE AND CO., Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.***

*Opposition to the registration of the following trade marks can be lodged up to October 12th.*

LIMIT. 490 199. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including talking machines and parts of talking machines. Limit Engineering Co., Ltd., 17, Albion Street, King's Cross, London, N.1; manufacturers. April 5th, 1928. (To be Associated. Sect. 24.)

DIKTATOR (sign). 491 857. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers. May 26th, 1928. (To be Associated. Sect. 24.)

ROBOT. 492 274. Class 8. Wireless telephonic apparatus, talking machines and talking machine records, but not including electric batteries or cells or parts thereof, and not including any goods of a like kind to any of these excluded goods. Thomas Large, 6, Irby Avenue, Eric Road, Wallasey, Cheshire; manufacturer. June 11th, 1928.

CLIX. 492 399. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching, but not including cameras, educational models, or educational appliances, and not including any goods of a like kind to any of these excluded goods. Lectro Linx, Ltd., 254, Vauxhall Bridge Road, London, S.W.1; manufacturers. June 14th, 1928. (To be Associated. Sect. 24.)

*Opposition to the registration of the following Trade Marks can be lodged up to October 19th.*

491,713. Class 6. Electrical machinery. Chesterton Jones and Co., Ltd., 44-45, Littleton Street, Walsall, Staffordshire; manufacturers.—May 23rd, 1928. (To be Associated. Sect. 24.)

491,860. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. The Parlophone Co., Ltd., 1, Broad Street Place, London, E.C.2; manufacturers.—May 20th, 1928. (To be Associated. Sect. 24.)

OCTRODA.—492,187. Class 8. Wireless telephonic receiving sets. The M.P.A., Ltd., 62, Conduit Street, Regent Street, London, W.1; manufacturers.—June 18th, 1928. (By Consent.)

# METAL AND CHEMICAL PRICES.

TUESDAY, September 25th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £68 0 0 | £1 10 0 | — |
| Electro Wirebars | ,, | £71 15 0 | £1 0 0 | — |
| H.C. Wires, basis | per lb. | 10 5/8d. | 1/2d. | — |
| Sheet | ,, | 10 1/2d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1 1/8d. | 1/2d. | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2d. | — | — |
| Sheet ,, | ,, | 9 1/2d. | — | 1/8d. |
| Wire ,, | ,, | 9 1/2d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 5 0 | — | — |
| Foreign or Colonial | ,, | £21 17 6 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £220 10 0 | £7 0 0 | — |
| Wire, basis | per lb. | 2s. 10 1/2d. | 1d | — |
| *Aluminium Ingots* | per ton | £95 0 0 | £2 0 0 | — |
| *Spelter* | ,, | £24 5 0 | — | 5s. 0d. |
| *Mercury* | per bottle | £24 15 0 | 10s. 0d. | — |

*Sulphur*—Flowers, Ton £12 0 0 *Sodium Chlorate*—Per lb. 2 1/2d.
,, Roll, ,, £10 15 0
*Sulphuric Acid* (Pyrites, 168°), Ton £6 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30 *Sodium Bichromate*—Per lb. 3 1/2d.
*Rubber*—Para fine, 10 1/2d.; plantation 1st latex, 8 1/2d.

. . The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

## LEAD MARKET REPORT.

The opening of the lead market last week was, according to James Forster and Co., slightly easier, but with the American price raised to 6.50 cents, prices became firmer on Tuesday in sympathy.

Closing prices on September 21st were £22 for September, £21 18s. 9d. for October £21 16s. 3d. for November, and £21 13s. 9d. for December, practically unchanged on the week.

# Coming Events.

### Friday, September 28th.

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row. Lecture by Mr. G. Rogers on "Automatic Sub-Stations." 7 *p.m.*

### Monday, October 1st.

SOCIETY OF ENGINEERS.—Apartments of the Geological Society, Burlington House, London. Paper by Dr. G. E. K. Blythe on "Pulverised Fuel in Theory and Practice." 6 *p.m.*

### Tuesday, October 2nd.

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—Junior Institution of Engineers, 39, Victoria Street, Westminster. Presidential address by Mr. S. B. Donkin. 7.15 *p.m.*

ELECTRICAL SOCIETY OF GLASGOW.—34, Gordon Street. Paper by Mr. W. Wilson on "Research Applied to Electrical Engineering." 7.30 *p.m.*

### Wednesday, October 3rd.

ELECTRICAL CONTRACTORS' ASSOCIATION (SOUTHERN SECTION).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (BATH SUB-BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (CARDIFF BRANCH).—Ordinary meeting. 2.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (BELFAST BRANCH).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

### Thursday, October 4th.

ELECTRICAL CONTRACTORS' ASSOCIATION (NEWCASTLE BRANCH).—Ordinary meeting. 11 *a.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (BRISTOL BRANCH).—Ordinary meeting. 3.15 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN (MANCHESTER DISTRICT BRANCH).—Town Hall. Open meeting. Address by Lieut.-Col. W. A. Vignoles on "The New Electricity (Supply) Act, 1926." 7.30 *p.m.*

### Friday, October 5th.

JUNIOR INSTITUTION OF ENGINEERS.—30, Victoria Street, Westminster. Lecture by Mr. A. J. Simpson on "Interesting Details of Swiss Alpine Railways." 7.30 *p.m.*

E.D.A. FACTORY AND WORKSHOP LIGHTING CAMPAIGN.—E.L.M.A. Lighting Service Bureau, Savoy Street, Strand, London. Sales Conference and Demonstration for London and Home Counties District. 7.30 *p.m.*

### Saturday, October 6th.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.—Hotel Cecil, Strand, London. Annual dinner. 5.30 for 6 *p.m.*

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

*Bouverie House, Fleet Street, London, E.C.4. Telegrams: Benbrotric, Fleet, London." Telephone: City 0244 (Ten lines).*

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# Current Topics.

## The "Electrical Outlet" Campaign.

We gather, from the comments of some electricity supply engineers and others connected with the industry, that the Electrical Association for Women is flying a little too high in the number of electrical outlets suggested in the Women's National Specification, which has been prepared for use in its Electrical Outlet Campaign. If this is the only criticism, there can be little with which to find fault in a campaign which is likely to be of great benefit to the industry, though that, of course, is not its real object. We must realise that the specification represents, not what engineers think the housewife should have, but what a large number of the women most intimately concerned think they are entitled to expect in an electrical installation in a new house. With no particular axe to grind, except that of increased convenience and comfort for themselves and others of their sex, they have so far divested themselves of superstition as to make the number of suggested outlets in a standard Ministry of Health house total up to 13; but, as the figure is additional to one good lighting point in each room, those who go in fear of the unlucky number will probably include the lighting points in their sum of outlets. Already, members of the E.A.W. have visited some 25 housing estates, representing over 2 000 houses, and have found that while electric light was, almost without exception, installed as a matter of course, little or no provision was being made for power. This is not altogether surprising, as it was found that builders still regarded an adequate provision of outlets as a luxury, and in no sense as necessary as, say, a hot water supply. The whole question of outlets and the size of consumers' services—60 A has been suggested as a suitable minimum for new installations—is of vital importance in the development of the domestic uses of electricity, and we should like to see the industry making some real effort to get this right. In the past, inadequate services and wiring have provided tremendous customer-resistance to the selling of domestic electrical apparatus, and, though improvement in old houses must inevitably be slow, there is no reason why we should allow similar obstacles to be created right under our eyes.

## Fuel Consumption Returns.

Analyses and summaries of the returns made to the Electricity Commissioners of units generated and fuel consumed at generating stations in Great Britain during the year ended March 31st, 1928, have just been published by H.M. Stationery Office (price 1s. 6d. net). While the publication follows the general form adopted in the two preceding years we are glad to see that the summary tables showing the best results as regards average fuel consumption and thermal efficiency have been restored. From these summaries it is easy to see that Barton again tops the list of steam stations for thermal efficiency at 21·07 per cent.; while the Padiham station of the Lancashire Electric Power Co., is only slightly behind with a figure of 21·03 per cent. On fuel consumption the position is reversed Padiham coming lowest in all groups of steam stations with 1·37 lb. per unit generated while Barton shows 1·39 lb., a figure which is also achieved by the North Tees station of the N.E.S. Co. Returns were received in respect of 570 generating stations, the same number as in the previous year. The total output of these stations during the year under review was 9 927 850 630 kWh, an increase of 18·7 per cent. on the figures for the preceding year, while the total coal, coke and fuel oil consumed was 9 224 151 tons, representing an increase of 4·1 per cent. It is pointed out that in seeking to draw comparisons with the previous year regard must be had to the adverse effect of the prolonged coal strike in 1926-27 upon the output and operating results in that year. We learn with interest that a further subdivision of the particulars as between local authority and company undertakers, railway and tramway authorities and non-statutory undertakings will be included in the Commissioners' Eighth Annual Report which is now in course of preparation.

## Television Demonstrated.

It was with feelings of gratification that we started out to attend a demonstration of television last week, at the invitation of the Baird Television Development Co., Ltd., at the company's special studio at Olympia, adjoining the National Radio Exhibition. Our views with regard to television in its present stage of development have already been expressed in these columns and it was, therefore, with raised hopes that we accepted the invitation to witness the demonstrating of televisors offered for public sale. We were prepared to accept a picture which was good but not perfect; we felt generous as to the "experimental age" of the science and for that reason did not expect too much; but, in spite of these none too enthusiastic feelings, we were disappointed. In the first place the picture was small and lacked detail, and, in the second place, the transmission

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was made by wire over a distance of a few feet only. We were told that the lack of detail was due to the un-" made-up " faces of the performers, and that, given suitable cosmetics, the features would show up clear and sharp. Bearing in mind that this was a demonstration by invitation and not of our own seeking, the Baird Company was, we presume, out to make a favourable impression, and for that reason it seems strange that excuses should have been offered for the lack of detail when the remedies were declared to be known. On the whole our disappointment was made all the greater by the announcement in the company's recent advertisements that television was ready for public enjoyment. We were prepared to enjoy but we were not allowed to. The demonstration showed that television by wire is possible, but it showed nothing else. Further, if the results obtained over a few feet of wire were as we saw them, we can only presume that they would be less clear when received, on, say, the "Aquitania " in mid-Atlantic, or in less distant latitudes on apparatus handled by a member of the public inexperienced in the operation of such a receiver. Though we have no desire to depreciate what has been done, we have nevertheless been educated by the Baird Company into expecting more than we are apparently entitled to. The pictures we saw were really pictures and they moved, but they were rather poor pictures to say the least. In our opinion, television as practised in this country has a long road to travel before it arrives at that condition reached by broadcasting in 1923, and though the work so far accomplished is highly commendable, the amount of progress made during the later years seems to indicate that the more advanced problems are becoming increasingly difficult of solution.

## Electrical Men in Public Life.

THE selection of Mr. H. J. Galliers, the well-known electrical contractor, to fill the office of Mayor of Brighton is an honour of which the electrical contracting side of the industry may well be proud. But this justifiable pride must be tempered by the reflection that electrical men, as a whole, play a regrettably small part in the public life of their own localities. The municipal electrical engineer, it is true, frequently figures in municipal affairs—securing at times more local publicity than he feels he deserves—but, unfortunately, he cannot secure election as chairman of his own Electricity Committee. But engineers engaged in other sections of the industry are not so restricted, and might, with great advantage, both to the public and themselves, secure representation on the local governing body. Then, when matters of electrical interest came up for consideration there would be at least a nucleus of electrically enlightened opinion to leaven the deliberations of the committees of laymen and thus prevent the taking of decisions inimical to electrical progress. We therefore hope that more members of the electrical community will emulate Mr. Galliers, who is probably one of a very small band of electrical men to be chosen for the office of Mayor.

## Successful Word Coining.

THERE have been many attempts to find snappy new words to take the place of the old-established electrical names for use by the general public, but so far few have met with any sort of success. The competition we organised a few years ago with the object of finding a simple descriptive name for a registered electrical installation contractor yielded nothing worthy of adoption by the National Register, and it seems as if the attempts of a contemporary to discover a monosyllabic word to replace " electricity " will meet with a similar fate. Occasionally, however, there comes to the electrical word coiner that happy inspiration which compensates for the past accumulation of unusable words. In this category we must certainly place the word " Metrovication " which, we have learnt from a current newspaper advertising campaign, is synonymous with modern electrification. It seems to apply equally well to industrial as to domestic electrification, conveys the idea of electrification and also associates electrification with a particular firm. In its way " Metrovication " is one of the best word inventions we have encountered for a very long time.

## The Importance of Detail.

THE importance of acquiring knowledge with the local requirements of overseas markets cannot be over-emphasised, and is in fact treated with due seriousness by most manufacturers in this country. We raise the question of local preferences on account of the fact that there has come to our notice an American commerce report dealing with the subject of flash lamps and hand torches. In this class of electrical exports the Americans look to Australia and New Zealand as their best buyers, and it is interesting to note that such small details as finish, shape and size occupy most of the report under review. The purposes for which such lamps are used in Australia, the towns which favour nickel finish and those which prefer black metal are enumerated, while the popularity of two and three cell lamps is also dealt with. Perhaps the most interesting item in the report, so far as we are concerned, reads to the effect that " the British products have so far been exceedingly faulty in most cases and have not found favour as they would have otherwise. Recently, however, marked improvement has been noted in the British manufacture." The satisfaction, or otherwise, gained from a flash lamp is, of course, dependent upon the service it gives ; in other words, the life of the battery. This in its turn is, in the case of Australia, dependent upon the ability of the battery to stand up to the temperature variations in transit, for whichever way round the globe the goods are shipped, they must hold their voltage through equatorial heat. This we appreciate is no small test of a battery, and one which we believe is receiving the attention of the battery makers of both this country and America. The problem, however, is not easy of solution. A way out of the difficulty would perhaps be found in placing the batteries in a moderate temperature cold storage during the voyage.

## A Point about Voltmeters.

PROBABLY the most popular type of voltmeter used by the general public is the " double-reading " variety having ranges from 0-6 V and 0-100 V, their chief purpose being to measure the voltages of the low and high-tension batteries of wireless receivers. A point of interest in connection with these instruments is the matter of their resistance, for of the cheap type with resistances of as low as 4 000Ω there are innumerable quantities offered for sale as being suitable for measuring the voltages of high-tension batteries. These meters, with very few exceptions, originate on the Continent and sell at a price somewhere about five shillings. On the face of things they are an attractive proposition, but when one considers the capacity of the average h.t. battery and the low resistance short-circuit put across it when using one of the voltmeters in question, it does not require a mathematical genius to work out the heavy load placed upon the battery by so doing. Further, it has been brought to our notice that a number of dealers in batteries use meters of this type for testing their voltage before sale, ignorant of the harm they are doing. This danger of low resistance voltmeters seems to us to be an unlooked-for obstacle. For, assuming that a perfectly good h.t. battery is sold to a member of the public in possession of a cheap voltmeter, it will not be long before the battery drops in voltage, much to the disgust of the purchaser and seeming discredit of the maker. The attitude of the public with regard to electrical measuring instruments of this type is that they are necessary evils, but unnecessary expenses, with the result that they buy as cheap an instrument as they can find. The problem is one which calls for attention and would probably be best solved by retailers explaining the position in a concise way with the aid of Ohm's law. The position would be further improved if all British-made meters bore an indication of their resistance, for both readings.

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# THE NEW I.E.E. PRESIDENT.

## Career of Lt.-Col. Kenelm Edgcumbe—Early Days at Cr[illegible]—Measuring Instruments—His Work on the International Electr[illegible]—Keen Territorial.

IN selecting Lt.-Col. Kenelm Edgcumbe to succeed Mr. Archibald Page as President, the Institution of Electrical Engineers has, after a considerable interval, gone back to the manufacturing side of the electrical industry, last represented by Dr. Ferranti in 1910.

Educated at Harrow, Dresden, and University College, London, it was in 1893 that young Edgcumbe, like many other distinguished electrical engineers, became an apprentice at the original Arc Works, Chelmsford, of Messrs. Crompton and Co.

On leaving Cromptons, the then newly-formed Northampton Polytechnic in London attracted his attention, and he spent something over three years there as a lecturer.

In 1900, however, he joined Mr. E. I. Everett in founding the firm of Everett Edgcumbe and Co., their first works being situated in Charterhouse Square, London. After two years they removed to Great Saffron Hill, and at the end of another two years progress demanded a further removal, this time to the site of their present works at Hendon.

As many of our readers are aware, Lt.-Col. Edgcumbe, who is chairman and managing director of the company, has, from the earliest days of his career, identified himself with the design of electrical measuring instruments, protective relays and similar gear, and has contributed numerous papers on these subjects to various institutions, notably three to the Institution of Electrical Engineers in 1904, 1920, and 1927. The last-mentioned paper, which he read in conjunction with Mr. F. Ockenden, established a number of new features in connection with such instruments. For example, it was there shown how current transformers could be designed to give an accuracy hitherto unobtainable, and also how the hysteresis error in moving-iron instruments might be eliminated.

Apart from his work on the manufacturing side, Lt.-Col. Edgcumbe has for many years played an active part in movements affecting the whole industry. For the last fifteen years or more he has been closely associated with the work of the I[illegible] mission, of which he [illegible] secretary in succession [illegible] had succeeded Col. Cr[illegible]

*LT.-COL. K. EDGCUMBE, T.D., R.E., (T.A.) ret.*

*A portrait study of the new President of the Institution of Electrical Engineers, who assumed office on Monday.*

[illegible] ing [illegible] subscr[illegible] having [illegible] nent [illegible] paration [illegible] of Electric[illegible] ing terms [illegible] lished by the [illegible]

The Electric[illegible] search Associa[illegible] which he is a [illegible] of the council, and [illegible] international Illumina[illegible] tion Commission, of which he is a vice-president, and chairman of the British National Committee, may be mentioned amongst his other activities.

His connection with the Institution of Electrical Engineers dates from 1894, when he joined as a student. In 1899 he became an associate member, and in 1905 a full member. He was awarded the Institution's Extra Premium, and the Ayrton Premium. In 1922 he was elected a member of the Council, and has been a vice-president since 1925.

As his possession of the Territorial decoration denotes, he has a lengthy connection with the Territorial Army, which he joined in 1898 as a "sapper" in the London Electrical Engineers (Volunteers) formed by Dr. John Hopkinson, when president of the Institution. Remembrance of that distinguished past-president's work in raising, mainly from his own Institution, a technical corps which has been of great value to our land forces, leads one to hope that steps may be imitated by the new President, during the coming year, to restore to their full establishment the units of the "London Electrical Engineers," the work of which is becoming increasingly important in view of our vulnerability to air attacks.

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# THE HIGH-SPEED CIRCUIT BREAKER.

## Breakers Operating on Dead "Shorts" Only—The Sequence of Events—Adjustability in Tripping Element—Determining Strength of Magnetic Blow-out Field.

By W. H. THOMPSON, A.M.I.E.E.

(*Continued from page* 338).

IN order to design the impulse coil method of tripping it is necessary to consider the division of currents in parallel inductive circuits.

The circuits are represented in Fig. 3, in which "X" denotes the reactor coil, and "Y" the impulse coil. Under short-circuit conditions, current will flow along the main conductor, increasing at the rate of, say, "A" amperes per sec. When the point "D" is reached the current will divide between the two parallel paths in a proportion that is the inverse of their impedances. Or, if $i_1$ represents the current in the coil "X," and $i_2$ represents the current in the coil "Y," then, $\frac{d}{dt}(i_1+i_2)$ will equal "A" at any instant.

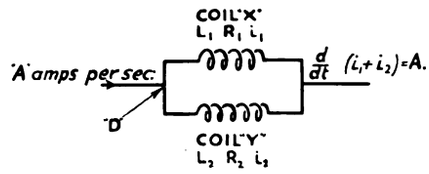


Fig. 3.

Also, if $L_1R_1$ represent the inductance and ohmic resistance, respectively, of the coil $X$, while $L_2R_2$ represent the same for the coil "Y," then it is essential, from the law of Kirchhoff, that

$$L_1\frac{di_1}{dt}+R_1i_1=L_2\frac{di_2}{dt}+R_2i_2 \quad . \quad . \quad . \quad (17)$$

The solution of this differential equation is :—

$$i_2=\frac{R_1A}{R_1+R_2}.t+\left\{\frac{AL_1(R_1+R_2)-R_1A(L_1+L_2)}{(R_1+R_2)^2}\right\}\left\{1-\epsilon^{\frac{-R_1+R_2}{L_1+L_2}.t}\right\} \quad . \quad . \quad . \quad . \quad (18)$$

And from this it is possible to determine the value of $i_2$—the impulse coil current—at any instant "$t$."

Now with a given pull-off force $P$ exerted by the springs on the armature, it is not sufficient that the corresponding pull exerted by the magnet on the same armature shall be equal exactly to $P$. Its magnitude must be greater than $P$, otherwise a small decrease in the hold-on flux will result in the breaker tripping. On the other hand, if the hold-on force is made much greater than $P$, there will be too long a time lag before the hold-on flux has been decreased to tripping value.

For any given form of mechanism and pull-off force, there will be one, and only one, minimum flux value at the magnet face below which the breaker will trip. And the margin above this value allowed for in the hold-on flux must depend upon the degree of sensitivity required in the breaker.

### A Reasonable Reserve.

In the case of breakers required to operate only on dead short-circuits, this margin must be kept as small as possible, and practice proves that 3 per cent. is a reasonable reserve. From this it follows that in order to trip the breaker at least 2·9 per cent. of the hold-on flux must be deflected from the armature. Practice proves that 5 per cent. is a more reliable value.

The pull required at the armature face being given, it is possible to determine the flux that must be provided in the hold-on magnet circuit, and also to determine the flux to be provided in the tripping circuit, whether impulse coil, bucking bar or any other type of magnetic release.

The sequence of events in the case of short-circuit is as follows :—

(1) BUCKING BAR.—A rapid increase of current through the bucking bar with a corresponding increase in the strength of the bucking bar field. A resultant decrease in the strength of field through the armature, until tripping value is reached. The value of the armature flux at any instant is, in this case, equal to the algebraic sum of the hold-on and bucking bar fields, plus that due to the hysteresis characteristic of the iron.

(2) IMPULSE COIL.—A rapid increase in main circuit current that results in an instantaneously high voltage being impressed across the impulse coil, with the resultant current growth in the latter. Growth of field created by impulse coil current, and corresponding decrease of field through the armature until tripping value is reached. In this case, the value of the armature flux at any instant is equal to the algebraic sum of the hold-on flux and the impulse coil flux plus that due to the hysteresis characteristic of the iron.

### Evaluating Impulse Coil Current.

The first thing to be observed from the above is that the smaller the hysteresis loop for the iron used, the smaller will be the time loss due to the hysteresis lag. In the case of an impulse coil breaker, there has been given an equation (18) from which it is possible to find the value of the impulse coil current at any instant "$t$"; and, as there is a definite value of impulse coil flux that will trip the breaker, the same equation will give the time at which this value is reached. Before, however, the equation can be solved, it is necessary to know the values of $A$, $L_1$, $R_1$, $L_2$, $R_2$.

The value of $A$ will depend upon the characteristics of the main circuit, and it is advisable to solve the equation for various values of this quantity.

Now $R_1$ and $R_2$ can be determined readily from the particulars of the reactor coil and impulse coils themselves. But, as the reactor coil is likely the blow out coil as well, it will surround an iron circuit, and it is obvious from this fact that the value of $L_1$ will vary according to the value of $i_1$ in the blow out coils.

Similarly, because the impulse coil will surround an iron circuit, the value of $L_2$ will vary as $i_2$. It is therefore necessary, before a satisfactory solution can be obtained, for the equation (18), to work out the variations of $L_1$ and $L_2$ for different values of $i_1$ and $i_2$.

It is known there are three different ways in which the

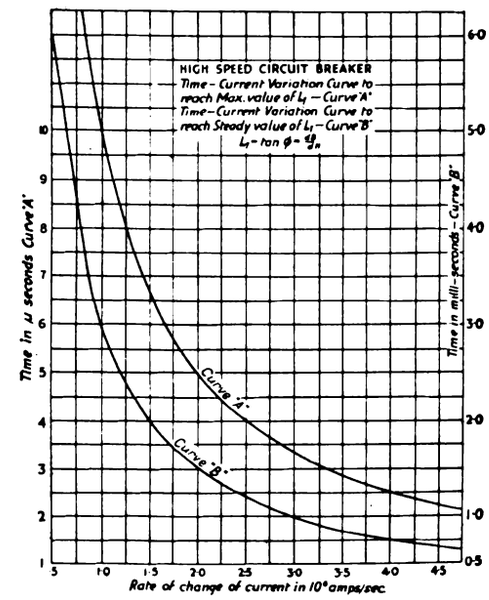


Fig. 4.

co-efficient of self induction of a circuit may be defined. One, as the ratio between the induced e.m.f., and the rate of change of the current producing it; or,

$$L \propto e.m.f. : \frac{di}{dt}. \quad . \quad . \quad . \quad . \quad . \quad (19)$$

Two, as the ratio between the flux in the circuit and the current producing it; or,

$$L \propto N : i. \quad . \quad . \quad . \quad . \quad . \quad . \quad (20)$$

Where $N$ = flux.

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Three, as the ratio between the energy stored in the magnetic field and half the square of the current at that instant ; or,

$$L \propto E : \frac{i^2}{2} \quad . \quad . \quad . \quad . \quad . \quad . \quad (21)$$

where $E$ equals this energy in the magnetic field.

It is also known that e.m.f. $\propto \frac{dN}{dt}$

Therefore, from (19),

$$L \propto \frac{dN}{dt} : \frac{di}{dt}$$

From which, $$L \propto \frac{dN}{di}$$

But the flux $N$ is proportional to $B$, and the current $i$ to $H$ ; therefore,

$$L \propto \frac{dB}{dH}$$

Again, from (20), it follows that, by the same reasoning as above,

$$L \propto \frac{B}{H}$$

By using either of the above definitions for " $L$," curves may be plotted for the variation of this function with current. Examples of such curves are given in Fig. 4.

There is, of course, a limit to the variation of this inductance, which occurs when the iron circuit has become saturated. " $L$ " then takes on a more or less steady value.

## An Example Case

The curves given in Fig. 4, for a [illegible] ample case, indicate the times taken for " $L$ " to reach [illegible] steady value, with different values of change of current, [illegible] also the times taken to reach the maximum value of " $L$ " [illegible] the same. It will be clear that the value of " $L$ " will start from some small value, will increase rapidly, and then approach a constant.

Having thus determined a series of values for $L_1$ and $L_2$ for various values of $i_1$ and $i_2$, it is now possible to solve the equation (17) for the values of $i_2$ with times. Curves should then be plotted for these solutions and for different rates of current growth in the main circuit. Then, from such curves, the time can be read for the impulse coil current to reach its tripping value.

As it is necessary that the same design breaker should be applicable to systems of different characteristics, it will be appreciated that some form of adjustment is desirable in the tripping element. This can be obtained by varying the inductance of the reactor coil or of the impulse coil ; and the latter is generally the more convenient method. An adjustment may also be obtained by the insertion of a variable resistance in the impulse coil circuit. It is to be remembered, however, that in a high frequency circuit it is the reactance that is the principal term of the impedance, and not the ohmic resistance. And the steepness of a short circuit current wave is equivalent to that of a high frequency wave.

Also, since the time constant of a circuit is equal to $\frac{L}{R}$, an increase in $R$ will result in a shorter, and not a longer, time interval for the tripping current to reach 0·632 of its maximum value.

(*f*) *The arc rupturing agent.*—This circuit will consist of a laminated iron core, laminated pole faces, and an air gap. The energising coils are generally in series with the main circuit. The pole faces are of a shape and size to cover the field in which the arc travels. Furthermore, these faces are not always laminated : but when they are the laminations are sometimes spread out fanwise to cover the field required. The blow-out effect in this case is naturally weaker than when they are concentrated.

The force of the blow-out depends, of course, upon the strength of the current in the arc, times the strength of the blow out field, and when the blow out coils are in series with the main circuit these two factors vary concurrently. Consequently, the greatest energy will be when the breaker commences to open.

It is undesirable that the blow-out action should be too severe ; because, as has been already explained, the too sudden extinction of the large short-circuit current with the resultant sudden collapse of the attendant magnetic field will induce pressure surges very dangerous to the various parts of the system, particularly across the brushes of the machines.

From the time figure it has been decided upon in which the breaker shall function, it should be possible, by calculating the time taken for the trip circuit to reach its operating value, and the time taken for the movement of the contacts, to determine the remaining time available for the disruption of the arc.

Let $\delta$ equal this last time interval ; it should, for reasons already given, be not too small. Again, knowing the time in which the breaker contacts will commence to open, and knowing the approximate rate of current growth under short-circuit conditions, it should be possible to estimate the value of the current at the instant of the establishment of the arc. It, therefore, remains to determine the strength of the magnetic blow-out field required to produce the necessary acceleration in the arc. This strength of the field can be considered as constant, although it is not strictly so. But the strength of current in the arc will decrease as the length of the arc increases; therefore, in the standard equation,

$$F = HIl \sin \theta,$$

(where $l$ equals length of arc) there are the two variables : $I$ and $l$. It is not, however, correct to assume that these two variables are conjugate functions ; although the departure from the truth by this assumption will be sufficiently small in practice to justify the much simpler mathematics involved. Now by simple mechanics, it is known that if $F$ is the moving force, $f$ the acceleration, and $m$ the mass, then,

$$F = mf.$$

Consequently,

$$HIl \sin \theta = mf.$$

From which $$f = \frac{HIl \sin \theta}{m} \quad . \quad . \quad . \quad . \quad (22)$$

But here the difficulty arises in what value is to be given to $m$, which is intended to represent the mass of the arc.

This can best be arrived at, and in a manner sufficiently accurate for practical purposes, by giving to $m$ the value of the mass of copper volatilised during the existence of the arc. This mass of volatilised copper will depend upon the strength of the current, and the time during which it persists. The latter has been denoted by $\delta$, and it is just as easy to determine $I$, the current value. If, then, )-( equals the heat developed,

$$)-( = EI\delta,$$

where $E$ is the voltage across the arc.

Let $T$ equal the temperature at which copper melts, then the heat required to volatilise a mass $m$ of copper, equals

$$msT \quad . \quad . \quad . \quad . \quad . \quad (23)$$

where $s$ equals the specific heat of copper. Therefore, from above,

$$4{\cdot}2\, msT = EI\delta$$

from which,

$$m = \frac{EI\delta}{4{\cdot}2sT} \quad . \quad . \quad . \quad . \quad (24)$$

and substituting the value of $m$, as given in equation (24), in equation (22),

$$f = \frac{4{\cdot}2HIl \sin \theta\, sT}{EI\delta} = \frac{4{\cdot}2HlsT \sin \theta}{E\delta} \quad . \quad (25)$$

and,

$$H = \frac{E\delta f}{4{\cdot}2lsT \sin \theta} \quad . \quad . \quad . \quad . \quad . \quad (26)$$

In order to find the value of $E$, which is the average pressure across the arc, it must be remembered that when the current is at its maximum value the voltage is at a minimum, and, as voltage is a linear function of current, the average value of the former will be the arithmetical mean.

## Determining Arc Line.

It is an experimental fact that approximately 400 V are required per ft. of arc length, so that at 1 500 V an arc 4 ft. long will be maintained. Or, for the mean voltage of 750, an arc 2 ft. long is possible. The tension in the arc will be the same throughout its length. Therefore, with the relative position of the arc tips known, the arc line can be determined ; and, from this, the maximum height to which the arc will rise. Let this distance be $y$.

Now as the time $\delta$ is known, and it is thus possible to find the distance $y$, it is then possible to calculate the value $f$ must have in order to move the arc through the distance $y$ in the time $\delta$.

Let $f^1$ equal this particular value of the acceleration ; then,

$$f^1 = 2y/\delta^2.$$

The velocity of the arc at any instant " $t$ " will be $\frac{dy}{dt}$ ; while

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$f$ will equal $\frac{d^2y}{dt^2}$

There is, however, the resistance of the air in the arc chute to be taken into account. It will be sufficiently accurate for all practical purposes to assume that this resistance varies according to the velocity of the arc; or, in other words, the resistance of the air will give rise to a negative acceleration equal to, $K\frac{dy}{dt}$, where $k$ is a constant. Therefore, the resulting expression for the acceleration $f$ becomes,

$$f = \frac{d^2y}{dt^2} = f^1 - K\frac{dy}{dt} \quad . \quad . \quad . \quad . \quad (27)$$

When $t = o$, $y = o$, and $\frac{dy}{dt}$ will equal $o$.

The above equation can be written,

$$\frac{d^2y}{dt^2} + K\frac{dy}{dt} = f^1$$

Which can again be written,

$$\frac{d\left[\varepsilon^{Kt}.\frac{dy}{dt}\right]}{dt} = f^1\varepsilon^{Kt}.$$

Therefore,

$$\varepsilon^{Kt}.\frac{dy}{dt} = \int f^1\varepsilon^K\,dt + c = \frac{f^1}{K}.\,\varepsilon^{Kt} + c.$$

It is obvious that when $\frac{dy}{dt}$ equals $o$, and $t$ equals $o$, $c$ equals $-\frac{f^1}{K}$.

Therefore

$$\frac{dy}{dt} = \frac{f^1}{K}\left(1 - \varepsilon^{-Kt}\right) \quad . \quad . \quad . \quad (28)$$

*(To be concluded.)*

# THE BENSON BOILER.

## American Investigator's Report on the Berlin Installation.

IN a report of the "Prime-Movers Committee" of the National Electric Light Association (New York), Mr. W. H. Fulweinher, referring to a visit to the cable works of the Siemens-Schuckert Co. to see the Benson boiler installation, states that the boiler was built in the form of an octagonal tower approximately 20 ft. in diameter and 55 ft. high, with a stack about 60 ft. above this. The boiler is fired by powdered coal, using the Raymond system with four burners and eight adjustable secondary air inlets.

The combustion chamber is lined with eight coils of tubes which form the boiler proper, so that the only firebrick is that in the top arch, and in front of the air preheaters. These tubes have eight loops to a coil, and are about 15 ft. long, the interior forming a combustion chamber about 12 ft. in diameter and 27 ft. high. The boiler is fired from the top, and the combustion products are swirled by air currents from the secondary air inlets; the gases pass down around the front of the tubes, then up around the back of the tubes and through the air preheaters, and then are drawn up, and forced out of the stack with a fan.

The outside of the boiler is jacketed by air which enters the air passages around the lower portion of the boiler where the ash is cooled; then passes up around the outside, down through the air heaters, and then to the secondary and primary combustion nozzles.

The eight coils of pipe are 1·3 in. outside diameter and 0·8 in. inside diameter. Four coils form the main boiler; two coils the first preheater, and two coils form the second preheater. Some of the tubes at the lower end of the coil are bent out in the form of an ell, so as to granulate the clinker, which then drops into a water pocket and is removed continuously with a screw. The air used in the pulveriser passes through an electrostatic separator before being discharged. The capacity of the boiler is 60 000 lb. of steam per hour at 2 200 lb. pressure and 400 deg. F. superheat.

The operation of this boiler is as follows:

Feed water at approximately 212 deg. F. and 3 500 lb. pressure is fed into the first four coils forming the boiler proper. Here it is heated to 752 deg. F. and 3 200 lb. pressure and expanded through an automatic expansion valve to 1 500 lb. pressure and 626 deg. F. It then passes back through two of the coils and is heated to 840 deg. F. The steam then passes through the high-pressure section of the turbine, is expanded down to 500 lb. pressure and 552 deg. F. It is then reheated to 750 deg. F. and passed to the low-pressure side of the turbine where a portion of it is taken off at 140 lb. pressure and the remainder at 95 lb. pressure and approximately 400 deg. F. All the steam generated is used as process steam, so that the feed water is all distilled water.

The turbine, made by the Escher Wyss Co. of Zurich, is of the Zoelly type, having an output of 4 410 kVA. There are two boiler feed pumps; one is of the hydraulic press type and is used as a spare, while the other is a twenty-stage centrifugal pump driven at 5 100 revs. per min. by a 500 kVA motor. This pump is made in two sections, each about 25 in. long and 9 in. in diameter. The pump is rated to give 3 500 lb. pressure.

The boiler is so arranged that all connections are brought to the top, and all the valves are operated by electric motors controlled from the turbine room. The flanges are made without gaskets, and are ground in so that there is a line contact. The bolts on the flanges have heavy springs to take up expansion.

### Automatic Control.

It is expected that when the plant is in complete operation, the boiler will be controlled automatically so that no one will be near it. The operating control panel has apparatus to give the temperature and pressure of the steam at the inlet and outlet of each coil. Not only are the flue gases analysed automatically for $CO_2$, but also for CO and hydrogen, and practically all of the appliances have autographic attachments for permanent record.

The steam end of the boiler has worked very satisfactorily, but there has been a good deal of trouble with the mechanical details of the Raymond pulverisers and also of the boilers.

The insulation used on all of the high-temperature steam lines is known as "Alfol" and consists of a 2 in. thick covering of handfuls of very thin aluminium foil about 0.005 in. thick. The foil comes in sheets about 1 in. thick, and portions are torn off and doubled over and roughly packed around the pipe under a tin covering with a spacer that seems to be made of soapstone placed at intervals.

Dr. Kuttgen stated that they were very well satisfied with the operation of the boiler, and they believed it was of a type that could be adapted to any size. The automatic recording mechanism showed that the boiler was rated at 60 000 lb. per hour, but most of the time it has been operated at from 20 000 to 30 000 lb. per hour.

The principal advantage of this boiler lies in the extremely simple and cheap form of construction, i.e., simply a coil of tubing. No disengaging surface is required, as in the ordinary type of boiler, because at the critical temperature and pressure there is no difference between the volume of water and steam, and the automatic reducing valve serves the purpose of the large steam drums used in ordinary boilers.

## MINERS' ELECTRIC LAMPS.

THE Board of Trade has made an Order approving the following electric lamps for use in all mines to which the Coal Mines Act, 1911, applies:—The "Ni-fe" miners' lamp, made by Svenska Ackumulator Aktiebolaget Jungner, Stockholm, the accumulator being made at the Hunt End Works of Batteries, Ltd., Redditch; the "Federation" 4 V lamp, the "Maurice" cap lamp, and the "Federation" rescue lamp No. 2, and the "Federation" 4 V rescue lamp, made by the Federation Lamp Co. (Wm. Maurice, Ltd.); the "Oldham" 6 V pillarless electric safety lamp, and the "Oldham" official's torch, made by Oldham and Son, Ltd.; "the "Pearson Ni + Fe bull's eye lamp, made by Alkaline Miners' Lamps, Ltd.; the "Ceag" 4 V bull's eye type, pillarless safety lamp, and the "Ceag" inspection lamp, made by Ceag, Ltd.; the "Gray-Sussmann" torch, made by Mr. William E. Gray; the "Premier" pocket torch, made by the Premier Lamp and Engineering Co., Ltd., and the "Wootton" safety lamp, made by S. Smith and Sons (Motor Accessories), Ltd. Amendments have been made in the schedules in previous orders relating to the "Derby," bull's eye type, miners' electric lamp, and the "Wefco" official's electric hand lamp. The Order can be obtained from H.M. Stationery Office.

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# THE FUEL CONFERENCE.

## Résumé of Some Papers of Electrical Interest—By-Product Recovery at Dunston—Experiments in Room Heating—Cost of Electrical Appliances—Popularity of Electricity for Industrial Heating.

THE Fuel Conference of the World Power Conference, which has been in session at the Imperial Institute, South Kensington, during the past two weeks, has discussed a programme of papers covering practically every aspect of fuel technology, and though some of the papers dealt with subjects of little direct interest to the electrical community there were many with an obvious bearing upon our industry.

Electrically speaking, Section J was one of the most interesting sections. It included a paper on the "Development of Fuelling Arrangements at the Vienna Municipal Electricity Works," by Ing. Fritz Siedle, in which the author described the remodelling of the installation of the municipal electricity works at Vienna for the utilisation of the poorer fuels available after the war by the installation of chain-grate stokers, improved combustion chambers and ashpits, as well as by the introduction of pulverised fuel.

Dr. Jaroslav Havlicek gave details of an extensive research into the properties of steam up to 253 atm. or about 3 600 lb. per sq. in. at temperatures up to 500 deg. C.

In a paper on the "Economic Utilisation of Fuel in the Production of Electricity," Mr. R. P. Sloan pointed out that the total quantity of coal used for the generation of electricity in Great Britain is about 7·75 million tons per year, or 4·3 per cent. of the total used in this country. This was not likely to increase much, as although the use of electricity was rapidly going up, the economy of the power stations was increasing. Also supplies of waste heat were being further utilised. In one company, a reduction in the coal consumption of 21 per cent. was effected by the utilisation of such waste heat.

Further economy must be sought by avoiding heat losses, pre-heating the air, bleeding or extracting steam from the turbine, re-heating and higher steam pressures and temperatures.

In cases where process steam was required, large economies could be effected by the use of back pressure turbines, any excess or defect in the electricity required being made up by feeding into or taking current from the supply company.

Another direction was in the treatment of coal to obtain the by-products and using the resulting coke and gas under boilers, and a complete account was given of the by-product recovery plant at Dunston-on-the-Tyne. The value of the derivatives from 1 ton of coal was 10s. 6d., and the value of the coke under the boilers 9s. 1d., or a total of 19s. 7d. On the other hand, the coal cost 12s. and the total cost of operation and maintenance 4s. 8d., or a total of 16s. 8d., giving a profit of 3s. 1d., so that up to the present no important commercial economies had been obtained, though these costs could be considerably reduced by working on a larger scale.

At the present time about 15 per cent. of the total coal mined throughout the world, or in the aggregate some 180 million English tons annually, is consumed in its raw state for domestic purposes. The principal object of Section L was to discuss the extent to which this household coal could be replaced efficiently and economically by other sources of energy, which must of necessity themselves be derived in the main from natural carbonaceous deposits.

### Hotplate Efficiencies.

Points of interest in this Section included the following:—The success with which prepared fuels or electricity can compete with raw coal depends as much upon the manner of their use as upon their inherent characteristics. Thus, insulation of the building fabric reduced the heat requirements of a house by nearly 40 per cent. Again, the efficiency of heating water on an electrical hotplate was reduced from 63 per cent. to 5 per cent. by battering the vessel, or from 75 per cent. to 47 per cent. by increasing the distance between hotplate and vessel from 0 to 0·5 mm.

A series of experiments carried out last winter in Vienna showed that for room heating 39 kWh per cu. m. was required during the heating season in an electric hot-water storage system, 30·5 kWh in an electric storage heater, and 25 kWh in a direct electric heater, in comparison with 8·9 cu. m. of gas. This would mean that with electricity at 1d. per kWh electric heating would cost respectively 2·5, 1·9 or 1·6 times as much as 500 B.Th.U. gas at 10d. a therm. Elsewhere it was estimated that at those prices direct electric heating costs 1·3 to 1·7 times as much as gas fires; electric stoves 2·8 times as much as flueless gas stoves or 2·2 times as much as gas stoves under flues. The argument was advanced that it does not follow that the fuel which costs the consumer least for any purpose will entail a minimum initial coal consumption. So that, provided that electrical appliances are not less than five times as efficient as their coal-fired counterparts, no waste of a country's coal reserves would be involved through their adoption.

### Industrial Heating Progress.

In Section K the use of electricity for industrial heating was discussed. "The Thermal Efficiency of an Industrial Electric Furnace" was discussed by the Power Association of Japan. The author divided the efficiency of an electric furnace, in which the heat given to the furnace electrically can be accurately measured into two parts. First, the thermo-dynamic efficiency; and, second, the relative contribution efficiency. It would seem that the efficiency used in the paper by Sir Robert Hadfield, and quoted by the author of the present paper from a work by M. D. K. Thomson—namely, the ratio of heat actually used to heat the reacting substances to the required temperature plus the heat absorbed by the reaction to the total heat supplied, will remain in use until it can be bettered.

In the paper, "The Use of Electricity for the Production of Heat in Industrial and Manufacturing Installations," presented by the Austrian National Committee, it was stated that in Austria there has been a steady growth in the use of water-power generated electricity for heating water, steam raising, mould drying, rivet heating, welding, smelting and reverberatory furnaces. Other uses are being explored. The effect of a night load for heating purposes on electric generating stations has greatly improved the twenty-four hour load curve, and the paper tabulated the additional loads on power stations due to the use of electricity for heating. Raising steam by electricity is said to be economical when a kWh does not cost more than from $\frac{1}{3}$ to $\frac{1}{4}$ of a kilogram of coal.

"Industrial Electric Heating" was discussed in a paper presented by the British Electrical Development Association. Many of the uses in Great Britain of electric heating and industrial electric furnaces were given. An analysis of some two-and-a-half billion B.Th.U. used in engineering works, brass foundries, shipyards, paint works, soap works, potteries and bakeries showed the percentage of these total heat units produced electrically varies from $\frac{1}{2}$ to 1 per cent. in potteries to $6\frac{1}{2}$ per cent. in engineering works. The general experience was that although the cost of the actual heating was greater than with fuel, the results were so satisfactory that its use was extending. This applied especially to the heat treatment and tempering processes.

In a paper, "The Utilisation of Electricity for Industrial Heating," presented by the Canadian National Committee, the author developed the view that since the fundamental constituents of fuel are hydrogen, oxygen and carbon, and that combustion in a hydrocarbon fuel is hampered by the 80 per cent. of nitrogen in the air, pure oxygen for the enrichment of air will be made in the future by the electrolysis of water. Water rather than air was chosen, because of the liberation of the oxygen and hydrogen in complete separation, and the value of the latter as fuel.

The "Utilisation of Electricity for Industrial Heating" was also discussed by the American Committee, which estimated that in the U.S.A. some 2 000 000 kW were being used for industrial heating, representing a little more than 10 per cent. of the electric motor load. Electric heating at high temperatures was used successfully for ferrous and non-ferrous metal smelting, with the advantage that the furnace gases could be made oxidising, reducing or neutral at will. The electric heating of ovens, mostly to temperatures not exceeding 1 000 deg. F., included vitreous enamelling and japanning, baking, drying, and very many other uses. A survey made in 1926 suggested that there was an industrial heating load in the U.S.A., inclusive of commercial electric cooking and baking, which could employ 47 000 000 kW.

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# CONSUMER CREDIT.

## The Modern Problem of Distribution—A New World of Money—An Economic Revolution—The Logical Basis of Hire-Purchase Trading.

By SIR ERNEST BENN, Bt.

THE world is getting richer every day, and the rate of increase in riches gets faster. Our facilities for production never cease to increase, and the problem, not only of this country, but of the whole world, is how to distribute the wealth which, after two centuries of experiment, we have at last found how to make.

The eighteenth and nineteenth centuries were concerned almost entirely with production. Our manufacturers enjoyed almost without interruption for 150 years the delights of a seller's market. Our grandfathers had little trouble to dispose of their products; their difficulty was to make them fast enough to supply the insistent demand of a world hungry for the new manufactures.

The task of the present and the immediate future is to create and perfect the machinery of distribution to the same extent that the machinery of production has been created and perfected; the two things must go together.

The new problem is very largely a monetary problem, and thus we find on all hands a groping after new ideas and new schemes in money, currency and banking. All the political talk about banking reorganisation, or the distribution of money in the form of pensions or doles, is nothing but the very natural political reaction to the larger economic problem which business men have created, and which business men must solve.

* * *

The rapid development of manufacturing and production 100 years ago brought about the modern banking system, gave us the joint stock bank, and developed those marvellous instruments of commerce, the bill of lading, the bill of exchange and the common cheque, and in less than 100 years enlarged and extended the capabilities of currency to meet all the requirements of the new production.

Now money, currency and credit have to be further developed and further improved to meet all the requirements of the new consumption, and thus there is arising a new world of money, which is for the moment vaguely described as consumer credit. The people who invented instalment buying, hire-purchase, or time payment, had probably little idea of the enormous economic revolution of which they were the real authors; many of them, indeed, were mere money-lenders, and some of them of the lowest conceivable type. But economic revolutions, like all revolutions, have queer beginnings.

* * *

Up to now most people have regarded hire-purchase as something which was not quite respectable, and it is, of course, true that much of the hire-purchase business transacted in the past has been of a character that would not interest the better class of business man.

But to-day most people are altering their opinions, and I have to confess, and I do it very gladly, that I have altered my mind. In a chapter on Saving, in "The Confessions of a Capitalist" I disparaged hire-purchase. That chapter has been quoted against me in view of my recent association with The Trade Promotion Trust, and the more recent founding of The Book Marketing Board. My conversion was effected by that most distinguished of modern economists, Prof. Edwin Seligman, of the Columbia University, New York, and his views, now widely known, have probably done more to bring about the next big upward step in the standard of living of the people as a whole than all the political talk of the last fifty years.

* * *

It is very significant that in the Jubilee number of "The Statist," perhaps the greatest monetary and economic authority that we have, a great deal of space is devoted to Prof. Seligman's views on consumer credit in general, and hire-purchase in particular. He was selected, it will be remembered, to preside over a commission which inquired into the supposed abuse of the new system in America. Little more than a year ago there were many Jeremiahs who foretold the downfall of America because of the development of hire-purchase trading. Seligman traces the history of currency and credit, and shows how less than 100 years ago the abuses associated with joint stock banking were the subject of far more stringent and far better justified criticism than is applied to the abuse of hire trading to-day.

It is interesting to notice that every monetary and banking advance has been subjected to public and political obstruction and abuse. All through the middle ages we had the laws against usury. "And, when later on banks were developed, the same prejudice was shown. In the great fight that occurred in the United States just about a century ago many books were written to show that banks were an evil institution, and that bank credit did nothing but foster speculation and evil commercial practices. It has taken the world a half-century or more to realise the essential value of credit, so that it is a platitude to say that our business life is to-day built upon credit.

"But at present we are coming to the last of the various stages of credit—individual credit, agricultural credit, business or production credit, and now consumption credit. Consumption credit is going through precisely the same phases traversed by every preceding form of credit; original unqualified opposition, numerous abuses, considerable doubt as to its propriety, grudging and reluctant recognition of its usefulness in principle, a deeper analysis of its real function and its limitations, a more careful statement of its applicability, and, finally, an acknowledgment of its unquestioned value as a part of the machinery of modern economic life. There is not a single doubt expressed to-day by some as to consumption credit which cannot be matched in the history of banking or production credit. To object, therefore, to instalment selling because consumption credit is in some way more dangerous than production credit discloses a poverty of analysis and an ignorance of the history of business life."

When I see "The Statist" giving prominence and approval to views like these from Prof. Seligman, I make no apology for my conversion to hire-purchase.

* * *

But apart altogether from the theory of the matter, I can now claim a good deal of practical experience. The position of the motor trade to-day may be said to be built upon hire-purchase. The furniture trade is just beginning to find out the enormous possibilities of payment out of income, if wisely arranged. In the course of the next year or two the book market will, I believe, treble itself as a result of the recognition by publishers and booksellers of the great possibilities of these new financial notions. Books, indeed, provide a perfect illustration of the theory of the matter. Book production has reached a point where it is positively dangerous without an extension of book consumption. There is, nobody doubts, an almost unlimited desire on the part of our new intelligent and educated population to possess more and more books, and the only thing that is lacking is the financial apparatus to make the whole thing work.

* * *

On the practical side, going right down to the details of the matter, there is a good deal of misapprehension still to be cleared away. It is thought by some that hire-purchase is the refuge of the spendthrift, the sort of dodge adopted by the man who has no credit to purchase luxuries to which he is not entitled. That is very far from the truth.

In furniture and books, to which I can refer with some claim to actual knowledge, a large proportion of the trade of the past has been done upon the most unsatisfactory credit terms. These terms have caused uneasiness, and prompted reluctance to business on the part of both buyers and sellers. People bought goods and paid when pressed or when possible in irregular instalments over, perhaps, one, two or three years. The seller has had to shoulder all the inconvenience and uncertainty, and the buyer has been afflicted with a sense of obligation which discourages trade. Every tradesman knows how the granting of credit to a valued customer often operates to keep that customer out of his shop for fear of a request for payment.

Instalment buying places all this class of business on to a definite, logical, regular basis well understood by both buyer and seller, a basis which maintains intact the self-respect of each, and promotes that confidence upon which further business flourishes.

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# AUTOMATIC TELEPHONY.

## Improved Working and Economies in Use Follow L.N.E.R. Change to Automatic System—Facilitating Communication Between Three London Termini.

By F. DOWNES, A.M.I.E.E. (Telegraph Superintendent, L.N.E.R.).

THE grouping of our railways caused many disappointments and difficulties and not the least among telephone users. Railway communications comprise varied services, and co-ordination of the pre-amalgamated companies' methods into efficient systems linking up headquarters and provincial centres has been a problem of no mean order.

Prior to amalgamation the three London termini had each a self-contained telephone system adapted to the organisation of the three constituent companies now forming the Southern area of the L.N.E.R.

At King's Cross two separate exchanges have existed for many years, first for purely railway services, and secondly for Post Office services, combination not being permitted until recent years. The railway exchange was of the C.B. signalling with inductive microphone batteries. Whilst the Post Office exchange only was owned and maintained by that Department both exchanges were operated by railway staff.

At Liverpool Street a system of departmental battery ringing exchanges was connected to a central exchange for intercommunication, each department having direct P.O. exchange connections.

At Marylebone a C.B. manual exchange maintained and operated by the railway company gave combined railway and postal service, this exchange being established subsequent to the Post Office agreeing to combined private branch exchanges.

The L.N.E.R. having no convenient route between their terminal stations, tie lines were formerly rented from the Post Office. To meet present requirements a 27 pair dry core paper insulated cable has been laid over the Metropolitan Railway between Liverpool Street and King's Cross, the tie lines between King's Cross and Marylebone being still rented from the Post Office.

Although the need for improved telephone facilities was apparent to all concerned, the consideration became an economic one and many trying hours were spent in ascertaining the value in savings to be effected by the outlay of the capital involved, and the possibility of automatic operation giving working, not only within the limits of each station, but from offices at one station direct to offices at another station, and also giving access to the company's extension system of private trunk and other provincial telephone circuits.

Specifications were prepared and tenders covering all systems were obtained when it was found that automatic working could be most economically and satisfactorily applied, a contract being made with the Relay Automatic Telephone Co. for their "Relay" system of working. I am pleased to record the savings anticipated are being fully realised, both as regards operating staff and maintenance, and also economies resulting from the smaller uses of the Post Office system for which an increasing annual charge was obtaining.

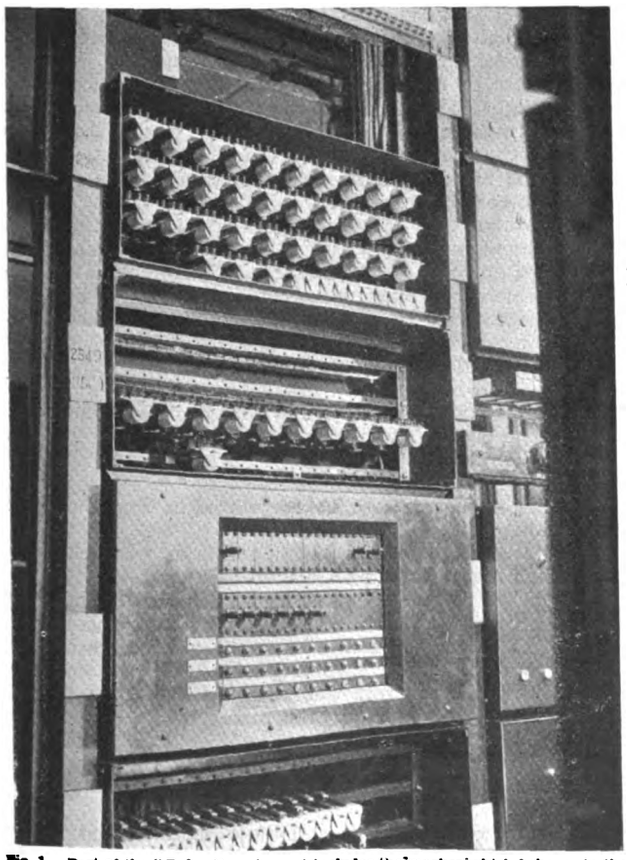

Fig. 1.—Part of the "Relay" equipment includes the marker, which behaves in the same manner as the human operator's hand.

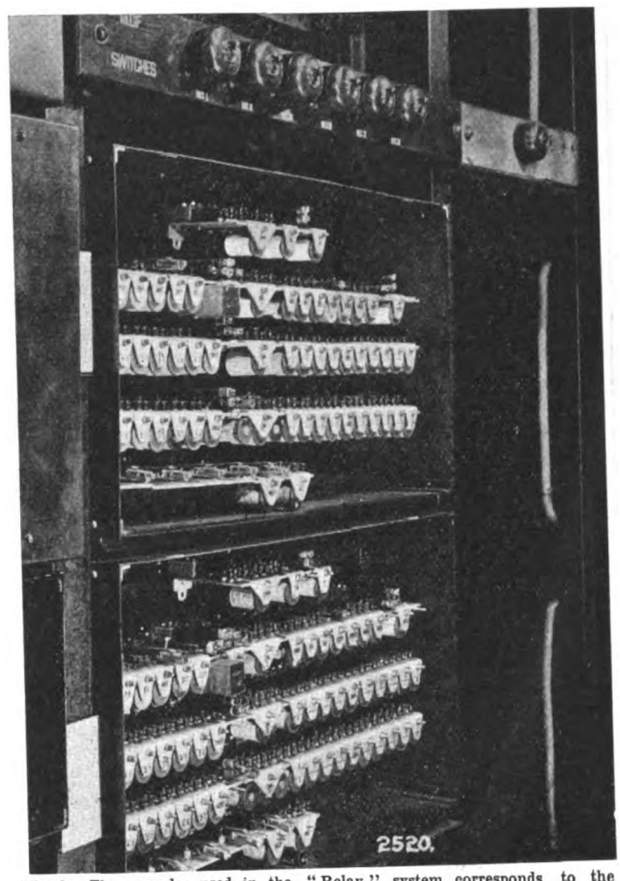


Fig. 2.—The recorder used in the "Relay" system corresponds to the human operator's brain.

A feature of the Relay system is the thermostat arrangement for preventing (*a*) faulty lines occupying the automatic apparatus; (*b*) connecting a caller to the manual board should he fail to dial after removing his receiver; or (*c*) should the dialling not prove effective within 30 to 45 seconds.

The auxiliary manual boards are of the latest P.O. standard type with apparatus for dialling the Post Office automatic exchanges, also special keys for ringing on the long distance railway trunk circuits. The speaking efficiency over the latter is very good, as might be anticipated owing to the elimination of switchboard losses under the old arrangement.

The number of calls dealt with at the automatic exchange now exceeds 3 000 per day.

The apparatus at present installed allows for 50 simultaneous conversations and seven simultaneous diallings, experience so far showing that these facilities are ample. Provision is made for redistribution of apparatus should too many busy telephones have been given access to the same group.

The dialling tone is not used; instead, should there be no automatic apparatus available, the "busy" tone would operate immediately the receiver was lifted. No such cases have been recorded. Each telephone has access to ten different outlets, experience so far indicating that number is sufficient.

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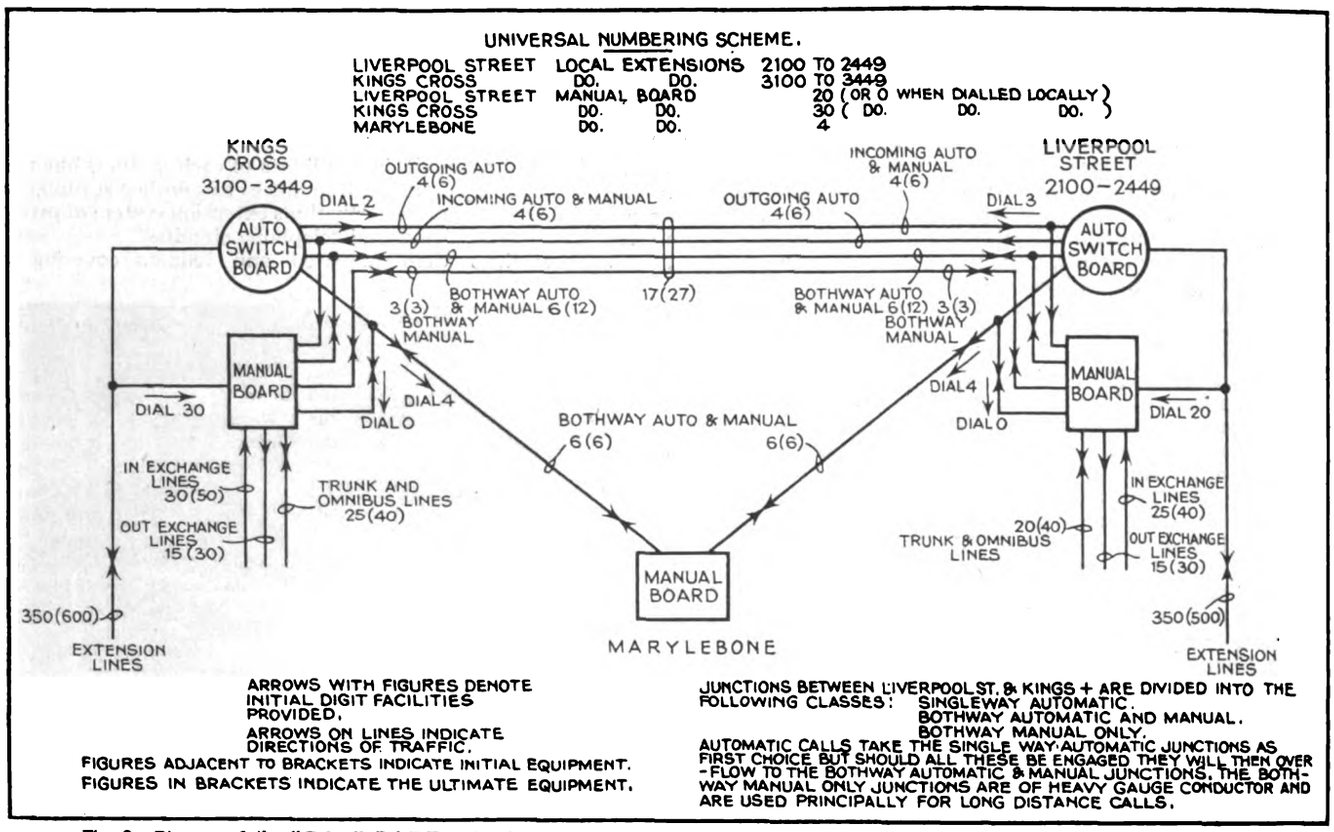


**Fig. 3.—Diagram of the "Relay" P.A.B.X. network connecting the King's Cross, Liverpool Street, and Marylebone termini of the L.N.E.Rly.**

Meters are provided for :—(1) Total calls ; (2) calls to manual board ; (3) calls to each of the other exchanges, such as King's Cross to Liverpool Street, Marylebone, etc. ; (4) total ineffective calls ; (5) all outlets busy ; (6) all inlets busy. From these, data as to the total calls and amount of traffic over the lines can be deduced and the adequacy of the automatic apparatus and telephones provided to cope with traffic during busy periods.

Electrical energy is supplied from the company's generating stations for charging 32 V accumulators. At King's Cross a motor generator converts a.c. at 415 V to d.c. at 40 V. At Liverpool Street d.c. current at 220 V is reduced by motor generator and at Marylebone the energy is converted from a.c. 415 V to 30 V for charging the battery. The accumulators at King's Cross and Liverpool Street are of 400 Ah capacity, duplicate sets being provided.

In general, the apparatus has been remarkably free from faults. A system of alarms calls attention to any irregularity, a main alarm indicating a fault and subsidiary indications show the location. Any part of the exchange can be switched out of service whilst a defect is being remedied.

The space available at Liverpool Street is limited, and this obtains equally at King's Cross, and in considering competitive tenders this factor was of great importance, as the expense and inconvenience in vacating premises by other departments would have been difficult to overcome.

I am closely investigating the possibilities of extending the system for linking up important provincial centres for automatic working with headquarters, and I would like to observe that some features embodied in automatic telephony may tend to simplify future problems in automatic signalling for the control of train working.

Briefly summarised, automatic telephony provides for :—(*a*) Prompt service to call, speak and clear ; (*b*) secret communication ; (*c*) 24 hours' service ; (*d*) permits of a loop resistance of subscriber's line up to 700 Ω ; (*e*) economic ; (*f*) indicates its own troubles.

In conclusion, I may state that when the automatic exchanges were brought into service the great improvement in the facilities was acclaimed by all our users and expressions of praise and admiration were accorded by all departments. The transition from manual to automatic working was smoothly and satisfactorily made.

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The charge for telegrams sent from Great Britain or Northern Ireland to places within the Irish Free State is now 1s. 6d. for 12 words or less and one penny for every word over 12.

## LOOKING BACKWARD.

### Lamplighting by Electricity Fifty Years Ago.

FIFTY years ago, according to THE ELECTRICIAN dated October 5th, 1878 : —

Lamp lighting by electricity had then been in practical operation for a fortnight in Pall Mall, London.

A writer in our columns discussing the domestic use of electric light, said, " The light is far too glaring, and expensive for small rooms, and until some means can be found of subdividing the electric light to a much greater extent than has been done hitherto, it is useless to think of its employment except in very large spaces.

The honour of having given the first idea of the telephone was claimed by the Paris " L'Illustration," which, in 1854, published an article on " Electrical Transmission of Speech," and in which the following passage occurred :— " Suppose one were to speak near a moveable metal plate, so flexible as not to lose any of the vibrations produced by the voice ; and that this plate should alternately establish and interrupt communication with a battery, you might have at a distance another plate which would produce at the same time the same vibration. An electric battery, two vibrating plates, and a metal thread would be sufficient."

* * *

Twenty-five years ago it was stated in THE ELECTRICIAN for October 9th, 1903 :—

Speeds as high as 125 miles per hour were claimed for an electric train during a German railway test.

A political speech delivered by Mr. Balfour in Sheffield was listened to by journalists in London by electrophone.

Mr. P. La Cour claimed to have had in successful operation for a year a small power station operated solely by wind power.

Mr. Percy E. Rycroft was selected from 101 applicants as assistant engineer as works manager to Islington Electricity Department.

The Brighton municipal telephone system was officially inaugurated. The subscription was £5 10s. per annum for unlimited service throughout the area.

The construction of the shallow underground tramway below the Victoria Embankment and Southampton Row, London, had just been commenced.

A compulsory licensing scheme for electrical installation contractors was instituted in Budapest. We suggest that many advantages would accrue to the electrical industry if an examination of the registration system could be inaugurated here.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Fires in Underground Subways.

[To the Editor.]

Sir,—The Editorial Note, in your issue of September 21st relating to the subway fire at the Victoria Embankment raises some interesting questions.

To begin with, it is difficult to suppose that it can be due to anything else than a broken down electric power cable.

Next, it can hardly be denied that electric power cables are scattered through London in huge profusion, according to the whim of the parties transmitting the power.

There must be an immense number of "through" trunks operating between stations, at all sorts of voltages down to, say, 5 000 V, or even less; and if these lower voltage cables could be cleared out of the way it would liberate a great number of ducts and be very much to the public benefit by reducing the terrible congestion in our underground subways.

It can be shown that, even at 30 000 V, it is possible to reduce the number of cables some six times for a given amount of "through" power transmitted, by employing the higher voltages which I am recommending, and at 5 000 V the reduction would be of the order of perhaps ten times (if the power were in a single transmission); not to mention that the heat developed in the ducts would, again, be reduced somewhat in that proportion.

It is possible to design armoured cables for the highest voltages, which could be pulled into 3½ in. existing ducts; and where the ducts were only 3 in., it would still be possible to design cables for a somewhat less pressure, which could be pulled in.

The cost of such cables, per kilowatt transmitted, would be of the order of from one-quarter to one-sixth of that of the existing cables.

Of course, if the existing ducts were even smaller than 3 in., there is still no reason why cables could not be designed to suit them, and yet to make a great reduction in the total number of ducts required for transmitting a given aggregate of power.—I am, etc.,

A. M. Taylor.

Slade Lodge,
Erdington,
Birmingham.
September 28th.

## A New Description of "j."

[To the Editor.]

Sir,—Many years ago (it must be approaching twenty) I wrote The Electrician a letter proposing a different way of regarding $j$: namely, to write $j = (-1)^{\cdot 5}$ instead of $\sqrt{-1}$. The benefit of this method is that one can represent any angle by varying the index: thus 45 deg. is represented by $(-1)^{\cdot 25}$, and so on for any other angle. This gives us simply and neatly the effect of multiplying vectors together: for $A\,(-1)^{\cdot 1}\,B\,(-1)^{\cdot 3} = AB\,(-1)^{\cdot 4}$. The vectors are multiplied together and the angles added.

It is, however, not necessary to use $-1$ at all; indeed, it is simpler and clearer to deal with 1 only. Noting that $j^4 = 1$, we have $1^{\frac{1}{4}} = j = \sqrt{-1}$. In other words, if we use 1 as the vector, we see that it rotates twice as fast as the vector based on $-1$. Thus $1^0$ is the vector in the initial position, $1^1$ denotes a complete revolution, $1^2$ two revolutions, and so forth.

Some interesting points arise from this. To extract the cube root of 1 we note that $1^0$, $1^1$, and $1^2$ all bring the vector to the same position: extracting the cube roots we have $1^{\frac{2}{3}}$, $1^{\frac{1}{3}}$, $+1^{\frac{4}{3}}$, after which they repeat. The three vectors make angles of 0 deg., 120 deg. and 240 deg. with the $X$ axis, and the Cartesian co-ordinates of the points $P_1$, $P_2$, and $P_3$ are 1, $-\frac{1}{2} + j\sqrt{\frac{3}{4}}$, and $-\frac{1}{2}$, $-j\sqrt{\frac{3}{4}}$, which are the cube roots of 1 as obtained in the usual manner. Any other roots of 1 may be obtained in a similar manner.

There seems to be no reason why the use of the rotating vector should not be developed for other purposes. Consider the expression $(1 + \frac{1}{n})^n$: this may be plotted as a curve, the vector approaching infinity when $n = 0$, and it coincides with the $X$ axis; when $n$ increases to 1, the vector $(1 + \frac{1}{n})$ becomes equal to 2, and rotates through 360 deg. As $n$ increases to infinity the vector diminishes to 1 unit in length, and rotates an infinite number of times round the origin.

The effect of making $n$ negative requires further discussion. It is to be noted that this has no relation to the expression which gives us "$e$," as in that case $n$ is of fixed value, whereas here $n$ is the variable.

It would appear that this method of looking at matters is capable of extension in many ways. It does not alter the definition of "$j$," but rather amplifies it, as $j = \sqrt{-1} = 1^{\frac{1}{4}}$. The two definitions have the same value, but the method of using $1^n$ is more general in its operation.

I have discussed this and other similar ideas with mathematical friends frequently, but they always ask if the ideas are to be found in text-books, and when no text-book can be quoted they drop the subject with great rapidity. Perhaps someone at home or abroad may oblige by expanding the subject in a text-book when our friends at home will be able to take it into consideration.—I am, etc.,

C. Turnbull.

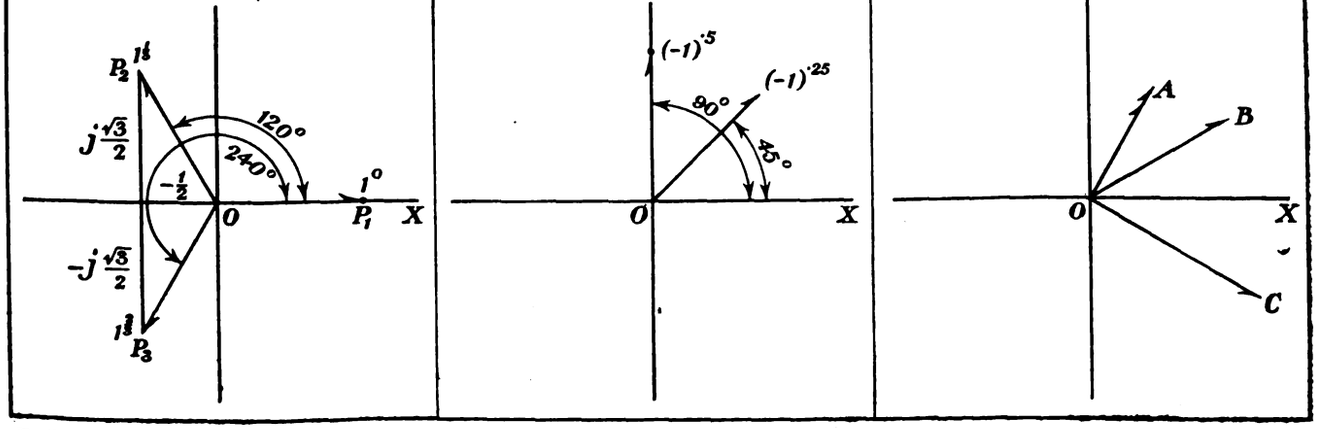
Electricity Works, Tynemouth.
September 14th.

## Page Sizes of Technical Journals.

[To the Editor.]

Sir,—The writer has noted with interest the correspondence in your editorial columns relating to the suggestion of standardisation of sizes of pages in the technical press.

From time to time these suggestions have been put forward by one or other of the technical journals. If this idea could be adopted by the *whole* of the technical press it would be beneficial to the advertiser, the advertising agent and the journals themselves. Beneficial to the advertiser, as he would be able to interchange layout without either paying for new blocks (of a slightly different size), or, alternatively, a certain amount of loss of "balance" and "white space." Valuable to the advertising agent upon whose shoulders falls the thankless task of adapting layouts, and indirectly of benefit to the journals, as most engineering allocations are limited,




The three diagrams reproduced above illustrate the method advocated in Mr. C. Turnbull's letter, published on this page. The figures show (left to right): Extraction of cube roots of j; Measure of angle by the index; and method of indicating rotation of vectors by half arrows, the half arrows being on the side to which the vector is rotating. A and B rotate counter-clockwise, C clockwise. A rotates twice as fast as B, as shown by the number of half arrow-heads.

C

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and less expenditure on blocks would mean an increase in amount of space purchased.

No doubt the practical difficulty in carrying out the project would be put forward by the printers of the various journals, and probably in some cases new machines would have to be installed. Surely this difficulty could be overcome in the interests of advertising ?—I am, etc.,

E. C. GRAHAM.
for W. C. Thorn, Ltd.

London.
September 25th.

[TO THE EDITOR.]

SIR,—A standardised size for technical journals would enable a great saving to be effected in production costs during an advertising campaign. At the moment, a series of advertisements appearing in two or more technical journals has to be adapted, which involves special settings to fit different page sizes, fresh blocks, and a considerable amount of additional studio work in the preparation of different layouts.

All such production expenses, which arise through the very considerable differences in page sizes, could be saved if a standardised page size for technical journals was adopted, and the saving thus effected might conceivably go towards the purchase of additional space in technical papers during the advertisement campaign.

One need hardly add that the result would mean more business to the publishers of technical papers.—I am, etc.,

JOHN GLOAG, Director.
F. C. Pritchard and Partners, Ltd.

6, Buckingham Street,
London, W.C.2.
October 1st.

[TO THE EDITOR.]

SIR,—The correspondence on this subject is interesting, and although standardisation would be ideal, I am afraid much pressure will have to be brought to bear on the journals before they would even consider making the necessary changes in page sizes.

Mr. C. C. Roe quotes the Press of the motor industry. While he is not quite correct in stating that the journals are approximately 10 in. by 7 in., and would find he would want a new set of blocks for the "Autocar," the fact that there is some similarity in size is not due to collaboration.

The proprietors of three wireless journals—"Modern Wireless," "Popular Wireless" and "Wireless Constructor"—have realised the importance of this question. These three journals are of the same size, and an advertiser taking space in all three has only to supply one set of original blocks for two monthlies and a weekly.

During the last few years, two or three of the leading electrical journals have yielded to persuasion and have accepted three-colour advertisements. It is almost out of the question to provide a set of three-colour blocks for each journal but the only alternative is to use a "misfit" in at least one.

With the exercise of a certain amount of ingenuity it is possible to produce simple, flexible layouts which can be lengthened or shortened, but this requirement seriously handicaps the lay-out man and the arrangement is almost sure to suffer in the transformation.

When the publication of Henley's little journal "Distribution of Electricity" was under discussion, the question of page size was given serious consideration, and it was decided to adopt a printing space of 10 in. by 7 in. for advertisements, approximately the dimensions of THE ELECTRICIAN, "Electrical Times," and "Electricity."—I am, etc.,

J. S. SIMMONS.
for W. T. Henley's Telegraph Works Co., Ltd.

Holborn Viaduct,
London, E.C.1.
September 28th.

## Advertising the National Register.

[TO THE EDITOR.]

SIR,—If I may say so, not intending to be offensive, Mr. C. H. Flower's views on publicity are typical of the mistaken notions with which the electrical contracting trade seems to be impregnated. Surely Mr. Flower and his fellow-contractors rate themselves higher than the tradespeople he mentions; if they do, why do they subscribe to the publicity ideas of the local tobacconist, whose case, by the way, is in no way comparable, as with very few exceptions all brands of tobacco and cigarettes emanate from the Imperial Tobacco Co.

Even if we accept the suggestion that it does not pay an electrical contractor to advertise a proprietary electrical article which has already been prominently advertised on a national scale there can be nothing against advocating fires during the cold weather, fans in the warm weather, and so on, without reference to the names of the makers.

Mr. Flower talks of having "only service . . to sell"; if he can find a better seller than real service he will be lucky indeed. My point against the contractors is that, with very rare exceptions, they will not advertise themselves, their service, or their goods, and that if they did they would benefit in direct ratio to their expenditure.

The suggestion that the buying public pay for all advertising is based on a misconception. Regular and persistent advertising creates increased production on economic lines, and by providing a steady production load promotes economy in manufacturing and distribution processes; a striking parallel is found in the load curves of the electricity supply industry.

Mr. Flower asks me to state what my publicity policy would be if I were an electrical contractor. In the first place I should make the utmost use of the publicity provided by manufacturing firms. Over-printed leaflets supplied by manufacturers would not be left to gather dust on the counter or merely used for "envelope stuffing," but would be sent out with special letters to likely customers. When the manufacturer of a branded electrical article advertised in the local newspapers I would turn his large space to good account by taking a small adjacent space telling the public that they could get their "Mazcosnet" electrical appliances from me, and I would link up my show windows with my newspaper advertising.

If I had been successful in meeting the requirements of the National Register of Electrical Installation Contractors I would lose no opportunity to make known as widely as possible in my district the reasons why the badge of the N.R.E.I.C. is the sign of good workmanship and materials.

In short I would leave no stone unturned to turn to personal advantage the nation-wide propaganda of big manufacturers and of such organisations as the National Register.—I am, etc.

"PUBLICIST."

September 29th.

## Wireless Cabinets.

[TO THE EDITOR.]

SIR,—My attention has been drawn to a paragraph in your issue of September 21st under the heading "Receiver Cabinet Design," in which your correspondent criticises the wireless cabinets shown at Olympia. Without holding a brief for the cabinets on exhibition, I should like to point out that directly inventions such as wireless or the gramophone become of domestic interest they are automatically regarded as pieces of furniture, and it is the duty of the cabinet maker to make something which will suit both the inventor on the one hand, and the householder on the other. No one likes to have in a drawing-room something which suggests mechanical contrivances; and, indeed, the telephone receiver, where it is seen in a sitting-room, is frequently covered up by some sort of hood to hide its mechanical appearance.

This being so, your correspondent's contention that as a general practice it is hardly necessary to disguise a wireless receiver to look like a cabinet is dead against popular opinion. The cabinet maker is bound to produce something which looks like, or suggests, a piece of furniture. The trouble is that there is no tradition to fall back upon, so that any piece of furniture he designs is bound to appear rather strange, simply because of its unfamiliarity.—I am, etc.,

"CABINET MAKER."

London.
September 27th.

## POINTS OF VIEW.

The radio audience does not file slowly out. It switches rapidly off.—*Mr. Marc Langley.*

* * *

Aladdin did wonderful things by rubbing a lamp. But Aladdin is a back number compared with the man who presses the [electric] button.—*Dr. Macnamara.*

* * *

In commerce more is to be gained in communicating the methods by which success has been achieved than by concealment.—*Sir Robert Horne.*

* * *

Messages and pictures will always be sent by wireless, but the cable is not dead by any means.—*Comdr. E. W. C. Grattan, R.N.*

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# THE PROGRESS OF TELEVISION.

## Demonstration of Commercial Apparatus—Pictures of Singer Projected—The Results Criticised—Receiving Equipment Described—"The Electrician" Televised.

THE progress so far made with television was demonstrated to a special representative of THE ELECTRICIAN on Friday, September 28th, by the Baird Television Development Co., Ltd., in premises adjoining Olympia, London. The company is offering for public sale three types of "televisor" wherewith to receive by radio moving pictures of artistes and such other performers as it may care to transmit. The present facilities of the Baird company for the broadcasting of music, singing, or speeches in conjunction with television are, we are informed, limited to the hours between midnight and noon, but the company has "recently given demonstrations to representatives of the Postmaster-General and confidently anticipates that extended facilities will be granted."

### The Receiving Equipment.

The first of the instruments offered is model A, which is a portable type and has been designed for operation when connected to the output terminals of an ordinary wireless receiver capable of working a moving coil type loud speaker. Model B comprises a television apparatus giving a larger size image than model A, combined with a moving coil loud speaker, for the simultaneous reception of vision and sound. This model, as with the previously mentioned type, requires a minimum h.t. voltage of 350 V. A 12 V accumulator is connected across a small motor which drives the mechanism of the "televisor," and the output terminals of the wireless set are connected to the input of the television-radio equipment. The television signals can then be tuned in by means of a small knob. One at first sees on the screen of the instrument a reddish light which, upon increasing the speed of the synchronising motor resolves itself into a series of images moving rapidly downwards across the screen. As the motor approaches the correct speed the images move more slowly and finally come to rest. At this stage a phase control centralises the picture and the apparatus may be said to be adjusted.

These operations are the same for each of the machines, including model C, the latter being a simultaneous instrument incorporating both radio and television receivers. Model C also, obtains its h.t. voltage from a rotary transformer which may, if desired, be run from the electricity supply mains for supplying both receivers. The radio portion of the equipment consists of a 5-valve set with thumb control, while for the reception of television a 6-valve equipment is employed.

As to results, the apparatus used at the demonstration consisted of a number of model C machines connected by wire over a few feet to a common transmitter. The first figure subjected to projection was a doll's head, the received picture of which measured about 3⅛ in. by 2½ in. wide. The detail of the picture was not good, the flicker was unpleasant, and a number of black lines were transmitted by the analysing disc. The next subject was a human face which was less satisfactory than that of the doll. Below the eyes and chin the projection was darkened to such a degree that any detail which might have been there was to some extent blackened out, and while the movement of the eyes, the mouth, etc., could be easily distinguished, the picture on the whole was lacking in detail. A lady vocalist was next transmitted, her voice and the piano accompaniment being reproduced by the loud speaker. Here again the darkness under the chin and eyes was prominent, and while we would not describe the picture as being in any way distorted, it was a long way from being perfect. The movements of the singer, however, could be followed without difficulty, the illumination being good.

This last transmission represented to some extent the conditions under which owners of televisors will receive the broadcast programmes predicted and for that reason was subject to more criticism. The fact that the Baird Television Development Co. can transmit moving pictures over a few feet of wire has been demonstrated, but whether or not even the same results can be obtained by radio over a few miles has, so far as we are concerned, yet to be demonstrated.

A representative of the Baird Company explained that the apparent lack of detail was brought about by the presence of the dark lines most prominent under the eyes and chin of the subject televised. This difficulty, it was further explained could be overcome by suitably painting or "making-up" the artiste in much the same way as is done in film studios. Further, the darkness was more prominent on some days than on others; also, different faces often produced lesser or greater degrees of darkness.

As a test of the abilities of the television equipment, both transmitting and receiving, the front cover of last week's issue of THE ELECTRICIAN was televised by request. Before the test was made, however, it was explained that the subject was an extremely difficult one on account of the smallness of the type, which explanation was fully confirmed by the result. A newspaper poster, however, was also transmitted and this, on account of the larger type, was received quite clearly and was easy to read.

**The complete radio-televisor showing the picture "screen" on the right and the moving coil loud speaker on the left.**

The transmission tests were confined to one image at a time, and the methods adopted for transmitting from the studio were not revealed, that section of the demonstration premises not being open to those present.

The impression given by the demonstration was that, though television is possible, the progress so far made in this country still leaves much to be accomplished. The projection was not so good as were those of the first public performances of the cinematograph and the size of the picture is, in our opinion, on the small side. From the fact that the Baird Television Development Co. has developed receivers for public sale and that a television service is predicted, it is obvious that the company holds views other than those expressed by ourselves.

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# NEWS IN BRIEF.

## New Zealand Electrical Developments—Manchester Tramways Managership—Scottish Electrical Service Bureau's Programme—Birmingham Electric Club Ladies' Evening—Commercial Travellers' Week End Fares.

THE demand in Australia for electric refrigerators is increasing.

The Oxford Post Office is to be supplied with electrically propelled trolleys to carry mail bags to and from the station.

Weymouth Electricity Committee recommends acceptance of a tender amounting to £2 533 for boiler house extensions at the electricity works.

Berlin has now one telephone to every eight inhabitants.

A successful electrical exhibition was held recently at the Pavilion, Tunbridge Wells.

The reduction in telephone charges in Argentina was made effective by a Government decree on October 1st.

The London Underground Railway Companies opened on Wednesday, at the Burlington Galleries, London, an exhibition of their posters covering 20 years of traffic advertising. The exhibition will be continued daily until October 20th.

Mr. K. S. Williams, the New Zealand Minister of Public Works, recently announced, in his annual statement to Parliament, that the expenditure in the current year on hydro-electric works would be £1 260 000, including the cost of completing the Arapuni installation. The Waitaki electric development, in the South Island, was expected to be completed in three years.

The "coming of age" celebrations of the Institute of Metals will be held in London on March 6th, 1929.

There are 15 002 consumers of electricity in Blackpool, against 3 271 ten years ago, and 386 miles of electric mains, an increase of 22 miles during the year.

Birkenhead electricity department last week held an electrical exhibition in the Town Hall and each afternoon and evening gave demonstrations of electric cooking, washing, etc.

Manchester Corporation Tramways Committee decided last week to advertise for a general manager and engineer to succeed the late Mr. H. Mattinson. The salary is £2,000 per annum.

Members of the Manchester College of Technology on September 29th entertained Dr. S. Z. de Ferranti and Sir Henry Fowler, on whom were conferred the honour of associateships of the college.

A feature of the Hull Corporation's new £26 000 scheme for refuse destruction is that the hot gases derived from the incineration process will be passed to two tube boilers to provide steam for driving two 75 kW generators.

The annual Ladies' Evening of the Birmingham Electric Club will be held on October 19th at the Grosvenor and Windsor Rooms of the Grand Hotel. The reception is timed for 7-7.30 p.m., a whist drive for 7.45-9.45, dancing from 7.45 to 2 a.m., and supper from 10-11 p.m.

At the National Band Contest at the Crystal Palace last Saturday, Callender's Cable Works Band was placed fifth in the championship contest, won by the Black Dyke Mills Band, and Callender's Cable Works "A" Band was second in the Junior Cup (A) contest, won by Stenalees.

The 1928-9 Session of the I.E.E. will commence on October 25th, when Lieut.-Col. K. Edgcumbe, President, will give his inaugural address. A meeting has been arranged for November 8th, when Mr. W. B. Woodhouse will give an account of the work of the E.R.A. in connection with overhead lines.

The Electricity Department of Guildford T.C. is to hold an exhibition in the Drill Hall from October 10th to 20th. Attractive features will be an all-electric bungalow and a shop window in which scientific lighting demonstrations will be given.

Subjects for lectures to be given in connection with the Scottish Electric Lighting Service Bureau include the modern lighting of laundries, factories, etc., architectural and home lighting. In addition, there are seven lectures arranged for Thursdays, commencing October 25th, and these together constitute a complete Illumination Design Course.

The new laboratories of the Safety in Mines Research Department, in Sheffield, will be opened officially by Mr. Stanley Baldwin on October 11th. The improvement of illumination in mines by means of electric lamps, and the elimination of the danger of ignition of gases by electric sparking are amongst the most important problems now under the Department's consideration.

About 50 members of the South Wales branch of the Association of Mining Electrical Engineers visited the works of Edison Swan Cables, Ltd. Lydbrook, Gloucestershire, last week. The visitors witnessed the various processes of cable manufacture, and were interested in the remarks of Mr. F. Gale (works manager) on the subject.

The Underground Electric Railways Co. of London have installed at Westminster station a set of illuminated discs, one for each railway comprised in the underground group. On these discs, which are divided into hours, strokes are printed on the paper to indicate the frequency of the train services. At rush hours the strokes form almost a solid mass. The public has evinced great interest in the apparatus. See page 387.

The Industrial Court will hear, on October 10th, an application by the railway companies that the wages paid to the staff solely employed in railway electricity generating stations and sub-stations, and on high-tension cables between them be reduced forthwith by 6s. per week. The Electrical Trades Union did not join in the voluntary arrangement made a few weeks ago by all the other unions and the companies for a general reduction of 2½ per cent. over all grades.

The National Union of Commercial Travellers has been informed that on and from to-day, Friday, the minimum fare for commercial travellers' week-end return tickets at single fare will be reduced to 4s. first class and 2s. 6d. third class, and the period of availability will be the same as the concession recently granted to the general public, namely, outward on Friday by any train at or after 4 a.m., Saturday or Sunday by any train. Return will be permitted by any train up to and including the following Tuesday.

At the annual conference of the National Union of Conservative and Unionist Associations last week, Mr. Amery (Colonial Secretary) said the Select Committee of the House of Commons investigated the question of Post Office telephone cables some time ago, and came to the conclusion that the association or ring which controlled this cable production was asking excessive prices. In consequence, the Department was not prepared to buy at that price. A resolution expressing the opinion of the Conference that Government departments should give preference to home and Empire goods was carried unanimously.

### *TEN ELECTRICAL COMMANDMENTS.*

1.—*Thou shalt have no needless drudgery in thy home—delegating to electricity all wearisome tasks.*

2.—*Remember the cellar light—don't leave it burning.*

3.—*Thou shalt not permit the cords of thy appliances to become frayed and worn, and easy prey to short circuit.*

4.—*Thou shalt not allow the frost to gather to an unseemly depth upon the freezing unit of thy refrigerator.*

5.—*Remember thy bag of thy vacuum cleaner to keep it empty.*

6.—*Thou shalt not forget that electricity is cheaper than eyesight, and shalt use freely of the first to improve the second.*

7.—*Thou shalt not tax thy electric circuits beyond their capacity lest they blow out their fuses.*

8.—*Thou shalt not fail to keep extra lamps in the house against the day when they shall surely be needed.*

9.—*Thou shalt have at least one light in every room controlled by a switch near each door—thus will you save much stubbing of toes and barking of shins.*

10.—*Thou shalt utilise thy toaster and thy percolator and all thy table appliances to the fullest extent, for thus wilt thou add to thy own comfort and thy family's enjoyment.*

(*With acknowledgments to the Society for Electrical Development.*)

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# PERSONAL.

COUNC. B. Pearlman, Lord Mayor-elect of Hull, is chairman of the Corporation Electricity Committee.

Mr. R. F. Lawrence, of Holophones, Ltd., addressed the Basingstoke Rotary Club last week on modern artificial lighting.

Mr. H. Talbot has relinquished his position as general manager of the Welsbach Light Co., Ltd., in order to assume duties of general manager of the Non-Inflammable Film Co., Ltd.

Mr. Harold Rawson, who was married on September 27th to Miss Jessie Hargreaves, was presented with a mahogany barometer by the maintenance staff of the Lancashire Electric Power Co., Radcliffe.

Mr. W. T. Harrop, who recently resigned as claims superintendent in Bolton Tramways Department, has been ordained deacon by the Bishop of Manchester. Mr. Harrop will shortly become curate of Deane Church, Bolton.

Guildford Electricity Committee has appointed Mr. E. J. W. Brown, assistant engineer to the London office manager of Bruce, Peebles and Co., Ltd., as working assistant borough electrical engineer at a salary of £350 a year, rising to £400.

Mr. L. Brooke, traveller of the Leeds Branch of W. T. Henley's Telegraph Works Co., Ltd. has been appointed manager of the Sheffield Branch. Mr. H. W. Turner, of the Engineering Department, City Office, has been appointed to the position at Leeds vacated by Mr. Brooke.

Guildford Town Council has made the following appointments:—Mr. Henry R. Billing, of Pontypridd, installation superintendent; Mr. W. F. May, of Maidenhead, assistant mains superintendent; and Mr. E. J. Williams Brown, of Hither Green, London, assistant borough electrical engineer.

The marriage of Mr. Robert Kington, a member of the staff of the Manchester branch of Callender's Cable and Construction Co., and Miss Eileen M. Hart was solemnised at St. Luke's Church, Reading last week. Mr. Kington was presented with a cheque by the staff of the company.

The current issue of the "Henley Telegraph" records the fact that Mr. H. T. Ramsay, of the Research Department of W. T. Henley's Telegraph Works Co., Ltd., has passed the Intermediate Examination (Engineering section) of the London University. Messrs. F. C. Grant and F. Ingles, both of the Sales Department, have been awarded bronze medals in the Internal Examination (Electrical Engineering section) of the London Polytechnic.

Awards in the competition for Whitworth Scholarships, 1928, have been made to Leslie I. Farren (Portsmouth), William G. Onslow (Chatham), William H. Stonelake (Devonport), Robert McCloghrie (Portsmouth), Sydney M. E. Rousell (Portsmouth), Harold G. Crook (Portsmouth), Charles S. Scantlebury (Devonport), Franklin H. Mole (Devonport), Frank L. Weatherdon (Devonport), Albert C. G. Witts (Sittingbourne), William T. Andrews (Sheerness), Lawrence F. Ainger (Devonport), and Robert D. Coventry (Portsmouth), all either acting or late electrical fitter apprentices.

Counc. H. J. Galliers, principal of the firm of electrical contractors which bears his name, has been chosen as Mayor-Elect of Brighton for the ensuing twelve months. Counc. Galliers, who has been associated with the Brighton Town Council since July 1923 (when he succeeded his late father as representative of the Pier Ward), is a native of Brighton, and founded his business in Brighton in 1900, since when he has extended to Hove, Worthing, Lewes, Haywards Heath and London. He formed the Sussex branch of the Electrical Contractors' Association in 1919, and was chairman in 1922-23

See page 387.

## Obituary.

MR. JOHN CHARLES LUCAS, on September 26th, aged 60 years. For many years on the staff of the Commercial Cable Co.

MR. ELIJAH STOREY, on September 22nd. He introduced electric light at Oundle, Northants, nearly 40 years ago, where he was for 48 years in business.

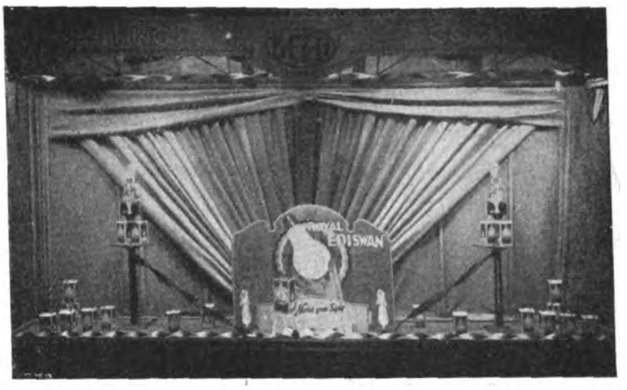
MR. FREDERICK GEORGE COOMBES, aged 43 years. He joined the testing department of the British Thomson-Houston Co., Ltd., at Rugby, in 1907. From 1909 to 1912 he was on the firm's outside testing staff in the London area, and he was then appointed chief of the general testing department at Coventry, and after being transferred to the engineering department in 1915 was appointed in 1922 personal assistant to the engineer and manager of the Coventry works.

# BUSINESS ITEMS.

MESSRS. R. and E. Potter, of Thame, Oxon, gave wireless demonstrations at the Thame Agricultural Show last week.

The offices of the Atlas Light and Power Co. have been removed to River Plate House, South Place, London, E.C.2.

An interesting event of the Leeds civic week, which commenced on September 24th, was the opening on that day of the Corporation's electricity showrooms at 117, Albion Street.




**The Ediswan lamp window display in the Bradford Corporation electricity showrooms. We understand that 1 500 of these displays are being placed throughout the country.**

The Reading Industries Exhibition, at the Reading Town Hall this week, includes a stand by the Reading Electric Supply Co. The Pulsometer Engineering Co. also has a stand.

The Blackburn Chamber of Trade is organising an industrial exhibition in the Public Halls during October, and the Blackburn Corporation Electricity Department and John Chew and Co., hardware and electrical factors, have taken a large space for the display of the latest electrical appliances.

The directors of the Castle Fuse and Engineering Co., Liverpool, last week deputed Mr. Edgar Golland to visit Belfast by the flying boat "Calcutta" to interview Mr. Whysall, the Belfast city electrical engineer. As a result of the firm's enterprise, a very acceptable order was received.

In connection with the marketing of the new Mazda-nickel filament valve, the British Thomson-Houston Co., Ltd., is launching an extensive advertising and publicity campaign. Special literature, showcards and other matter have been prepared, and extensive advertising will be made in the daily Press.

A successful three-days electrical exhibition was held at Upton-on-Severn, Worcestershire, last week, in connection with a campaign which is being conducted by the Shropshire, Worcestershire, and Staffordshire Electric Power Co., with the object of increasing the popularity of electricity in the rural areas.

An important feature in the publicity campaign which is being conducted by Tungsram Electric Lamp Works (Great Britain), Ltd., is the broadcasting of circulars to past, present and potential users of Tungsram lamps. Each name on the company's mailing list of over 300 000 will receive 12 communications during the year.

The first rotary automatic telephone system exchange in Paris was cut over on September 22nd by Mons. Cheron, the newly appointed Minister of Commerce. The opening of the Carnot Exchange marks the first step in the conversion of all the telephones in Paris to dial working. The programme, extending over ten years, has been mapped out for conversion to the rotary automatic system developed by the International Telephone and Telegraph Corporation.

National advertising and a free gift scheme are the methods chosen by the Cooper-Stewart Engineering Co., Ltd., to achieve a wider distribution of "Sunbeam" and "Princess" electric irons and toasters and multi-purpose electric heater-cooker outfits. Briefly, the scheme is to present free a "Little Princess" iron to every purchaser of a "Sunbeam" griller and-toaster. To every buyer of a "Sunbeam" toaster, or 5 lb. or 6 lb. iron, a gift is made of a "Handy Mandy" clothes hanger, and with every multi-purpose "Aristocrat" heater sold is given a pure spun aluminium kettle to fit. This scheme will be in force during the month of October only. An outside shop pennant, black printed on yellow, and a set of attractive window showcards which will call attention to the free gifts have been prepared.

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# SELLING LINES.

AMONG the newest devices put on the market by British B. A. G., Ltd., is a Maxim toaster with a loading of 450 W. The finish is in nickel plate and the weight is 1¼ lbs. Another Maxim appliance is an electric iron. This is made in three sizes, with loadings of 275, 325 and 450 W, the respective weights being 3¾, 5, and 6¾ lbs.

We give herewith an illustration of the Naldera fire by the Thermo-Path Co., Ltd. This radiator was specially designed for the P. and O. Steamship Co., for the s.s. " Naldera "—in all the first class cabins of which ship it is fitted. The frame is of cast-iron, vitreous enamelled in a pleasing shade of dark blue, with nickel guard and fittings. The reflectors are made from rustless steel. The guard is fitted with a lock, and the elements are of the " clip in " type, according to standard practice. This fire is suitable for bedrooms and small sitting rooms or nurseries and is made in all standard voltages. The load for cabin use is 2-300 W and for domestic use 2-700 W, with a separate switch for each element. This radiator, having a wide base, cannot easily be knocked over. The ship cabin pattern has a cast back with slots for bulkhead supports and drop handle while the domestic pattern has a sheet steel enamelled back.

The Naldera fire by the Thermo-Path Co., Ltd., which has been recently introduced for domestic use.

A new immersion heater, which embodies several notable improvements in design, is being put on the market by Charles Joyner and Co., Icknield Square, Birmingham, the makers of " Angelus " electric fires and cookers. The new heater is made in all loadings from 0·25 kW to 10 kW—the latter size being intended for heavy duty in large institutions—and utilises four heater tubes. The contacts in all types are self-aligning and of ample capacity, and the elements are so arranged as to permit of easy withdrawal without necessitating the removal of the tube or the emptying of the tank. Switchgear on the walls is eliminated, the mains being connected to a busbar system in the heater. The loading on the surface of the tube is arranged at a low wattage per square inch, so as to minimise the formation of deposit from impurities in the water.

The same firm is producing a new " Angelus " cooker for small family work, in which the grill chamber is fitted with a front drop-door, permitting the whole of the heat to be utilised both during and after cooking. The boiling plate with griller combined is efficiently braced to prevent warping and cracking, and the oven is vitreous enamelled throughout. The firm is devoting attention to the production in the near future of new models in electric cookers for export trade only.

## New Switches.

The Midland Electric Manufacturing Co., Ltd., has sent us a sample and particulars of a new combined switch and fuses, fitted in an all-insulated case. The combination is rated at 5 to 10 A, 250 V, while the medium rating is 8 A; hence the name " Mem 8." It is claimed that the new switch is the smallest, most effective and least expensive combination at present available. It is suggested that " Mem 8 " is suitable for a main service switch for small houses and tenements, and assisted wiring schemes. The switch is 4½ in. by 3½ in. by 2 in., is attractive in appearance, and should find a large field of usefulness in those many cases where the additional protection of double pole fuses would be an advantage, as in domestic appliances, such as portable heaters, vacuum cleaners and the like.

" M.K." Electric, Ltd., has introduced a number of new lines including a horizontal interlocked 15 A switchplug, anti-flash sockets in various types, 5 and 15 A all-insulated switchplugs, bakelite flush sockets, surface plugs and sockets, and switch plates and units. These, we understand, will be ready during October and November, and advance particulars are given in the company's accessory list just issued.

George Nobbs, Ltd., have sent us particulars of the " Genii " Maclaren thermostats suitable for the automatic temperature control of all kinds of electric water heaters and domestic hot water storage tanks. The chief features of the device are robust construction with minimum of moving parts, and one type is adjustable so that it can be used in any position through the side, top or bottom of tanks or even in a canting position. It is fitted with an adjustable temperature regulator with a dial graduated 100–200 deg. F., which simplifies adjustment to any temperature without guess work. The expansion movement is by invar steel rod and brass tube for the " M.T." type control and by the addition of bellows to obtain finer regulation, for room and refrigerator controls, etc. A tank protection sleeve with spring clip is provided so that the thermostat may be inserted or withdrawn without drawing off water in the tank, while the mercury tube switch is fitted with a ceramic liner to withstand the flash at the breaking of the electrical circuit, thus prolonging the life of the tube.

# UNIVERSITY PROSPECTUSES.

## Details of Engineering Courses for the Next Session.

THE prospectus of University College (London) Faculty of Engineering for the 1928-29 session is to hand. It contains particulars of the personnel of the departments, which include electrical engineering and physics departments; the Engineering Society; terms and vacations; fees; conditions of admission of students; degrees, examinations, prizes and scholarships; the training provided by the Faculty of Engineering; post-graduate work and research, etc. In the department of electrical engineering separate sections are devoted to electrical technology, electrical design and electro-communications, and students in their third year, or others possessing certain qualifications, can be admitted to work in the Pender Electrical Engineering Laboratory. The book also contains a time table of classes, and information relating to the Union Society, Women's Union Society, Officers' Training Corps, Old Students' Association, and numerous special societies not connected with the Unions.

The prospectus of University Courses in the Municipal College of Technology, Manchester, is a volume consisting of 320 pages. In addition to the college calendar, it comprises a description of the college buildings, a list of professors and lecturers, conditions of admission of students, details as to fees, prizes, examinations, degrees, certificates, time tables, syllabuses of classes, information regarding the College Old Students' Association, the Old Owensian Association, the Faculty of Technology Union, University Union, the laboratories, Officers' Training Corps, etc. There is an adequate staff of professors and lecturers to deal with electro-technics and every branch of electrical engineering, and several pages are devoted to particulars of the work done in the various electrical sections.

## Evening Classes.

Particulars of evening classes in electrical engineering during the 1928-29 session are given in a prospectus issued by the Northampton Polytechnic Institute, Clerkenwell, London, E.C.1. There are courses of instruction in general electrical engineering, radio engineering, electrical installations and cable jointing, electrical machine and armature winding and electrical instrument making, a course leading to the University degree in electrical engineering, and courses for (*a*) electrical contractors' technical staff and (*b*) automobile electricians. Enrolment, requirements for admission, examinations, certificates and the University degree in engineering are also dealt with, while much useful information is contained in the schedule of courses and syllabuses.

London County Council's " Clerkenwell " Junior Technical Institute, Compton Street, London, E.C.1, opened its 1928-29 session last month. A prospectus has been issued, giving information as to fees, free admissions, organisation of classes, etc., and also containing a time table, with the names of instructors in the various subjects, which include electrical and mechanical engineering, wiremen's work, instrument making, etc. Lord Riddell will distribute the prizes and certificates for the 1927-28 session at Finsbury Town Hall, Rosebery Avenue, E.C.1, on October 27th.

The General Council of the British Association has accepted an invitation to hold the Association's meeting in 1930 at Bristol.

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# TRADE PUBLICATIONS.

A NEW booklet, No. 416, entitled "The Construction of h.t. Supply Units," has been published by Ferranti, Ltd.

The September stock list of Baxter and Caunter, Ltd., has been received.

Mr. Alan Wright has published a new booklet relative to Inventum electric heaters.

A new leaflet describing the A.B.C. Spinner Washer has been issued by the Sun Electrical Co., Ltd.

A special leaflet dealing with the "Sprayit" device for paint or other spraying operations, has been published by L. G. Hawkins and Co., Ltd.

The General Electric Co., Ltd., has published a new booklet dealing with household electric appliances, a booklet on electric fires, and a folder descriptive of the "Wizard" washer.

John Shaw and Sons, Wolverhampton, Ltd., have published a new folder concerning the 20-20 electric vacuum cleaner, while a new folder featuring Trojan lamps has also been issued.

George Nobbs, Ltd., have issued catalogue section No. 220, describing "Genii" Maclaren thermostats for automatic temperature control of electric water heaters and domestic hot water storage tanks.

A new domestic electric appliances catalogue, together with postcards and text letters relating to the Company's October Free Scheme, have been published by the Cooper-Stewart Engineering Co., Ltd.

The current price list of Siemens Electric Lamps and Supplies, Ltd., has been received. A copy of catalogue No. 196 dealing with the company's glassware, and superseding catalogue No. 97, is also to hand.

Wright and Weaire, Ltd., have published list No. U.1, dealing with a high frequency unit for radio purposes; list No. A.F.1, dealing with an anode filler unit; and a special leaflet giving details of the company's high frequency choke.

A special booklet dealing with sound reproduction has been published by the British Thomson-Houston Co., Ltd. The issue illustrates and describes cone and R.K. loud speakers, amplifiers and gramophone equipment. A number of circuits are included, in addition to many technical details and explanations.

Siemens Brothers and Co., Ltd., have published catalogue No. 500, describing and illustrating telephones and accessories of the company's manufacture. The issue is a fairly comprehensive publication indicative of the large range of manual and automatic telephones and equipment available. The catalogue comprises no less than 134 pages, is well illustrated, and is produced in imitation art paper.

We have received from the Allgemeinen Elektrisitäts Gesellschaft a copy of a book entitled "Twenty-five Years of A.E.G. Turbines," which marks the 25-year jubilee of the company's turbine business. The book is produced with an attractive cover in colours on a blue background, and comprises 132 pages. A number of illustrations of early models, in addition to modern machines, are given.

*THE stand of the Mullard Wireless Service Co., Ltd., at the National Radio Exhibition, which concluded at Olympia on Saturday, September 29th. It is understood that so far as the Mullard Company is concerned, the exhibition was an unqualified success.*

# THE SOCIAL SIDE.

THE staff of the Thames Valley Electricity Co. lost at bowls to the Henley Corporation by four points.

The Graham Amplion Co., Ltd., recently held a dance at the Thames Hotel Pavilion, Slough. It was attended by nearly 300 people.

**Group taken at the E.C.A. of Scotland Bowling match, West v. East, at Glasgow on September 14th.**

At the annual meeting of Dick Kerr's (Preston) Cricket Club it was reported that the team had won the 1st division championship for the fourth time in five years.

Reading Corporation Tramways Social Club held a produce show last week, at which Mr. P. Durman took the championship prize for the best exhibit, and Mr. W. South that for the competitor gaining the highest number of points. Mr. A. G. Robey carried out the duties of general secretary.

The annual bowling match, East *v.* West, of members of the E.C.A. of Scotland, took place on the Shawlands Green, Glasgow, on September 14th, and resulted in a heavy win for the West. This match is held every year for a trophy which was presented by Mr. T. B. Wright, of Glasgow, in memory of his father, the late Mr. Thomas Wright, the first President of the Scottish Association, and during the whole period of the contest this trophy has been won by the Western team.

## A PROBLEM FOR DESIGNERS!

IN the current issue of the "Engineering Gazette," the house journal issued by Marryat and Place is reproduced the following inquiry received by the firm from Bangalore, India:—

"I am in the market for a few magnets of the following specification, and shall be very much obliged to you if you can quote your lowest for the same, if in stock, and send me your illustrated catalogue of your products.

The magnet is to be fixed 35 ft. above the ground level, and it should be capable of attracting (drawing near it) one iron plate placed on the ground with some weights on it weighing in all 135 lb. But the magnet should not draw the plate so close to it as both the plate and magnet come in contact with each other; but should draw the plate (with weights) to a height of about 5 ft., and should keep it there suspending in the air.

"If you kindly reply me per return your views, I shall write to you my requirements."

### THE JOHN BENN HOSTEL BALLOT.

The Boys' Ballot will close for judging on Monday, December 31st, 1928, and the full list of prize winners will be published in the "Daily Telegraph" of February 20th, 1929. No entries can be accepted after 14 days from the closing date.

It is felt that many of our readers will welcome the opportunity to do good work in ticket selling over the Christmas season, and all who wish to participate in the £1 500 prize list containing a standard saloon motor car, trips abroad, valuable furniture, gramophones, aerial flights, and over 350 other attractive gifts, should send without delay for tickets, 1s. each (10s. for a book of 11) to the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BRENTFORD GUARDIANS.—Installation of intercommunication telephone system at Isleworth institutions. Particulars from the Clerk, Union offices, Isleworth.

CENTRAL ELECTRICITY BOARD, October 5th. — Supply, delivery and erection of 132 000 V outdoor switchgear for transformer stations in area covered by South-East England Electricity Scheme. Specifications, etc., from the offices of the Board, Trafalgar Building, Charing Cross, London, W.C.2; deposit £2 2s.

WATFORD CORPORATION, October 5th.—Two 750 gal. per min. sewage ejectors, with electrically driven air compressors. Specification from Borough Surveyor; deposit £2 2s.

WIRRAL GUARDIANS, October 5th.—Electrical installation at Bebington Poor Law Institution. Specification (£2 2s.) from Messrs. Finchett, Lancaster and Archer, 13, Hoghton Street, Southport.

BRADFORD CORPORATION, October 6th.—Electrical installation at City Hospital. Specification, etc., from City Architect.

ECCLES TOWN COUNCIL CORPORATION, October 8th.—Electric installation in 66 houses in Edison Road, Patricroft. Particulars from the Borough Electrical Engineer; deposit £1 1s.

ISLINGTON (LONDON) BOROUGH COUNCIL, October 8th.—Supply and installation of two new lead batteries, for driving two Edison refuse collecting vehicles, having carrying capacity of 2½–3 tons. Further particulars from the Cleansing Superintendent, Liverpool Road, London, N.1.

LEICESTER CORPORATION, October 8th.—Electric light installations at Abbey pumping station and Beaumont Leys Farm. Specification, etc., from City Engineer; deposit £1.

NORWICH CORPORATION, October 8th.—Supply and erection of 12 500 kW turbo generator and condensing plant at Thorpe power station. Specification, etc., from Mr. F. M. Long, city electrical engineer, Duke Street, Norwich; deposit £1.

GREAT WESTERN RAILWAY, October 9th.—Supply of telegraph instruments (list 18), electrical apparatus (list 19), lamps and fittings (list 23) and electric lamps (list 24). Forms of tender from Stores Superintendent, Swindon.

DUNDEE CORPORATION, October 10th.—Supply of e.h.t. and l.t. paper insulated lead covered and armoured cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HAWARDEN RURAL DISTRICT COUNCIL, October 10th.—Electric light wiring of isolation hospital, Pentrobin, Buckley, near Chester. Particulars from Mr. Arnold K. Wroe, clerk, Carlton House, Hawarden, Chester.

SIDMOUTH URBAN DISTRICT COUNCIL, October 13th.—Erection of l.t. overhead electricity main about 1½ miles in length from the electricity works at Sidford. Details from the engineer and manager, Mr. Henry Burgess.

DARLINGTON CORPORATION, October 15th.—Cooling tower, with foundations and tank. Specification, etc., from the Borough Electrical Engineer, Houghton Road, Darlington; deposit £1 1s.

EDINBURGH CORPORATION, October 15th.—Coal and ash plant, for Portobello generating station, including weighbridge, truck tippler, three electric capstans, belt conveyors and elevators and two ash telpher hoists. Specification, etc., from Mr. E. Seddon, city electrical engineer and manager; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE October 18th.—Electric light installation at Thorne Grammar School. Particulars from Education Department, County Hall, Wakefield.

GLASGOW PARISH COUNCIL, October 20th.—Twelve months' supply of electric fittings (item 62) and electric lamps (item 62A). Forms of tender, etc., from Mr. M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 23rd.—Supply of electric cables during 12 months ending November 30th, 1929. Further particulars from the Electrical Engineer, Electricity Works, Penrose Street, Walworth Road, S.E.17.

LONDON COUNTY COUNCIL, November 12th.—Four electrically-driven sewage-pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc.; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £5.

### Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 10th.—Telegraph material. (Reference A.X. 6 905.)

INDIA STORE DEPARTMENT, October 11th.—Supply of two 150 kVA transformers.

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, October 12th.—Installation of electric motors, etc., in mechanical transport workshops, Island Bridge Barracks, Dublin. Specification, etc., from Office of Public Works, Dublin; deposit £1.

SOUTH INDIAN RAILWAY CO., LTD., October 12th.—Supply of electric cables and wires. Specification, etc. (5s.), from the Company's offices, 91, Petty France, Westminster, S.W.1.

INDIA STORE DEPARTMENT, October 16th.—Supply of porcelain insulators for 11 000/33 000 V. Forms of tender (5s.) from Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, October 16th.—Supply of flame proof, jumper wire (specification P. and T. 151/1076). (Reference B.X. 4770.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

PORT ELIZABETH MUNICIPALITY, October 25th.—Steel cross arms for transmission line. (Reference A.X. 6 892.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 25th.—Supply of two 6½ kW crude oil driven generating sets.

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water-tube boilers with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of six induction voltage regulators. (Contract No. 55.) (Reference B.X. 4 768.)

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353.) (Reference B.X. 4 638.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Supply of 22 000 V. armoured type switchgear. (Reference B.X. 4 763.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Steel lattice towers, with cross arms, insulators, etc. (Reference A.X. 6 897.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

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SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically-driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director General, Belvedere Road, London, S.E.1.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories, for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

NEW ZEALAND PUBLIC WORKS DEPT., November 13th.—Supply of transformers. (Reference B.X. 4 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362). (Reference B.X. 4 396.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Supply of switchboard keys and parts (schedule C. 362). Reference B.X. 4 752.)

MELBOURNE CITY COUNCIL, November 14th.—Supply of totally enclosed, metal clad type switchgear and spares (specification 952). (Reference B.X. 4 748.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 749.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of indicators (schedule C. 371). (Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). Reference B.X. 4 753.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

## Tenders Accepted.

MERSEY DOCKS AND HARBOUR BOARD.—British Insulated Cables, Ltd., supply of cable.

WESTMINSTER GUARDIANS.—Metro-Vick Supplies, Ltd., supply of Cosmos electric lamps, etc., for 12 months.

GOLBORNE URBAN DISTRICT COUNCIL.—Roberts Bros., electrical installation in 16 houses, £7 8s. 6d. per house.

GENERAL POST OFFICE.—Siemens Bros. and Co., Ltd., submarine telephone cable from the Isle of Man to Belfast.

ISLINGTON (LONDON) GUARDIANS.—Metro-Vick Supplies, Ltd., part contract for supply of electrical accessories for six months.

WHITTON AND ASHLEY (LINCOLN).—G. A. Howard, electric light wiring and fitting of new premises, 183, High Street, Lincoln.

GENERAL POST OFFICE.—Automatic Telephone Manufacturing Co., Ltd., supply of telephone equipment, for Manchester, £400 000.

CHICHESTER CORPORATION.—Crompton Parkinson, Ltd., alterations of motors necessitated by change to alternating current, £1 090.

WELLAND SHIP CANAL, ONTARIO.—Harland Engineering Co., Ltd. (Montreal Branch), electrical equipment to operate lock gates and sluices.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply, erection, etc., at Agecroft power station of one 16 000/20 000 kW turbo-alternator, with condensing plant, £50 841.

NEW SOUTH WALES RAILWAY COMMISSIONERS.—Babcock and Wilcox, Ltd., six boilers for Ultimo power house, £269 000. Tender was referred back by Legislative Council, but has now been approved by Cabinet.

CARNARVON CORPORATION.—National Electric Construction Co., Ltd., distribution cables from the transformer to corner of Priestley and Bethel Roads and from the transformer to connect with existing four core distributor in Victoria Street, £441.

SOUTHEND CORPORATION.—Crompton Parkinson, Ltd., eight generator coils for 300 kW set, £180; General Electric Co., Ltd., plant for receiving bulk supply, £959; John Le Boutillier, Ltd., three sets of top end bearings for Diesel plant, £90.

GENERAL POST OFFICE.—Siemens Bros. and Co., Ltd., supply and laying of submarine telephone cable to the Isle of Man. The cable, which consists of four quads of conductors, providing 12 circuits, will be laid by the Company's c.s. "Faraday."

GUILDFORD CORPORATION.—W. Lucy and Co., Ltd., supply of five transformer kiosks, £670; New Switchgear Construction Co., Ltd., extension of switchboard at central sub-station, £252; Crompton Parkinson, Ltd., supply of sub-station switchgear, £2 711.

HORNSEY CORPORATION.—Metropolitan-Vickers Electrica Co., Ltd., supply of spare motor to drive Babcock and Wilcox stokers; Albion Clay Co., Ltd., supply of troughs, covers and bridges (renewal for 12 months at same prices as before). (Both recommended.)

BRADFORD CORPORATION.—F. Smith and Co., Ltd., eight drums (7 200 yards) of trolley wire, £427 15s. 2d.; Forster, Wheeler, Ltd., radiant type superheater, for a boiler at Valley Road power station; J. Blakeborough and Sons, Ltd., supply of four 16 in. steam valves, for Valley Road power station.

STOKE-ON-TRENT CORPORATION.—Chloride Electrical Storage Co., Ltd., provision of secondary battery for plant extensions at central power house, £1 621; John Thompson Water Tube Boilers, Ltd., supply and erection of two 60 000 lb. per hour water tube boilers, £44 975 14s.; Barnett and Soans, supply and erection of overhead services, at Sutton housing estate, Trent Vale, £239 15s. 6d.

GLASGOW CORPORATION.—Mr. R. J. M'Intyre, electric light installation at Crossloan Road and Kepochill Road housing estates, £446 10s. 9d.; A. Reyrolle and Co., Ltd., re-conditioning switch of an alternator at Dalmarnock power station, £2 131 18s.; Andrew Hutcheson, Ltd., supply and erection of electric goods lift (manufactured by A. and P. Steven, Ltd.), at Mearnskirk sanatorium, £313 10s. (All recommended.)

MANCHESTER CORPORATION.—British Insulated Cables Ltd., supply of tram rail bonds; Babcock and Wilcox, Ltd., repair of chimneys, etc., at Barton power station; Metropolitan Vickers Electrical Co., Ltd., supply of static transformers; Callender's Cable and Construction Co., Ltd., maintenance of 33 kV feeders; Revo Electric Co., Ltd., and Credenda Conduits Co., Ltd., supply of domestic cookers; Ferranti, Ltd., supply of large capacity single phase-meters.

BIRKENHEAD CORPORATION.—Gent and Co., supply of electric clock for Woodside ferry station, £78 16s.; Ferguson, Pailin, Ltd., supply of switchgear cubicle, £102 4s. 6d.; Hackbridge Electric Construction Co., Ltd., supply of two 200 kVA transformers, £282. Supply of l.t. four-core and S.T.A. cable, W. T. Glover and Co., Ltd., £2 366, and Macintosh Cable Co., Ltd., £1 110; l.t. cable, Hackbridge Cable Co., Ltd., £4 322, and W. T. Glover and Co., Ltd., £807.

POPLAR (LONDON) BOROUGH COUNCIL.—Parmiter, Hope and Sugden, Ltd., supply of two distribution boards, £116 15s.; Bruce Peebles and Co., Ltd., supply of 1 000 kW motor converter for Wick Lane sub-station, £3 348; New Switchgear Construction Co., Ltd., supply of switchgear, £279; George Ellison, Ltd., extension of l.t. switchgear and distribution boards, £589; Mirrlees, Watson Co., Ltd., supply and erection of pump motor and starter, £172 19s. (All recommended.)

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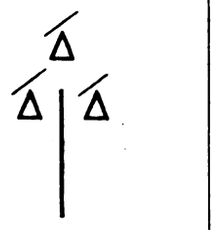
# ELECTRICITY SUPPLY.

## Carlisle and the N.W. England Scheme—Eight All-Electric Houses for Stoke on Trent—Progress at Preston—Proposed Extensions at Derby—Further Extensions at Hammersmith—New Mains at Swansea.

BEDFORD Electricity Committee is to seek sanction for a loan of £10 000 for house services.

Leicester Electricity Committee is to seek sanction for a loan of £40 000 for mains extensions.

Callington U.D.C. has decided that the town shall be lighted by electricity during the coming winter.



*A reproduction of the effective device which has been adopted as the "mark" of the Overhead Lines Association. Unlike the badges of many older bodies the design is highly conventionalised.*

The Cleveland and Durham County Electric Power Co. is seeking a site for a distributing station at Barnard Castle.

Stoke-on-Trent Housing Committee has passed plans for eight all-electric houses, and tenders are to be invited for their erection on a site in Avenue Road, Hanley.

Ilford T.C. seeks sanction to a loan of £50 000 for mains and services. The Electricity Committee has applied for sanction to borrow £17 095 for main generating and sub-station plant.

Beckenham Electricity Committee has decided to negotiate with the West Kent Electric Co. for a partial bulk supply. The Committee has authorised mains extensions at a cost of £2 120.

Huntly T.C. has appointed a committee to consider the feasibility of an electric scheme for the burgh. The Provost suggests that a company should be formed to carry the venture through.

Stranraer T.C. has approved a draft agreement for the provision of electricity supply for the burgh by the Ayrshire Electricity Board. The Board proposes to erect a generating station in the town.

The Wessex Electricity Co. has applied to the Ministry of Transport for consent to the erection and laying of overhead and underground mains for supplying the districts of Cold Ash and Thatcham.

Derby Electricity Committee recommends the installation of a 20 000 kW turbo-alternator, two boilers, etc., at the electricity works, at a cost of £140 000, instead of the 10 000 kW set approved previously.

The Haywards Heath and District Electricity Supply Co. has informed Cuckfield R.D.C. that a Special Order has been applied for, proposing to extend the supply over a wide area by means of overhead lines.

Colchester Corporation has decided to purchase from the U.D.C. the Wivenhoe Electricity undertaking for £2 150, and to pay the Council a sum not exceeding £275 in respect of their application for a Special Order.

Horsham U.D.C. will apply for a Special Order to extend its area of supply. The area to be taken in under the scheme will include Warnham, Kingsfold, Southwater, Christ's Hospital, Broadbridge Heath, and parts of Faygate and Rowhook. The estimated cost is £7 100.

Sanction has been received by Hammersmith (London) B.C. to the borrowing of £35 960 for mains and services, plant and meters. The Electricity Committee is to seek sanction to the borrowing of a further £6 000 in connection with the hire and hire-purchase of wiring installations.

Battersea (London) Electricity Committee is to carry out the following works: Electricity services to 177 premises, £172 15s.; extensions of mains for private services, £433; extensions of mains for public lighting and conversion of gas lamps, £95; substitution of armoured cable for vulcanised bitumen distributors, £1 119.

Mr. J. H. Inskip, presenting the annual report of the Bristol Electricity Committee at last week's Council meeting, said the Committee hoped that at about next Christmas they would be generating electricity at Portishead. In the meantime they were compelled to put in hand the preliminaries for the second instalment of the Portishead scheme.

Wareham T.C. has been informed that the undertaking of the Wareham Electricity Supply Co. has been taken over by the Bournemouth and Poole Electricity Supply Co., Ltd., and that Mr. Field, who has been retained as engineer to the undertaking, is to submit a quotation for the continuance of the public lighting contract.

Swansea Electricity Committee is to lay a main from Oystermouth Road to a sub-station to be erected at the Mayals, at an estimated cost of £12 000. The Committee has prepared schemes for laying mains from Cockett to Waunarlwydd, at a cost of £12 600, for developing the Waunarlwydd and the Mynyddbach areas, from Mayhill station to the waterworks, cost £2 000, and from Delabeche Street to Mount Pleasant, £2 500.

In moving adoption of the Electricity Committee's minutes at the meeting of Preston T.C. on September 27th, Coun. Heaney said the output of electricity last year had grown by 12 million kWh. Whereas working costs had only increased by £201, the income had advanced by £35,700, thus justifying the bold policy of the department. They had now reached the stage when for every decimal point they could reduce their costs they could make a saving of from £12 000 to £13 000 a year. Last year's profit was £17 000.

Blackburn T.C. has approved the laying of cables from Limefield to Revidge and Beardwood Brow, at a cost of £6 900, and a cable from Yew Tree Drive to Lammack Road, at a cost of £7 600. The Commissioners are to be asked to sanction the loan.—The Council has approved expenditure of £900 for three 100 kVA, three 200 kVA, and one 500 kVA transformers, and £173 for switchgear.—The electrical engineer has been authorised to expend £45 for a stand at the Chamber of Trade exhibition in October.—An estimate of £5 350 for the supply and distribution of electricity to Pleasington has been confirmed.

Glasgow Electricity Committee has authorised ordinary mains extensions at a cost of £4 000, and extensions in Centre Street at a cost of £900, and in Nimmo Drive and Ure Street, £2 186. In connection with the change of frequency the Committee is seeking sanction for the following proposals: Govan sub-station, two conductor feeder panels, £1 416; G.C.E.D. laboratory, meter testing set, £263; double-tier switchgear (Messrs. A. Reyrolle and Co.'s price) £10 162 10s.; Dalmarnock power station, alterations to control panel (Messrs. Reyrolle's price) £106.—The installation of motors, etc., in the premises of Messrs. Harland and Wolff, Ltd., the Fairfield Shipbuilding and Engineering Co., Ltd., and Messrs. Alexander Stephen and Sons, Ltd., in connection with the change of frequency, is to be carried out by the electricity department on the basis of 50 per cent. on wages cost for overhead charges.

Mr. C. W. Salt, city electrical engineer of Carlisle, reporting on the North-West England and North Wales Electricity Scheme, says, the effect upon Carlisle is that the Board will take over all capital charges on the generating station at Willow Holme, both in respect of the present and future commitments; it will also take over all revenue expenditure, including expenditure on materials, wages and salaries in respect of generation, but not including expenditure in connection with distribution and sales of electrical energy. The Corporation is entitled to buy back as much electricity as it may require for local distribution at the adjusted station cost, which includes an addition of 0·033d. per kWh to cover the Board's expenses. Mr. Salt is of opinion that, provided the output of electricity increases to the extent foreshadowed in the Board's scheme, the estimated saving of £104 833 spread over the four years commencing 1931–32 will be realised. The council had approved an outlay of £88 000 in respect of the provision of a 7 500 kW turbo-alternator, but the Board's requirements necessitated the substitution of a 15 000 kW set. Mr. Salt expresses the view that in the period between the installation of this larger set, and the date on which the board takes over the capital charges, the Corporation should be relieved of the difference between the capital charges on the 7 500 kW and the 15 000 kW extension.—The Electricity Committee has authorised several mains extensions for serving new houses, a chapel and the premises of Messrs. W. D. Mark & Sons, at a total cost of £2 212.

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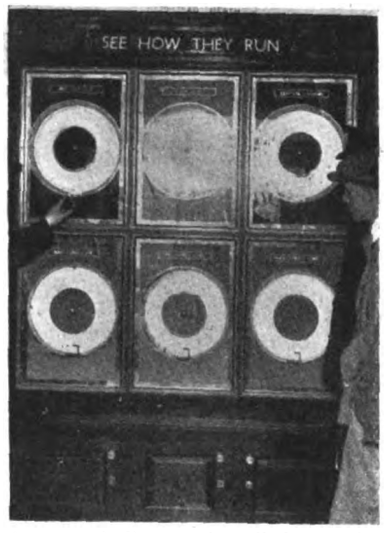
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Counc. H. J. Galliers, head of the firm of electrical contractors which bears his name, who has accepted the Mayoralty of Brighton. P. 381.

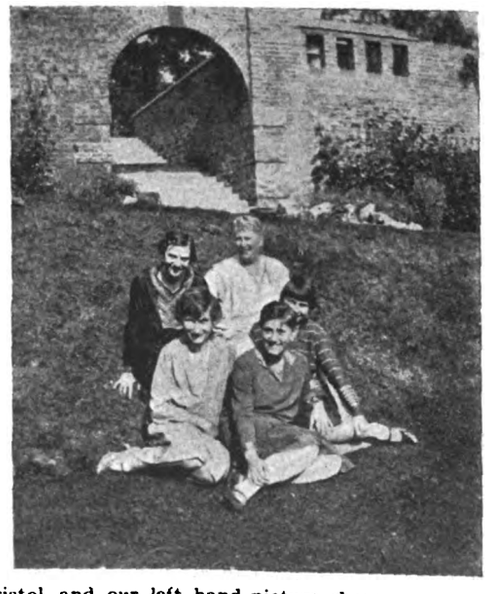
The Lord Mayor of Liverpool, Miss Margaret Beavan, visited the Strowger Works of the Automatic Telephone Manufacturing Co. on September 27th, and is here seen in one of the principal departments. Before leaving she was introduced to the A.T.M. Male Voice Choir, some 60 strong, who, under the conductorship of Mr. David Green, sang "Comrades in Arms." See page 390.

The exhibit of Callender's Cable and Construction Co., Ltd., in the recent Swansea Carnival, for which they were awarded a Diploma of Merit in the Special Class, gaining the first prize.




A new indicator installed at the Westminster Station of the London Underground Railway, to show how frequently trains are running. The dials are connected to various stations.

A picturesque view of the Linz broadcasting station, Austria. A Marconi 1½ kW transmitter is used, and the station was specially built for the benefit of people in Upper Austria.



The Women's Engineering Society this year held their annual conference at Bristol, and our left hand picture shows a group of members taken on the steps of Clifton Hill House. The right hand picture shows Mrs. Ll. Atkinson and the apprentices.

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# WIRELESS NOTES.

## A New Hire Purchase Scheme—The Manchester Wireless Exhibition.

A NEW hire-purchase scheme which has just come into operation for wireless equipment, including sets and accessories of £10 value or over, is that of Metro-Vick Supplies, Ltd.

The newly published window bill which has been designed to advertise the hire-purchase scheme of Metro-Vick Supplies, Ltd.

The scheme has been drawn up in the simplest possible manner for the convenience of the trade, and it is only necessary for the retailer to introduce a customer to the company, by forwarding the agreement form supplied, duly filled in according to requirements.

A special window bill, which is reproduced above, has been prepared in connection with the scheme.

### Manchester Exhibition.

The Manchester Wireless Exhibition which is to be held at the end of this month, October, is meeting with good response, and already the number of stands booked approaches the hundred mark. Among the principal exhibitors are:—Messrs. G. D. Barraclough, A. F. A. Accumulators, Ltd., Brown Bros., Ltd., the British Thomson-Houston Co., Ltd., Brandes, Ltd., A. C. Cossor, Ltd., the Chloride Electrical Storage Co., Ltd., Celestion Radio Co., the Fuller Accumulator Co. (1928), Ltd., Ferranti, Ltd., the General Electric Co., Ltd., Graham Amplion, Ltd., the Electrical Machine and Apparatus Co., Ltd., the Edison Swan Electric Co., Ltd., the Electron Co., Ltd., the Igranic Electric Co., Ltd., the Lancashire Dynamo and Motor Co., Ltd., K. N. Electrical Products, Ltd., Lissen, Ltd., Langham Radio, Ltd., the Mullard Wireless Service Co., Ltd., Metro-Vick Supplies, Ltd., the Marconiphone Co., Ltd., the New London Electron Works, Ltd., Philips Lamps, Ltd., Peto-Scott Co., Ltd., the Sifam Electrical Instrument Co., Ltd., and the Standard Insulator Co., Ltd.

### Wireless Licences in Switzerland.

The Department of Overseas Trade is informed that the Federal Administration of Telegraphs is issuing as from September 1st, monthly licences for wireless receivers. The formalities for the issue of these licences have been made very simple, as the object of the new system is to enable owners of new receiving sets to test their sets thoroughly before applying for the ordinary annual licence, the cost of which was raised from 12 to 15 francs on January 1st, 1928.

## DISPLACED ELECTRICAL STAFFS.

A Central Displacement Committee has been appointed by the National Joint Board of Employers and Members of Staff for the Electricity Supply Industry, for the purpose of giving assistance to members of the technical staffs who may be displaced under the new electricity schemes. Undertakings needing a staff are to be asked to get in touch with the committee before advertising any vacancies they may have to fill. The committee consists of ten members, equally divided between representatives of municipal electricity undertakings and engineers, and of the Electrical Power Engineers' Association. The chairman is Ald. W. Walker, of Manchester. The committee will act in concert with the area displacement committees, which—with the exception of two which have been established—cannot be formed until the areas laid down by the Central Electricity Board have been defined. The offices of the Central Displacement Committee are at 18 and 19, Ironmonger Lane, Cheapside, London, E.C.

# ELECTRIC TRACTION.

## Ministry of Transport Inquiry into Charing Cross Electric Train Accident.

COL. Sir John Pringle held a Ministry of Transport inquiry on Monday in reference to the collision of an electric train with the platform buffers at Charing Cross station (London) on September 19th. The motorman of the train, Richard Caselli, said he had been driving electric trains for two years. He had previously driven steam trains, and had 35 years' experience with the company. The brakes were good when they started from Crayford. He had no difficulty in stopping until Lee, where he overran two coach lengths. He applied his brake, but found to his surprise that it did not have its usual retarding effect. He could not account for it, but thought it might be due to the wet rails. He took the precaution of approaching Charing Cross under the normal speed of 15 miles an hour by applying the brake earlier than usual. H did not at any time release the brake on entering the platform. At four or five car lengths from the buffers he found the car was not stopping. He then let go the dead man's handle, the result of which would be an emergency application of the brake. He could not understand how it happened. He thought he let go the dead man's handle three or four coaches away.

Henry Briant, acting assistant station master, estimated the train's speed at 12 miles an hour as it entered the platform.

Frederick Warman, a ticket collector, said the train ran past him "absolutely free of the brake."

Chas. Burton, another ticket collector, said the train was going about four miles an hour when it hit the buffers. He saw sparks flying, showing that the brake was on.

At the close of the inquiry, Sir John Pringle said he would examine the coaches and the braking.

On the invitation of the engineer and manager of the Hastings Tramways Co., Bexhill Watch Committee recently inspected two of the company's new trolley omnibuses, one of each of the double and single-deck types, and were taken for a trial run.

Glasgow Tramways Committee is seeking an extension of the time limit in regard to the construction of various tramways and the proposed underground passages at St. Enoch Station.

An official inquiry has been held regarding the collision which took place on August 8th on the Manx Electric Railway. Evidence was given that this was the first serious accident on the railway during its 35 years' working.

The General Post Office is about to use experimentally a new type of electrically propelled van for the delivery of parcels and letters. At first about ten vans will be used, in London and Leeds. The vehicles will be used chiefly in districts where there are a great number of parcels to be delivered, and for the delivery of letters in large numbers.

## ELECTRICAL TRANSMISSION.

A COMPLETE work describing modern practice in the transmission and distribution of electricity supply is to be published by Sir Isaac Pitman and Sons, Ltd., in 30 parts, edited by Mr. R. O. Kapp. Each part will be priced at a shilling, and the work covers the construction, erection and maintenance of overhead lines, distribution in rural areas, the manufacture of cables and cable laying methods, the testing and maintenance of underground cables, consumers' connections, e.h.t. switchgear lay-outs, e.h.t. switchgear apparatus, generating voltage switchgear, d.c. and low tension a.c. switchgear, apparatus and lay-outs, the care and operation of switchgear, indicating instruments, electricity meters and maximum demand indicators, the operating routine of a meter department, control room design, the construction of transformers, converting plant, mercury arc rectifiers, the handling, care and protection of transformers, the design and lay-out of sub-stations, the testing, maintenance and operation of sub-station plant, automatic sub-stations, and boosting devices and power factor apparatus. Among the contributors to the work are Messrs. Norman A. Allen, W. A. Benger, D. Berry, V. A. Brown, W. Anselm Coates, J. L. Eve, C. C. Garrard, R. E. Hopkins, Oliver Howarth, H. Hugh Jaques, C. W. Jolley, Philip Kemp, C. W. Marshall, R. Borlase Matthews, A. P. Pyne, H. S. Selves, S. Parker Smith, H. Cobden Turner and C. J. Sargeant.

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# COMPANY NEWS.

## Appreciation of Prices of Manufacturing Companies' Shares—Associated Fire Alarms Increased Dividend—Crompton Parkinson's Offer of Deferred Ordinary Shares—New Electrical Companies Registered.

THE greater part of last week's rise in Newcastle-upon-Tyne Electric Supply shares has since been lost, the shares at the time of writing being half-a-crown down, at 27s. 6d. In the manufacturing group, Henley's ordinary have jumped up 3s. 9d., while Metropolitan Vickers ordinary and preference and Callender's ordinary have improved 1s. 3d., and Ever Ready shares are 6d. better. Underground Electric Railways ordinary shares have shed 6d. and Metropolitan ordinary stock is ½ down.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/0 | 19/6 | 10/- |
| (*c*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/0 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/0 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 23/6 | 23/0 | 68/6 | 14/0 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 20/6 | 20/0 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1).. | 28/- | 28/- | 104/0 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 40/10½ | 40/10½ | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 17/6 | 17/6 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 30/- | 30/- | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 27/6 | 30/- | 22/6 | 7/9 |
| 6 | ,, ,, Elec. Sup. Ord. .. | 23/- | 23/- | 20/- | 11/0 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 10½ | 10½ | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 27/0 | 27/0 | 62/- | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 36/3 | 30/3 | 23/- | 22/- |
| 1.4½ | Shrops,Worcs.&Staffs Power B.Ord. | 27/- | 27/- | 52/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 17/6 | 17/6 | 21/6 | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1).. | 38/- | 38/- | 32/9 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 24/- | 24/- | 25/- | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | | | | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 72 | 72 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. .. | 79 | 79 | 103 | 50½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. .. | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½* | 68½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 67 | 67½ | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 79 | 00½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** .. | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 83/9 | 86/3 | 20/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/0 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 100 | 100 | 109⅜ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 80/- | 22/- |
| 6½ | ,, ,, ,, 6½% C.P. .. | 25/- | 23/9 | 26/7 | 3/- |
| 7½ | ,, ,, ,, 7½% B. Pref. .. | 20/3 | 20/3 | 27/6 | 10/6 |
| — | Crompton Parkinson Pref. Ord. .. | 18/- | 18/- | 18/- | 8/- |
| 7 | ,, ,, 8% Cum. Pf. | 26/3* | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/0 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 20/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/0 | 35/9 | 0/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 10/- |
| — | English Elec. Ord. .. .. | 6/10½ | 6/10½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 28/- | 27/6 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 41/6 | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 116/3 | 112/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 37/6 | 37/6 | 67/11 | 11/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 35/- | 33/9 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 53/9 | 52/6 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 30/- | 30/- | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 50/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3¾ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 262½ | 260½ | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. | 69½ | 69½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38 | 38½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 40½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 76/3 | 77/6 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 57/- | 56/6 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½* | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7 7/16d. per share. (*b*) £8 8s. 6.666d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 9·12d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus. * Ex. dividend.

QUEBEC POWER CO.—Div. of $½ p. sh. on common shs. for qrtr. ended Sept. 30 will be payable on Oct. 16.

ASSOCIATED TELEPHONE AND TELEGRAPH CO.—Qrtrly. div. of $1.75 p. sh. on 7 p.c. pfd. stk. for qrtr. ended Sept. 30 is now payable.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. on common shs. of 60 cents (agst. 50 cents) for qrtr. ended Sept. 30 is now payable.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Intm. divs. for qrtr. ended Sept. 30 of ¾ p.c. on ord. stk. and 1½ p.c. on pfd. stk. (same rates as last year) are announced.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—It is announced that 33 of the 25-year 7½ p.c. gen. mtge. sinkg. fd. gold bds., due 1948, were drawn for redemption on Sept. 14.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—intm. div. of 2½ p.c. actual, on pref. stk. and intm. div. of 4½ p.c., actual, on ord. stk. (same rate as last year) are now payable.

RHINE-WESTPHALIA ELECTRIC POWER CONSOLIDATED.—The recent offering of £20 000 000 worth of this co.'s con. mtge. 6 p.c. gold bds., 1953, by the National City Co. in New York was heavily oversubscribed.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—Directors announce paymt. on Nov. 1, of intm. div. on A ord. shs. of 4 p.c. actual, less tax at 4s. in £, in respect of year endg. Dec. 31, 1928.

ASSOCIATED FIRE ALARMS, LTD.—Pft. for year ended June 30, 1928, £7 004, against £5 100. Reserved for income tax £1 058, against £1 027; leaving £5 946, plus £1 646 brt. in. To res. £2 000, making total of £23 000. Div. 8 p.c., less tax, against 6 p.c. Fwd. £1 931.

ELECTRIC BOND AND SHARE SECURITIES CORPORATION.—The board has voted to offer *pro rata* to common shhldrs. the privilege of subscribg. (at the rate of one new sh. for each three shs. now outstandg.) for 801 275 shs. without par value of common stk., at $90 p. sh., payable until Oct. 31.

SHANGHAI ELECTRIC CONSTRUCTION CO., LTD.—Intm. div. at rate of 5 p.c., actual, tax free, has been declared on sh. cap and will be payable on presentatn. of coupon 36 on and after Nov. 1, at Eastern Bank, Ltd., 2 and 3, Crosby Square, London, E.C.3. Coupons to be left two clear days before paymt.

HURST, NELSON AND CO., LTD.—Gross pft. for year ended July 14, 1928, £89 915, agst £79 584, from which is deducted depreciation £6 163. With amt. brt. in, £9 477, blce. is £93 229. After paymt. of pref. div. and placing £10 000 to res., fin. div. of 2s. p. sh. and bonus. of 6d. p. sh., makg. 4s. p. sh., less tax, are recommended on the ord. shs.

SOCIÉTÉ INTERCOMMUNALE BELGE D'ELECTRICITE.—Letters of acceptance in respect of the offer for sale by M. Samuel and Co., Ltd., of £500 000 35-year sinkg. fd. 5½ p.c. Sterling bds. of this co. have been posted. Owing to the large number of applicatns., allotmts. in the cases of applicatns. for over £100 only amt. to between 25 and 50 p.c. of the amts. applied for.

ATIBIBI POWER AND PAPER CO., LTD.—A resolutn. has been passed at a mtg. of hldrs. of 1st mtge. 6 p.c. serial gold bds., whereby the co. is authorised to redeem on Dec. 1, 1928, all such bds. which are outstandg., by paying amts. ranging from 100½ to 107½ p.c. of the principal amt., accordg. to the serial maturities of such bds. Unless, before Nov. 1, holdrs. of more than 25 p.c. of the outstandg. bds. have notified the trustee that they object to the said resolutn. the same will be acted upon.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—Mfg. pfts. of associated cos. for year ended March 31, 1928, £471 119, agst. £430 257; net pfts. £148 379, agst. £100 715. After provisn. for depreciatn., taxatn. and outstandg. divs., net blce. is £53 945, agst. £13 310. Rev. acct. of parent co. shows £69 531 contributns. and int. recd. from associated cos., and £14 391 surplus on Aldwych House acct., and after deductn. of int. and administratn. exes, blce. is £35 840, plus £67 345 brt. fwd. Board propose that £46 740 standg. to debit of foreign sales developmt. shd. be written off. Fwd., £56 445.

CROMPTON PARKINSON, LTD.—Arrangemts. have been made whereby a block of dfd. ord. shs. are made available. The whole of these have been held privately by Mr. F. Parkinson and Mr. A. Parkinson, and it is a conditn. of the terms of sale that a portion of the shs. shall be available for purchase by

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hdlrs. of the pfd. ord. Prior to the marketing, the dfd. ord. cap., which consisted of 50 000 shs. of £1 each, will be subdivided into 200 000 of 5s. each, and by means of an increase of cap. and capitalisatn. of reserves a further 200 000 dfd. ord. of 5s. each will be created and distributed fully paid to present hldrs. The voting power of the deferred ordinary will then be one vote per share. The price of the shares reserved for pfd. ord. shhldrs. (subject to permission to deal being granted) is 19s. 3d. net per fully-paid sh. of 5s.

## Company Meeting.

CLIFTOPHONE AND RECORDS, LTD.—Sir H. Capel L. Holden, presiding at the statutory meeting last week, said since the public issue the directors, particularly Mr. W. E. Clifton, the managing director, had been extremely busy in laying the foundations for what was expected to prove a very successful and profitable business. The factories at Bermondsey Square and Abbey Street were overflowing with the manufacture of instruments, and a site and premises had been purchased at Clapham, where artistes, orchestras, etc., could be properly accommodated. They had developed and placed on the market an improved form of loud speaker for wireless reception which was covered by basic patents. The demand for these loud speakers had been unexpectedly great, and they could not yet keep pace with their orders. They were, however, taking steps to produce them in large quantities, and were exhibiting them with their other electrical and wireless productions on two stands at the Wireless Exhibition at Olympia, and also in attractive showrooms at 67, Hammersmith Road, opposite Olympia, during the Show week.

## New Companies.

APPROVAL LTD.—Cap., £300. Dealers in wireless instruments and accessories, etc.

RUSSON BROS., LTD.—Cap., £750. Brassfounders, engineers, electricians, etc. Reg. office :—232A, Aston Road, Birmingham.

ALLAN BOYLE AND CO., LTD.—Cap., £1 000. Electrical and general engineers, etc. Reg. office : 98, Duke Street, Dennistoun, Glasgow.

PERFECTION RADIO STORES, LTD.—Cap., £300. Manufacturers of wireless apparatus, electrical engineers, etc. Reg. office : 1, Crosshall Street, Liverpool.

KITCHEN INDUSTRIES TRUST, LTD.—Cap., £100. Manufacturers of and dealers in electrical goods, etc. Reg. office : 41, North John Street, Liverpool.

G. YELDON, LTD.—Cap., £2 000. To acquire business of radio engineer and manufacturer carried on by Gerald Yeldon at 20, New Road, Portsmouth.

HUNTLEY AND SPARKS, LTD.—Cap., £2 500. Electrical and general engineers, etc. Reg. office : 44-6, King's Road, Sloane Square, London, S.W.3.

LONDON AND PROVINCIAL BUILDING CO., LTD.—Cap., £6 000. Builders, electrical engineers, etc. Reg. office : Coventry House, 3, South Place, London, E.C.2.

TICKHILL MOTOR CO., LTD.—Cap., £100. Motor garage proprietors, mechanical and electrical engineers, etc. Reg. office : Gas Works, Tickhill, Rotherham.

SHAGREEN, LTD.—Cap., £2 000. Dealers in electrical appliances, fittings and accessories, etc. Solicitors :—Kenneth C. Bartlett and Co., 83, Cannon Street, London, E.C.

BROOKLYN TRUST, LTD.—Cap., £20 000. Electrical engineers, manufacturers of and dealers in electrical apparatus, etc. Solicitor : M. Blumberg, 31, Princess Street, Manchester.

WEST WALLASEY GARAGES, LTD.—Cap., £3 000. Garage proprietors, wireless dealers, electrical engineers, etc. Reg. office : West Wallasey Garages, Leasowe Road, Wallasey.

BULLMAN MACHINE CO., LTD.—Cap., £250 000. Electricians, engineers, etc. Solicitors : Hore, Pattisson, and Bathurst, 48, Lincoln's Inn Fields, London, W.C.2. (Public co.)

HASSOCKS AND HURST ELECTRICITY CO., LTD.—Cap., £5 000. Electric light and power company. Reg. office : 424, Salisbury House, London Wall, London, E.C.2. (Public co.)

CELEBRITONE CO., LTD.—Cap., £100. Salesmen and manufacturers of wireless apparatus and installations, electrical goods, etc. Reg. office : Kent House, 87, Regent Street, London, W.1.

WOLFE GARAGE, LTD.—Cap., £100. To acquire business now carried on at Westerham, Kent, as "The Wolfe Garage," and to carry on the business of electrical and mechanical engineers etc.

HYGIENIC AND GENERAL SALES CO., LTD.—Cap., £3 000. To adopt agreement with G. Jones and P. G. Jackson and to carry on business of mechanical, electrical and general engineers and manufacturers, etc. Reg. office : 37/8, Strand, W.C.

CINE-SOUND, LTD.—Cap., £1 000. Manufacturers of and dealers in apparatus for recording of sound in synchronisation with cinematograph films, photographs and pictures, or independently thereof, and wireless apparatus, motors, batteries, amplifiers, and all appliances and accessories, etc. Reg. Office : 14, Coleman Street, London, E.C.2.

## METAL AND CHEMICAL PRICES.

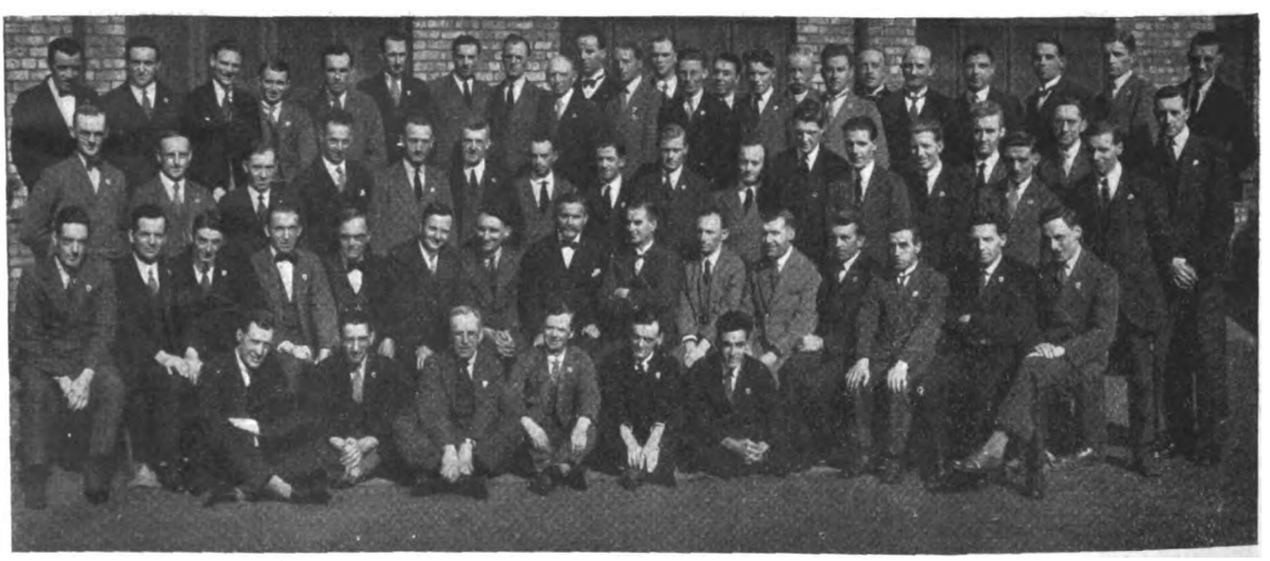
TUESDAY, October 2nd.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £68 0 0 | — | — |
| Electro Wirebars | ,, | £71 15 0 | — | — |
| H.C. Wires, basis | per lb. | 10 ⅛d. | — | — |
| Sheet | ,, | 10 ⅛d. | ⅛d. | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1 ⅛d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8½d. | — | — |
| Sheet , | ,, | 9½d. | ¼d. | — |
| Wire ,, | ,, | 10½d. | ¼d. | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 5 0 | — | — |
| Foreign or Colonial | ,, | £21 15 0 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £228 0 0 | £7 10 0 | — |
| Wire, basis | per lb. | 2s. 11½d. | 1d. | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 2 6 | — | 2s. 6d. |
| *Mercury* | per bottle | £25 5 0 | 10s. 0d. | — |

*Sulphur*—Flowers, Ton £12 0 0 Roll, ,, £10 15 0 *Copper Sulphate*—Ton £25 to £25 10 0 *Boric Acid* (Crystals) ,, £30 *Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d. *Sodium Bichromate*—Per lb. 3½d.

*Rubber*—Para fine, 6½d.; plantation 1st latex, 9½d.

∴ The metal prices are supplied by British Insulated Cables Ltd.



*DURING the occasion of Liverpool Civic Week, the Lord Mayor, Miss Margaret Beavan, visited the works of the Automatic Telephone Manufacturing Co., Ltd., and was there introduced to the A.T.M. Male Voice Choir. A performance was given before the conclusion of the visit, the sixty odd members giving a very good account of themselves. The assembled choir is shown in the above picture.*

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ACCUMULATOR CHARGING CO., Alexandra Road, Rugby. £19 14s. 10s. August 22nd.

CLARKE, W. E., 149A, Seabank Road, New Brighton, wireless dealer. £11 7s. 6d. August 22nd.

DITTON ELECTRIC SERVICE, Winters Bridge, Portsmouth Road, Long Ditton, electrical engineers. £12 15s. 2d. August 27th

HEALD, Sydney, 39, Steeley Lane, Chorley, wireless dealer £19 8s. 7d. August 22nd.

HEWSON AND LOWN, 68, Victoria Street, Westminster, electricians. £12 16s. 9d. July 26th.

KINVIG, H. L., 167, Jeffcock Road, Wolverhampton, electrical engineer. £19 3s. 6d. August 22nd.

NORMINGTON, John, 5, Victoria Park, Shipley, electrical dealer £15 18s. 7d. August 21st.

RELIANCE ELECTRIC AND MAINTENANCE CO., 59, Queen Victoria Street, E.C. £16 16s. April 26th.

SOUTH WALES WIRELESS DEPOT, 16A, Duke Street, Aberdare. £14 7s. 1d. August 22nd.

WARNE, N. P., 134, Uppingham Road, Leicester, electrical engineer. £11 10s. 10d. July 31st.

## Bills of Sale.

HILL, Alex. Henry James, 1, South Street, Greenwich, electrical engineer. Dated September 29th, filed October 1st. £50.

MONK, Charles Philip, Mon Caprice, 35, Acacia Drive, Thorpe Bay, electrical engineer. Dated September 27th, filed September 28th. £80.

TRICKER, Reginald, Regina, Wood Lane, Isleworth, electrical engineer. Dated September 20th, filed September 25th. £120.

## Deed of Arrangement.

PRICE, Fred, and TARVER, Charles Reekes, trading at 15, Working Street, Cardiff, as FRED PRICE, TARVER AND CO., electrical engineers. Dated September 27th, filed October 1st. Liabilities unsecured, £774; assets, less secured claims, £257. Trustee, A. E. Orchard, 34, Windsor Place, Cardiff, accountant.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BURGOYNE MANUFACTURING CO., LTD., London, E.C., wireless manufacturers. Registered September 14th, £4,000 debenture, to W. B. Fordham and Sons, Ltd., 36-40, York Road, N.; general charge.

ELECTRIC MOTOR SUPPLIES, LTD. (late ELECTRIC MOTOR SUPPLIES (HUDDERSFIELD), LTD., AND LANGDON DAVIES MOTORS, (CANADA) LTD.), Huddersfield.—Registered August 31st, £2 000 (not ex.) mortgage, to bank; charged on 1, John Street, Huddersfield. *Nil. December 12th, 1927.

HEXHAM AND DISTRICT ELECTRIC SUPPLY CO., LTD., Newcastle-on-Tyne.—Registered September 4th, series of £10 000 debentures, present issue £6 500; general charge (subject to first debenture). *£26 000. April 22nd, 1928.

MAUGHAN (J. L.) AND CO., LTD., Newcastle-on-Tyne, electrical engineers, etc.—Registered September 3rd, £49 4s. mortgage, to S. Phillips, 86, Pilgrim Street, Newcastle-on-Tyne, solicitor; charged on 29, Carliol Street, and 13, Erick Street, Newcastle-on-Tyne.

TAYLOR (HERBERT E.) AND CO., LTD., Norwich, electrical engineers.—Registered September 6th, charge to Bank; charged on properties at Cringleford.

WIRELESS ENGINEERING CO. (SCUNTHORPE), LTD.—Registered September 7th, £200 debentures, to Mrs. M. Bone, 75, Brumby Wood Lane, Scunthorpe; general charge.

### Satisfactions.

DELHI ELECTRICITY SUPPLY AND TRACTION CO., LTD. (late DELHI ELECTRIC TRAMWAYS AND LIGHTING CO., LTD.), London, E.C. Satisfaction registered September 17th, £50,000, registered January 17th, 1908.

HEXHAM AND DISTRICT ELECTRIC SUPPLY CO., LTD., Newcastle-on-Tyne.—Satisfactions registered September 4th, £2 000, registered August 25th, 1923, and £1 000, registered November 4th, 1924.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD., Birmingham.—Satisfaction registered September 17th, £400 000, etc., registered June 13th, 1913.

RADIO SERVICE (LONDON), LTD.—Satisfaction registered September 6th, £125, part of amount registered July 26th, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

RUSSELL AND CO. (ENGINEERS), LTD., 9, Cheshire Court, New Bond Street, London, W.1, lighting, heating and ventilating engineers. The statutory meeting of creditors in the voluntary winding up of this company was held on September 27th, at the Holborn Restaurant, when a statement of affairs was submitted which showed liabilities of £3 760, of which £3 143 was due to unsecured creditors, and total assets of £1 496, less preferential claim of £63, and amount subsequently paid Sheriff in possession, £75, leaving net assets of £1 358, or a deficiency of £2 402. The issued capital of the company is £2 000, consisting of 1 000 6 per cent. preference shares of £1 each fully paid, and 1 000 ordinary shares of £1 each fully paid. It was reported by the liquidator, Mr. R. C. Taylor, that the business was commenced in 1888 and the company was actually formed in 1910. Accounts had been prepared which showed that for the year ending January, 1921, the sales amounted to £19 354, there was a gross profit of £2 708, the expenses were £1 428, and the net profit £1 487. In the following 12 months on sales of £16 203, there was a gross profit of £2 845 and a net profit of £1 646, the expenses totalling £1 340. For the year to January, 1923, the turnover amounted to £19 512, and the gross profit rose to £3 418, the expenses being £1 759 and the net profit £1.863. In the next 12 months, however, the sales dropped to £10 634, and the gross profit was £2 327, the net profit fell to £1 037 and the expenses amounted to £1 390. For the 12 months to January, 1925, the sales were £9 070, the gross profit £1 088, the expenses £1 287 and there was a net loss incurred of £153. The position improved in the following year, however, when a net profit of £1 223 was earned on sales of £14 335, the gross profit totalling £2 519 and the expenses £1 327. For the year to January, 1927, the sales again fell to £7 838, there was a gross profit of £1 383, the expenses were £904, and the net profit £479. For the 12 months to January last, on sales of £9 757, the net profit was £941, the gross profit being £1 955 and the expenses £1 014. All the profits were arrived at before charging the directors' salaries, income tax, etc. After some discussion it was decided to confirm the voluntary liquidation of the company with the present liquidator and a committee of inspection of three of the principal creditors was appointed.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

GLOW-ACTIVA SIGN CO., LTD. By reason of its liabilities, September 25th. F. E. Ellis, Chartered Accountant, Walter House, 418-22, Strand, W.C.2, appointed as liquidator. Meeting of creditors at 1-5, Cecil Court, St. Martin's Lane, London, W.C.2, on Wednesday, October 10th, at 3 p.m.

KAY (T. L.) AND CO., LTD. By reason of its liabilities, September 25th. H. Gardiner, 1A, Low Ousegate, York, Incorporated Accountant, appointed as liquidator.

### Bankruptcy Information.

EXCEL RADIO COMPONENTS, 53, Abingdon Street, Northampton, manufacturers of wireless sets and components. First meeting, October 9th, 11.30 a.m., Official Receiver's Office, The Parade, Northampton. Public examination, November 2nd, 10 a.m., County Hall, Northampton.

### Notices of Intended Dividends.

HODDINOTT, Henry Joseph, 3 and 5, Cathedral Yard, Manchester, trading as HODDINOTT AND CO., electrical fittings supplier. Last day for receiving proofs, October 17th. Trustee, F. Murgatroyd, Byrom Street, Manchester, Senior Official Receiver.

### Application for Discharge.

HALL, Geoffrey Samuel, 55, Maldon Road, New Malden, Surrey, electrical engineer, trading as GEOFFREY S. HALL AND CO. Hearing, November 2nd, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

### Partnership Dissolved.

THOMAS HORN AND CO. (Albert William KAY and Thomas John HORN), electrical and wireless engineers and suppliers, 5, Harrogate Parade, Moortown, Leeds, by mutual consent, as from September 24th, 1928. Debts received and paid by T. J. Horn, who continues the business.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### September 12th.

26 134 J. R. Jennens. Thermionic valve holder.
26 210 J. Lucas, Ltd., and E. O. Turner. Electrical contact breakers.
26 173 A. J. Martin and Plessey Co., Ltd. Electrical pick-ups for gramophones.
26 125 J. Neale. Solenoid actuated devices.
26 201 S. Rogers. Bonding devices for conductors.
26 222 A. H. Seabrook. Overhead transmission systems.
26 127 T. Smith. Insulators for overhead wires.
26 162 F. Warburton. Telegraph printers.
26 208 O. M. Weiss. Electric oven.

### September 13th.

26 284 C. P. Allison. Wireless telegraphy.
26 343 A. D. Blumlein and Standard Telephones and Cables, Ltd. Alternating current bridge circuits.
26 329 J. J. Brand. Electric ignition systems for internal combustion engines.
26 337 British Hanovia Quartz Lamp Co., Ltd. and H. S. Lockwood. Mercury vapour lamps.
26 291 British Thomson-Houston Co., Ltd., and H. C. Heath. Circuit breakers.
26 294 C. G. Carey, S. H. Long and Siemens Bros. and Co., Ltd. Wireless telegraph apparatus.
26 290 Hotpoint Electric Appliance Co., Ltd. Liquid-heating appliance.
26 319 G. Rosengvist. Making articles by galvano-plastic process.
26 309 Siemens-Reiniger-Veifa Ges. fur. Medizinische Technik. Apparatus for operating Rontgen tubes. (13/3/28, Germany.)
26 342 Standard Telephones and Cables, Ltd. Switching mechanisms.
26 344 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Telephone systems.
26 345 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Telephone exchange systems.
26 300 D. S. S. Stewart. Transmitter devices for telephones, etc.

### September 14th.

26 408 A. E. Allsop and E. Shipton. Indicating devices for electric circuits.
26 399 Ateliers de Constructions. Electriques de Charleroi. Cascade connected electrical groups. (12/5/28, Belgium.)
26 458 W. de S. Bass. Coils etc., for wireless telephony, etc.
26 459 W. de S. Bass. Signalling devices, etc.
26 438 A. Blondel. Electrically-operated megaphones, etc. (14/9/27, Belgium.)
26 460 L. G. Brazier. Loading coils.
26 387 Dubilier Condenser Co. (1925), Ltd., and W. C. Tingey. Dials for electrical condensers, etc.
26 428 Edison Swan Electric Co., Ltd., and T. F. Stent. Formers for inductance coils, etc.
26 473 Electrical Research Products, Inc. Talking motion picture projection. (8/8/28, U.S.)
26 412 Electro-Mechanical Brake Co., Ltd., and J. H. Williamson. Trucks for tramway rolling stock, etc.
26 401 P. E. Erikson and Standard Telephones and Cables, Ltd. Electric cables.
26 402 M. C. Field and Standard Telephones and Cables, Ltd. Dielectric material for submarine cables.
26 404 Graham Amplion, Ltd., and P. K. Turner. Tuning arrangements for radio receivers.
26 427 International General Electric Co., Inc. Overload protective devices. (14/9/27, Germany.)
26 367 W. G. Kennings-Kilbourn. Wireless systems, etc.
26 413 M. L. Magneto Syndicate, Ltd., and E. A. Watson. Permanent magnets.
26 414, 26 415 M. L. Magneto Syndicate, Ltd., and E. A. Watson. Magnetos.
26 474 W. Morgan. Ignition control of internal combustion engines.
26 453 C. Berrage-Moulton. Electrical pick ups, etc.
26 370 E. Nuttall. Apparatus for electrically heating glasshouses, etc.
26 357 J. J. P. O'Beirne. System of television.
26 376 Westinghouse Electric and Manufacturing Co. Turbine blading. (14/9/27, U.S.)

### September 15th.

26 510 J. R. E. Bray and British Quain Sunlight, Ltd. Immersion heaters.
26 499 British Power Railway Signal Co., Ltd., and E. C. Irving. Signals for railways, etc.
26 538 Elektrizitats Akt.-Ges. Hydrawerk. Electric condensers. (21/9/27, Germany.)
26 535 Graham Amplion, Ltd., and W. J. Rickets. Apparatus for controlling intensity of beam of light.
26 527 R. B. North. Ignition apparatus for internal combustion engines.
26 529 A. D. S. Rice. Radio apparatus.
26 496 A. Sadler (G. B. Shipley and H. Alinder. Electric furnaces.

### September 17th.

26 642 Allgemeine Elektricitats Ges.—Thermionic valves. (17/9/27, Germany.)
26 615 W. E. Beatty (Bell Telephone Laboratories, Inc.). Volume control for sound recording, etc.
26 608 Eisenwerk Weserhütte Akt.-Ges. Laying cables. (14/10/27, Germany.)
26 586 Graham Amplion, Ltd., and W. J. Rickets. Television systems.
26 647 Infra Soc. Anon. Electric furnace. (29/9/27, France.)
26 594 International General Electric Co., Inc. Motor controllers. (17/9/27, Germany.)
26 622 K. Kohl, and Suddentsche Telephon Apparate, Kabel u. Drahtwerke Akt.-Ges. Generation of electric oscillations. (17/9/27, Germany.)
26 587 C. Oliver and Oliver Pell Control, Ltd. Supports for sound reproducing devices.
26 588 L. H. Reid. Indicators for electric switches.
26 592 A. Schmid. Primary electric cells, etc.

### September 18th.

26 727 Associated Telephone and Telegraph Co. Telephone systems. (19/9/27 U.S.)
26 780 British Electric Reproduction Co., Ltd., and A. B. Calkin. Thermionic valve amplifiers.
26 741 British Thomson-Houston Co., Ltd. Compasses. (22/9/27, U.S.)
26 742 British Thomson-Houston Co., Ltd., and T. H. Kinman. Radio components.
26 744 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dynamo electric machines.
26 690, 26 692 H. F. and G. H. Collins. Electric heaters.
26 691 H. F. and G. H. Collins. Electric heating apparatus.
26 729 B. B. Fenn. Incandescent lamps.
26 766 A. C. Hyde and L. A. Levy. Illuminated signs.
26 713 A. G. Ionides. Electric heating and cooking apparatus.
26 738 Marconi's Wireless Telegraph Co., Ltd. Aerial systems. (28/10/27, U.S.)
26 758 Metropolitan Vickers Electrical Co., Ltd. (Westinghouse Electric and Manufacturing Co.). Arc welding.
26 707 R. E. Ollerenshaw. Illuminated fires.
26 714 A. Pringle. Means for telegraphically reproducing images.
26 756 Siemens-Schuckertwerke Akt.-Ges. Safety electric switches. (24/9/27, Germany.)
26 713 I. T. Stokes. Electric heating and cooking apparatus.
26 735 Telefonaktiebolaget L. M. Ericsson. Impulse senders. (20/9/27 Sweden.)
26 739 Telefonakiebolaget L. M. Ericsson. Telephone call bells. (20/9/27, Sweden.)
26 757 Telefonaktiebolaget L. M. Ericsson. Micro-telephones. (20-9-27, Sweden.)
26 678 H. C. Wilson. Wireless receivers.

### September 19th.

26 866 Allgemeine Elektricitats Ges. Automatic electricity meters. (26/9/27, Germany.)
26 900 Almeida Accumulators, Ltd., and L. A. Levy. Secondary cells.
26 885 Associated Telephone and Telegraph Co.. Remote control systems. (8/10/27, U.S.)
26 822 J. H. Collie. Acid level and charge indicators for accumulators.
26 876 J. Cook. Means for transmission of power from electric motor to sewing machine, etc.
26 853 A. J. Cunningham. Burglar alarms.
26 893 General Electric Co., Ltd., and E. L. Randall. Supports for electric lamps.
26 874 R. Girandon. Rheostats, etc. (20/9/27, France.)
26 809 A. Graham and Co., and W. J. Rickets. Telephone exchange systems.
26 883 E. Green. Aerials, etc.
26 832 M. H. Hodgson. Electric motors.
26 911 A. E. Lallemand. Tuning devices for wireless apparatus, etc.
26 804 F. A. Lindeman. Apparatus for producing electric current corresponding to light incident thereon.
26 894 O. D. Lucas. Combined radio receiving sets and electrical gramophones.
26 836 H. Steele and J. Steele and Sons, Ltd. Trays, etc., for accumulators.

# ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* Gee and Co., *Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C.2, from whom further information may be obtained.*

*Opposition to the registration of the following Trade Marks can be lodged up to October 26th.*

SH. (Sign)—461 895. Class 8. Electrical measuring instruments. Siemens and Halske Aktiengesellschaft (a joint stock company organised and existing under the laws of Germany), 101 to 110, Nonnendamm-Allee, Berlin-Siemensstadt, Germany: manufacturers. September 2nd, 1925. (By consent.) User claimed from February 1st, 1921.

Brolda.—492 444. Class 8. Instruments and apparatus for use in wireless telegraphy and telephony. The Benjamin Electric, Ltd., Brantwood Works, Tariff Road, Tottenham, London, N.17; illuminating engineers. June 15th, 1928. (By consent.)

Insol.—493 534. Class 8. Electrical dry batteries (not for medical purposes). Louis Holzman, 34, Kingsway, London, W.C.2.; merchant. July 24th, 1928. (To be Associated. Sect. 24.)

Trojan.—493 586. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Trojan, Ltd., Vicarage Road, Croydon, Surrey; engineers. July 25th, 1928.

Tricity.—493 044. Class 11. Electrical appliances or lamps for surgical or curative use. The British Electric Transformer Co., Ltd., Clayton Road, Hayes, Middlesex; manufacturing electrical engineers and contractors. July 4th, 1928. (To be Associated. Sect. 24.)

Insol.—493 535. Class 13. Electric torches and electric lamps for torches. Louis Holzman, 34, Kingsway, London, W.C.2; merchant. July 24th, 1928. (To be Associated. Sect. 24.)

## LEAD MARKET REPORT.

According to James Forster and Co., the lead market last week had an easier tone but the final close was steadier. The American price remains unchanged at 6.50 cents per lb.

Closing prices on September 28th were £21 13s. 9d. for September, £21 11s. 3d. for October, £21 10s. for November, and £21 8s. 9d. for December, about 6s. 3d. per ton lower on the week.

# Coming Events.

### Saturday, October 6th.

Electrical Power Engineers' Association.—Hotel Cecil, Strand, London. Annual Dinner. 5.30 for 6 *p.m.*

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place, Cardiff. General Meeting. 6 *p.m.*

British Medical Association (Brighton Division).—Visit to the all-electric farm of Mr. R. Borlase Matthews, East Grinstead.

### Monday, October 8th.

Electrical Contractors' Association (Hastings Sub-Branch).—Lewcock Restaurant. Ordinary meeting.

Institute of Transport.—Lecture Theatre of the Institution of Electrical Engineers, Victoria Embankment, London. First ordinary meeting of the session. Presentation of premium awards.

Electrical Association for Women.—18, Stanley Crescent, Notting Hill Gate, London. Meeting arranged by the Mayoress of Kensington (Mrs. R. Dudley Baxter) for members of the E.A.W. to meet representative women of Kensington. 5 *p.m.*

Institution of Electrical Engineers (Western Centre).—Merchant Venturers' Technical College, Bristol. Ordinary general meeting. Inaugural address by the chairman, Mr. W. J. Bache. 6 *p.m.*

### Tuesday, October 9th.

Electrical Contractors' Association (Bournemouth Branch).—Ordinary meeting.

Electrical Contractors' Association (Swansea Branch).—Ordinary meeting.

Electrical Contractors' Association (Leicester Branch).—Corridor chambers. Ordinary meeting. 2.30 *p.m.*

Electrical Contractors' Association (Derby Branch).—Ordinary meeting. 5 *p.m.*

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting 7 *p.m.*

### Wednesday, October 10th.

Electrical Contractors' Association (Eastbourne Sub-Branch).—5, South Street. Ordinary meeting.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. 5.30 *p.m.*

Overhead Lines Association.—Wellington Rooms, 105, Victoria Street, London. Conversazione. 8 *p.m.*

### Thursday, October 11th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East Yorks. Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Optical Society.—Imperial College of Science and Technology, Imperial Institute Road, South Kensington. Ordinary meeting. 7.30 *p.m.*

### Friday, October 12th.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. F. Squirrell on "Boiler House Instruments." 7.30 *p.m.*

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## The Factory Lighting Campaign.

If the number of people attending the various meetings last Friday in London and the provinces to discuss the Factory and Workshop Lighting Campaign is of any value as a criterion, there is every reason to anticipate extremely good results from this latest E.L.M.A.–E.D.A. co-operative propaganda effort. One outstanding feature which materially strengthens the case for better industrial lighting is the large volume of official support afforded to the aims of this campaign in the shape of Government and Home Office reports emphasising the importance of lighting in many different spheres of activity. While users of light may sometimes pay insufficient attention to statistics prepared by those who have something to sell, the disinterested data provided by the Government publications referred to are sure to be regarded as authoritative. When a Joint Industrial Council definitely recommends to members of the printing trades a lighting intensity of 20 foot candles to ensure maximum output and accuracy in composing rooms, it is obvious that the objects of this campaign have ample disinterested support. We have often pointed out how closely our self-interest in pushing some development of electricity and electricity consuming appliances is related to the best interests of the public; how in addition to benefiting ourselves we have added to the comfort, health and efficiency of the public as a whole. In no electrical development drive has this relationship been more strikingly illustrated than it is in the Factory Lighting Campaign, for while the industry stands to benefit enormously from its operation, the advantages that will accrue to the factory owners, executives and workpeople are immeasurably greater. Another interesting point about the campaign is that the cost bogey does not arise. Those who put in properly designed modern lighting equipment will not pay for lighting but for increased works efficiency, and, as production tests in various trades have shown, the cost of obtaining quite remarkable increases is very low indeed. In printers' composing rooms, for instance, an increase in the illumination from 2 to 20 foot candles resulted in a 25 per cent. increase in production. In a works devoted to stamping and pressing the change from 0·7 to 13 foot candles raised production by 12·2 per cent. As an improvement of only 1 per cent. in production will quite easily pay for the installation of modern high intensity lighting, it is easily seen how attractive our proposition must prove to factory owners. The machinery devised by the E.L.M.A. staffs for interesting, and what is more, obtaining business from the specialised public to which the campaign is directed is as nearly perfect as it could possibly be, and already more than 1 700 inquiries to headquarters have originated through the circulation of direct mail publicity. Excellent as are the headquarters organisation and publicity, there is still plenty of scope for personal effort on the part of those individuals in the industry who are concerned with lighting. If everyone concerned would individually call upon at least one industrial organisation in his district and explain the benefits of good lighting, and, if possible, put in at least a trial installation, the ultimate success of the campaign would be materially enhanced. As has been said before, the campaign is definitely a business-getting effort, and we have no hesitation in predicting that when its results can be computed it will completely justify itself by the volume of business induced.

## A Doleful Report.

Efforts to discover the general policy underlying the publications of the Economic and Statistical Department of the British Electrical and Allied Manufacturers' Association are rendered difficult by the infinitely variable viewpoints from which the problems of the industry are examined by the authors of the Department's periodical reports. As recently as last June, the B.E.A.M.A. "Survey" made the definite statement that there was in this country at that time a real deficiency of at least 500 000 kW of generating plant; this followed previous statements of a similar nature at the beginning of the year. We now gather from a report issued to certain daily newspapers on Wednesday, that a period of intensified trade depression has recently been exerting an unfavourable effect on the upward progress of electrical power production, but that it has nevertheless "allowed the capacity of new generating plant installed to draw level with power demand and make good the shortage indicated at the beginning of this year." Though we are not meant to read it in that way, one might pardonably deduce from this statement that a considerable amount of new generating plant had been installed. This, we are told, is not the case, as "public supply undertakings, which showed at the beginning of the year a tendency to budget for very considerable extensions, have, in view of the decline in industrial demand, cut down their requirements to the minimum,

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with the result that in the event of any real trade improvement they may find themselves unable to cope with the load which will be developed." Of the real meaning of these apparently conflicting views we are for the moment unable to judge, but we do think that the characteristic pessimism of these reports is rather too strongly emphasised in the conclusion that the electrical industry, both on the supply and manufacturing sides, is not at present in a position markedly different from that of the other basic industries of the country. On the contrary, we have every reason to believe that despite checks in certain directions a fair, if not altogether satisfactory, rate of progress is being made by most branches of the industry. Unbridled optimism is a dangerous thing, but there are occasions when it is preferable to gloomy forebodings which tend rather to accentuate temporary difficulties than to overcome them.

## Radio and the Ironmonger.

IT was with some perturbation that we read an article in which the chairman of the Radio Manufacturers' Association expressed the belief that "hardware shops will be recognised as one of the natural sources of public supply of [radio] sets and accessories." It is natural for manufacturers of any article to seek to expand outlets for their productions, but we question the wisdom of radio manufacturers in looking to ironmongers to handle the retail end of the radio trade. It has with some justice been said that at one time most electrical contractors were not particularly enthusiastic in developing the sale of wireless receiving apparatus, but in many cases this attitude was justifiable because of the poor quality of some of the goods and on account of the prevalence of price-cutting and other trading evils. Now that the radio trade is becoming stabilised at the production end, and with the temptation to piece-meal home construction practically removed, the time has arrived when the retail end of the business should also be stabilised. The electrical contractor's shop is the natural outlet for radio receiving apparatus, for no other class of trader is able to provide the technical knowledge of the product and the necessary maintenance and battery charging service, which is an everyday matter for the electrical trader. Further, it was not so long ago that the R.M.A. was tending to discourage the dabbler; the position now appears to be that he should be fostered.

## The Latest Zeppelin.

THE airship "Graf Zeppelin" which at the time of writing is about to make her maiden trip across the Atlantic, is an example of the modern applications of electricity to navigation. Apart from the now commonplace equipment for direction-finding and communication, the Germans have been quick to recognise the possibilities of picture transmission by radio. The new airship introduces another application of this now widely practised art, in that by utilising such apparatus the Germans hope to transmit to the airship during her Atlantic flight, weather maps compiled from information received by radio from the usual sources. To the best of our knowledge this represents the first application of picture transmission to navigation, and now that it has been suggested one wonders why it is that it has never been done before. We understand that a special service of these maps has been organised and pictures will be sent at frequent intervals, thus giving to the airship information as current as that procurable ashore. The experiment is one of extreme interest apart from the flight, for it shows the way to a hitherto untouched field of opportunities.

## Anglo-Australian Telephony.

IT seems that where the amateur leads the General Post Office follows. Some two years or so after the radio amateurs of this country and America had successfully established two-way telephony across the Atlantic, the G.P.O. inaugurated the Anglo-American telephone. Some two years ago those same amateurs in the country established telephonic communication with Australia, receiving acknowledgments of their messages in Morse. We now learn that the General Post Office contemplates investigating the possibilities of a commercial service between the two countries on much the same lines as the service we enjoy with America. Since the lines of communication with America, other than by wire or wireless, occupy something like a week to complete, and those with Australia something over a month, the need for a telephone service to the latter place is obvious; further, Australia is British, and a very big potential market for the sale of United Kingdom products. We already have the "beam" of course, but there is something about the telephone which introduces personality, and personality is the thing we need most to declare in Australia. Electrically speaking, the Australians know our goods and they like them, but in most cases they have never spoken to the firms which supply them. With an Anglo-Australian telephone service the personal touch will have been introduced, and it will be possible for the head of a buying firm to exchange, by word of mouth, views on the position with the head of the firm which is selling—a considerable improvement upon the present facilities.

## Shoddy Wiring in Churches.

DURING the course of last week no less than two instances of shoddy wiring in churches were brought to light, the first in London and the second in Southport. In the case of the London church it was reported that "wires are jumbled together anyhow, joints have been made by loosely twisting wires together, bare wires are lying loose under the boards, etc. By touching one circuit all the others are affected." In the case of Southport the wiring is said to pass through the woodwork, the roof and the organ, and is described as "dangerous." The inefficient wiring of houses is a considerable danger to life, but when such wiring is installed in a public building, such as a church may be described, the danger is even more acute. Many of the electrically-lighted churches are many years old and contain a considerable amount of wood; further, their very age is conducive to easy firing. For this reason, if not for any other, the authorities responsible for placing contracts for lighting such churches by electricity should at least be acquainted with the dangers of inefficient wiring and should further be prevailed upon to employ only those contractors whose names appear upon the National Register. Our old churches are in many cases show-places of the country, and are, in consequence, of national as well as local interest.

## An Ambitious Carpenter.

OUR attention has been drawn to the activities of a contracting carpenter whose present work is that of erecting the woodwork in connection with a new building estate in Surrey. Some several hundred houses have been completed and the electrical wiring with which each of the houses is installed has so far been carried out by an electrical contractor of some years' standing. Having acquainted himself with the manner of wiring houses, our carpenter friend no doubt sees an opportunity of combining window and roof erection with the work of installing electricity in the houses he helps to build, for last week he opened on the same estate a small shop. Above the door of the premises he has hung a signboard which proclaims him to be an electrical engineer and wireless expert, while in the window may be seen fittings, accessories, radio sets and loud speakers. The man must be congratulated upon his enterprise, though a personal knowledge of him reveals his lack of qualifications either as an electrical engineer or wireless expert. The unfortunate position is that such a man will now enter into competition with those contractors who are qualified and whose work is much more likely than the carpenter's to stand the test of time. Similar cases are, of course, not unknown, but the fact that such competition is possible in an industry which requires engineering knowledge and skill in order to protect the public, shows that something ought to be done to reduce it.

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# AN IMPROVED SPARK GAP GENERATOR FOR HIGH FREQUENCY FURNACES.

## Apparatus with Fixed Electrodes in which Height of Mercury Surface is Altered by Means of Special Mercury Displacing Device—Advantages of the Device Proved after Several Months' Use.

By WALTER ROSENHAIN, D.Sc., F.R.S., and FRANK ADCOCK, M.B.E., B.Sc., of the National Physical Laboratory.

MANY high frequency furnaces of moderate capacity are energised by oscillations generated by means of some form of spark gap. In the modern Northrup equipment the spark gap consists essentially of two water-cooled copper electrodes supported so that their lower ends are just above the surface of a mercury pool. The outer vessel containing the mercury is also water cooled, and the whole apparatus is made approximately air-tight by means of a large spring lid and washer. Both electrodes are supported laterally, and insulated from the outer metal pot or containing vessel by tubes of fused silica. The enclosed chamber is filled with hydrogen before sparking is commenced, care being taken to sweep out all air to avoid risk of explosion. A continuous supply of hydrogen is also necessary during the operation of the spark gap.

Since the power absorbed by the apparatus depends largely on the exact distance between the lower ends of the electrodes and the mercury surface, the electrodes are attached to a raising and lowering gear which can be worked by means of a handle on the front panel of the equipment. In order to avoid leakage of hydrogen where the movable electrodes pass through the metal bushes fixed at the upper ends of the silica tubes, stuffing boxes are necessary, and these are the cause of considerable friction.

The proper action of the raising and lowering gear is further impeded by the fact that the electrodes cannot always be assembled exactly parallel to each other, or at the proper distance apart. Occasionally the electrodes become firmly wedged into the bushes. Not only is this inconvenient, but there is also the risk that the spring lid might be lifted when an attempt is made to raise the electrodes under these conditions, and the consequent entry of air into the spark chamber might lead to an explosion.

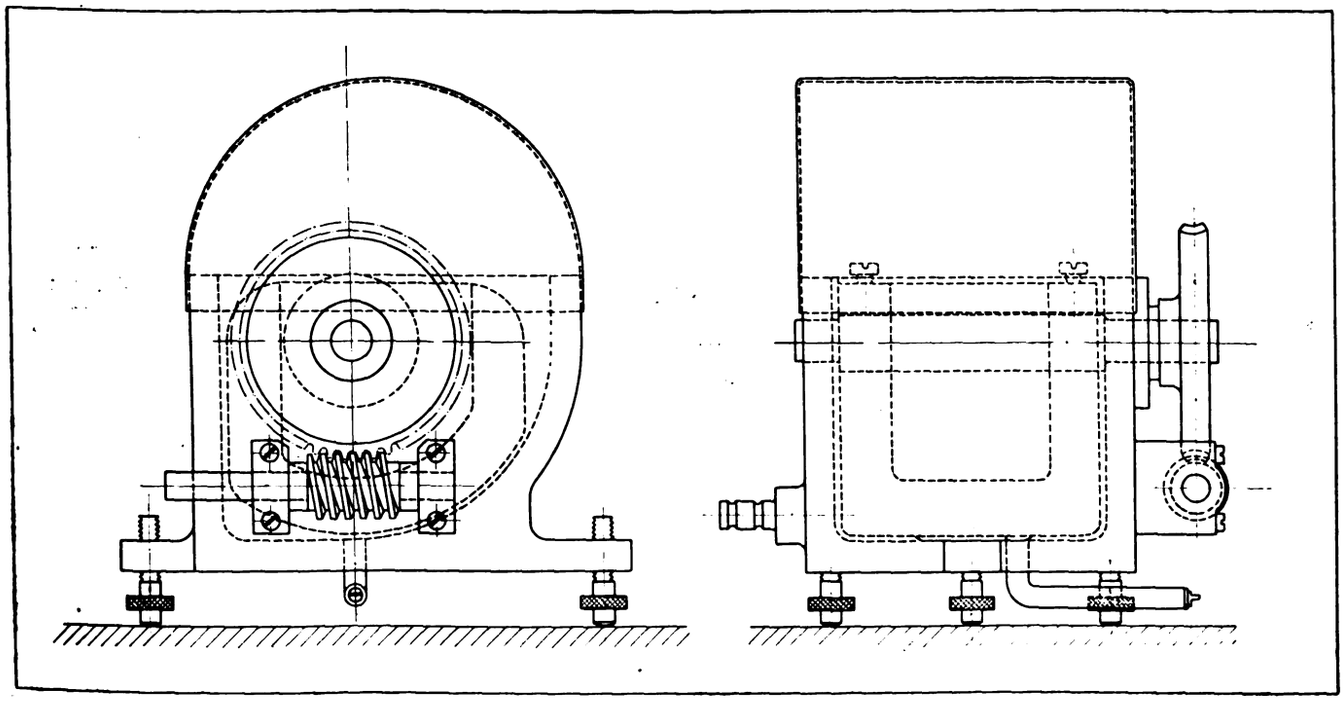
Although Northrup in an early publication * demonstrated the possibility of regulating the power input of the spark gap by altering the level of the mercury, the method has not apparently been developed in recent practice. In his original apparatus the change in mercury level was effected by raising or lowering a mercury reservoir connected to the spark gap vessel by means of a flexible pipe.

The writers have modified a spark gap of the ordinary pattern so as to eliminate the troubles inherent in spark gaps fitted in the movable electrodes. Fixed electrodes are used, and the mercury level is adjusted by placing the spark gap chamber in communication with a special mercury displacement vessel instead of a movable reservoir. This mercury displacement vessel is shown in the figure below, and is operated by means of a handle on the front panel of the equipment.

Essentially, the displacement apparatus consists of a cast iron vessel in which an iron armature is mounted eccentrically on a horizontal axis. The iron armature is of such a shape that equal angular movements about the axis produce approximately equal displacements of mercury in the vessel. Mercury is displaced for the maximum rotation of the armature (90 deg.) to the extent of 40 cu. in., corresponding with a change in the mercury level in the spark gap vessel of $\frac{7}{8}$ in. This is about twice the difference in level between the adjustments for attaining maximum and minimum power in the furnace. Ample range of adjustment of mercury level is desirable, otherwise the working of the apparatus may be unduly affected by changes, such as a slight loss of mercury or disintegration of the electrode tips.

A length of ebonite rod is interposed between the worm wheel spindle of the displacement apparatus and the adjustment handle of the control panel to avoid risk of electric shock to the operator. A small drain cock is fitted to the mercury displacement vessel. The sectional drawings shown above are those of the equipment actually in use, but it is suggested that the two rear supporting legs of the vessel could with advantage be placed slightly further apart to give increased stability.

The modified spark gap and displacement vessel have been in operation for several months, and have proved much more reliable than the original equipment. Their employment has permitted the use of higher powers and consequently larger melts in the furnaces than were previously possible. A considerable saving of hydrogen gas had also resulted.



Drawings of the apparatus devised by Messrs. Rosenhain and Adcock, and described in the accompanying article.

* "Trans. Electrochem. Soc.," Vol. xxxv, 1919, p. 132.

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# THE FACTORY AND WORKSHOP LIGHTING CAMPAIGN.

## Good Lighting and Works Efficiency—Factory Lighting and Hygiene—Manufacturers' Propaganda Policy—Large Field for Development—Electric Circle Activities.

By W. J. JONES (E.L.M.A. Lighting Service Bureau).

SINCE the report of the Home Office Committee in 1913 our knowledge of the fundamentals of lighting has greatly expanded, and, perhaps of still greater importance from the sales point of view, we have been able to obtain practical lighting data, while, in addition, the experience of lighting executives in industry has proved to what a remarkable extent good lighting assists in providing works efficiency. Our outlook on industrial illumination has in the meantime undergone a radical change, for we no longer think in terms of the minimum amount of illumination necessary to render objects visible, but rather in intensities of illumination which we know can definitely bring about increased working facilities and safety.

The whole question of factory efficiency is a national one, and the Chief Inspector of Factories and Workshops states in this year's report that "within recent years factory lighting has come to be recognised as a very important section of industrial hygiene, and the large amount of investigation and experiment that has taken place has established clearly that good lighting has a marked influence both on the safety, health and comfort of the worker, and on the ease and efficiency with which the work can be done."

The campaign on factory and workshop lighting which is being taken up so enthusiastically by all sections of the electrical industry represents the culmination of a series of investigations extending over a number of years, and it is important to realise that the facts given in connection with the campaign are largely based upon reports from official sources.

Parallel with the efforts of investigators, the manufacturers of lighting appliances have pursued an active propaganda policy through the dissemination of lighting data, and signs are not wanting that this work is commencing to bear fruit in a general appreciation on the part of factory executives and employees of the value of better lighting.

As in all electrical campaigns really worth while, there is an opportunity for gain to the supply undertaking, the manfacturer, distributor and retailer, and, above all, an enormous gain in working facilities to the purchaser. The interests of the purchaser and the supplier are complementary.

### E.L.M.A. Lighting Service Bureau's Survey.

As in previous lighting campaigns, the E.L.M.A. Lighting Service Bureau considered it necessary to make a survey on the lighting conditions obtaining in this particular field, and consequently Mr. J. L. H. Cooper, during last autumn and spring, conducted an extensive investigation with special reference to the engineering industries, and presented the results of his investigations in the form of a paper read before the Illuminating Engineering Society.* Mr. Cooper visited many works, and in addition to compiling data on the intensity of illumination and the systems employed, was able to interview the factory executives and workmen with a view to obtaining their general attitude towards lighting. He found that the majority of employers agreed that inadequate lighting is a handicap to the worker, and noted the general willingness on the part of employers to meet the wishes of workmen on lighting matters. He found, however, that in the majority of instances there was a lack of appreciation as to what constituted good lighting. He showed that no less than 70 per cent. of our factories and workshops are inadequately lighted.

The purpose of the modern reflector was not properly understood, for in some workshops bare lamps were installed, resulting in glare and harsh shadows. In many instances enamelled iron shades were used with gasfilled lamps, largely due to the practice of replacing broken or burnt out vacuum lamps with gasfilled lamps; in other words, users place new lamps into old equipment and do not realise the improvement which can be effected by employing the equipment which has been specially designed for the modern electric lamp.

On the other hand, it was found that in certain progressive establishments that lighting had received proper considerations, and the standard of illumination was in some instances much higher than that at present recommended by lighting experts. It is evident from the results of this survey that factory lighting offers a very large field for development, and that very little has been done up to the present to exploit this particular market.

For some reason, lighting has always been assumed to be an expense, as it probably is when poor, but a study of lighting economics will show that lighting represents an investment which will pay handsome dividends in increased production, better work, less spoilage, improved working conditions, and fewer accidents. Provided glare is avoided, the saturation point (when a further increase of light does not provide additional advantage) is known to be well above the intensities recommended by even the most advanced advocates of better lighting.

### Increased Production due to Better Lighting.

An investigation into different classes of industries shows that the additional cost of modern high intensity lighting can be easily met if an increase in production of some 1 per cent. can be obtained as the result of the better lighting. This estimate does not take into consideration that improved illumination, in addition to increasing production, eliminates waste in spoilage and maintains a high standard of workmanship.

The following table summarises production tests on various manufacturing processes, and shows that the required increase in production is obtained many times over.

TABLE I.

| Nature of Work. | Illumination Intensity. Foot-candles. | | Percentage Increase in Production. |
|---|---|---|---|
| | Old. | New. | |
| Stamping and Pressing .. .. | 0·7 | 13·0 | 12·2 |
| Semi-Automatic Buffing .. .. | 3·8 | 11·4 | 8·5 |
| Soft Metal Bearing .. .. | 4·6 | 12·7 | 15·0 |
| Heavy Steel Machining .. .. | 3·0 | 11·7 | 10·0 |
| Spinning Textile Mill .. .. | 1·5 | 9·0 | 17·0 |
| Composing Rooms .. .. | 2·0 | 20·0 | 25·0 |
| Hosiery .. .. .. .. | 6·5 | 16·7 | Knitting Machines, 10·8<br>Looping Machines, 6·1 |

One would naturally expect the advantages of improved lighting to be more apparent on the score of increased production in manual or semi-manual operations; but even though the work may be largely automatic, good lighting will maintain output at a high level. There will be fewer stoppages, and closer attention to work.

A Government Committee has given especial attention to the "Relation between Illumination and Output in Fine Work," and has carried out exhaustive tests on the speed and accuracy of composing (in printing) under different intensities, and systems of illumination. This investigation shows that not only does the output increase, certainly up to 20 foot-candles, but that there is at the same time a reduction in the number of errors. These results have been considered so important by the Joint Industrial Council of the Printing Trades that it has issued a leaflet which definitely recommends that a lighting intensity of 20 foot-candles be provided to ensure maximum output and accuracy in the composing room.

It is estimated that the cost of providing poor lighting works out at an average of ⅛d. per day per worker, while that of providing good lighting is about ¼d. per day per worker. In some instances, the cost of good lighting for one hour is equal to one worker's wage for 32 seconds, so that if the hourly saving of each worker is 32 seconds, the lighting installation pays for itself.

Whichever ways one looks at the problem there does not appear to be any warrant for the parsimonious use of light. Some few years ago the Home Office kept careful statistical records of the frequency of accidents in different months of the year. It was found that the majority of accidents occur in the winter months, and that the accident rate by night on account of defective lighting is much greater than by day.

* An Investigation of Electric Lighting in the Engineering Industry, January, 1928.

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Although there may be other contributory causes to account for the greater frequency of accidents during winter, it appears certain that the shorter duration of daylight necessitating longer periods of work under the poor artificial lighting conditions which prevail in factories, represents a major cause of the higher accident rate. Excellent lighting undoubtedly represents a safeguard of first importance.

It is recognised that faulty vision involves a strain upon the muscles and the nervous system. This strain, in turn, produces headaches and fatigue, affects the general health, and reduces the worker's capacity for all kinds of fine work and the enjoyment of leisure hours. Ophthalmic surgeons recognise that this faulty vision may in a good many instances be due to incorrect or inadequate illumination, and if it is borne in mind that in industry a worker is compelled to use eyes (designed by tradition and evolution for long-distance focussing) almost exclusively on fine close work, it is surprising that defective eyesight is not more common.

## The Market for Modern Equipment.

The recent Industrial Survey indicated that only 30 per cent. of the works visited employed modern equipment, but that nearly half of these were inadequately lighted. Thus, it will be seen that 70 per cent. of the factories require entirely re-equipping, while a further 14 per cent. require additional lighting equipment.

This campaign has been planned by the E.L.M.A. Lighting Service Bureau, and is being conducted by the British Electrical Development Association, with the assistance of all sections of the electrical industry, and will continue until the end of November.

There are many ways in which you can take part in this campaign: (1) Co-operate with an E.D.A. Circle; (2) Assist in the organisation of exhibitions and lecture demonstrations; (3) Offer your services for lecture work if you are able to lecture. (In this connection a special lecture booklet has been prepared, which will enable anyone to give a talk on the subject of industrial lighting. Sets of lantern slides and demonstration apparatus can be borrowed on application to the district officer); (4) Make yourself familiar with the problems of industrial lighting, and have all the facts at your finger tips; (5) Wherever possible, the national effort should be followed up by individual sales letters and personal calls; (6) If you have a showroom, arrange a window display and demonstrations; (7) Instal trial installations wherever possible.

An important part of the organisation is the formation of Electric Circles throughout the country, and it is desirable that many additional Circles should be formed. In most instances the Circles have already been addressed as to the purpose of the campaign, and each Circle is asked to organise a lecture demonstration to which factory owners and officials should be invited, as well as everyone connected with the industry. It is suggested that this lecture demonstration should, if possible, be arranged in local works when permission can be obtained. The E.D.A. has a panel of lecturers, who have undertaken to address audiences and application for the services of a lecturer should be made as early as possible.

It will sometimes be possible to organise a lecture in connection with an electrical exhibition, and here, again, the success of the effort depends upon the thoroughness of the organisation. Much depends on whether the right kind of audience is secured as our experience leads us to believe that in many cases factory executives only require to be convinced of the value of good lighting by demonstrations, and to be put in possession of the full facts before they will ensure that the lighting in their own works is up to modern standards.

Another means whereby interest in factory lighting can be stimulated is that of arranging industrial lighting demonstrations in showrooms. These should, wherever possible, include facilities to contrast good and bad lighting. Folios consisting of technical data and charts are available from the E.D.A., which may be hung in a showroom, and to which reference can be made when explaining to a customer the fundamentals of good factory lighting.

The Campaign has now been in operation several weeks, and has aroused considerable interest in the industry. Up to October 3rd, as the result of the first letter issued to factory owners, 1 685 inquiries (distributed over no fewer than 130 different undertakings) have been received for booklets and further information on factory lighting, while a large number of E.D.A. Circles are actively taking part in the campaign, and have arranged 55 lecture demonstrations to such audiences as welfare societies, factory owners, associations of works' foremen and organised groups representing specialised industries. In making lecture arrangements the fact should not be overlooked that the proprietors of small garages and workshops are just as interested in the question of better lighting as the large factory owner, and consequently there are very few districts where a lecture on industrial lighting could not be arranged. In all industrial areas the opportunity for business is enormous, while the colliery and shipbuilding industries offer a field where good lighting is very much the exception.

It is well known that when a trial installation of modern lighting has been installed it is very seldom taken out again, and in one instance reported from the Midlands, a trial installation resulted in the complete relighting of the factory involving over 400 points.

In conclusion, this activity is, from our point of view, not only educational but also very distinctly a business-getting campaign, and its success or otherwise will be judged by the volume of business it induces. We need have no fear in intensively supporting the campaign, for while we, as an industry, stand to benefit enormously, the advantage of better factory lighting from the points of view of the factory owners, executives, and workers is immeasurably greater.

## PACIFIC CABLE BOARD.

## Annual Report upon the Financial Position for 1927-8.

THE accounts of the Pacific Cable Board for the year ended March 31st, 1928, show that the total receipts were £397 730. The traffic receipts, £387 046, fell short of those of the previous year by £80 018, and the report states that this reduction of revenue was due entirely to the entry into the telegraph field of a beam wireless service between the British Isles and Australia. This service, which was opened in April, 1927, at lower rates than those of the cables, succeeded in attracting a substantial portion of the business hitherto carried by the cables. The loss was chiefly in the cheap classes of traffic which are limited to plain language and are subject to delay. The Board's expenditure during the year was £355 622, a decrease of £32 140. Sums aggregating £7 554 have been expended from the reserve and renewal fund during the year in connection with the duplication of the cables between Vancouver Island and Fiji. As a consequence of the introduction of automatic apparatus and also the reduction of traffic, the service was found to be largely overstaffed. Accordingly, the training establishments at Bamfield and Sydney were closed down and the students then in course of training were disbanded. The surplus staff has been substantially reduced by resignations, and advantage is being taken of the remaining surplus to work off a large amount of arrears of long leave.

During the year approximately 9 200 000 words of international traffic (viz., traffic other than local messages between Australia, New Zealand and the Pacific Islands) were transmitted over the Board's system. This volume was less by approximately 2 800 000 words than that carried during the previous year. The ordinary or full rate International traffic showed a reduction of approximately 220 000 words, deferred ordinary 269 000 words, daily letter telegrams 235 000 words, week-end telegrams 2 000 000 words, Government 60 000 words, and Press 53 000 words. There was an increase of approximately 40 000 words of deferred Press traffic. In addition to the above traffic approximately 4 173 000 words were carried between Australia and New Zealand, and between those Dominions and the Pacific Islands. This was approximately 466 000 words in excess of the number handled during the previous year. Most of this increase was in the Press and night letter telegram services.

### WORLD'S LARGEST ELECTRIC LAMP.

**The world's largest electric lamp, a monster 50 000 W experimental bulb built recently in the U.S.A., is like a radio valve in appearance. At the top of the bulb, a radiator made of metal fins carries off intense heat generated by the white-hot tungsten filament, which has a temperature of 5 500 deg. F. The bulb is filled with nitrogen, the circulation of which cools the lamp and carries upward into the radiator evaporated or thrown-off tungsten particles from the filament, thus preventing blackening of the walls. Although the present lamp is intended simply for a test, such huge lights ultimately may find use in aerodromes and motion picture studios.**

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# WORK OF THE CENTRAL BOARD.*

## Details of the Scottish Scheme—Special Towers for River Crossings—Standard Construction over Roads and Railways—Types of Sub-Station—The Transformer Equipment.

By S. B. DONKIN, M.Inst.C.E., M.I.M.E., M.I.E.E.

THE electricity schemes already prepared or in preparation by the Electricity Commissioners are roughly as follows :—

(1) The Scottish scheme, covering the industrial areas lying between Glasgow and Edinburgh, constituting a belt of a width of about 80 miles from South-West to North-East. South Scotland may also be subsequently dealt with.

(2) The South-East England scheme, with London as a centre and with Peterborough to the north, Ipswich to the east and a line running south from Peterborough to Reading and down to a point near Littlehampton.

(3) The Central England scheme, with Birmingham as a centre including Nottingham, Derby and Stoke to the north, Wolverhampton and Worcester to the west, Banbury to the south and Newark and Northampton to the east.

(4) The North-west England and North Wales scheme, with Liverpool and Manchester as a centre, Carlisle to the north, Burnley and Buxton to the east and Crewe to the south.

(5) A scheme under consideration for North-east England.

(6) A scheme under consideration for South-west England.

(7) A scheme under consideration for Norfolk and Suffolk, as an extension to one or other of the existing schemes.

(8) Ultimately for other parts of Great Britain.

### General Programme.

The Commissioners have provided for interconnecting lines between the various areas. They will, in all probability, advise the Board at a later date, when further adjacent areas are at work, as to the desirability, on economic grounds, for such interconnection between these areas as and when this becomes necessary.

The Board have already adopted the schemes (1), (2) and (3) enumerated above, and the fourth scheme—i.e., that for North-west England—will, it is believed, shortly be adopted. The remaining schemes are in preparation by the Commissioners and will come forward as and when they are ready. The general programme is that all the schemes would be completed and in operation by 1935 or 1936. The Scottish scheme should be in operation partially in 1929 and completely shortly after.

The Board employ consulting engineers to help them in the carrying out of the schemes, and the work, so far, has been divided in the following manner: Messrs. Merz and McLellan are responsible for the South-east England scheme, Messrs. Kennedy and Donkin are responsible for the Scottish scheme, and Messrs. Highfield and Roger Smith are responsible for the Central England scheme.

The Central Scotland Electricity scheme deals with an area of 4 980 square miles with a population of approximately 3 760 000, and the following particulars relating to the scheme may be of interest.

The transmission system consists of three-phase overhead transmission lines with a voltage of 132 000 between phases. The total length of line is approximately 253 miles, of which 220 are single circuit and 33 are double circuit lines. Steel cored aluminium conductors are used, consisting of seven 0·11 stranded steel cores surrounded by thirty 0·11 aluminium conductors. The normal span is 900 ft. and the sag is 23 ft., with a 22 ft. distance between ground and overhead line at the lowest point; the normal height of the galvanised steel transmission towers is 60 to 70 ft. The conductors are supported on insulator strings containing 9 and 10 units in series, 9 are used for suspension and 10 for tension strings, and each string is fitted with an arcing horn and guard ring. The spacing of the conductors is equivalent to about 15·5 ft. symmetrical spacing for double circuit lines, and to 18·5 ft. for single circuit lines. The diameter of the conductor is 0·77 in. Local corona would not occur under normal atmospheric conditions until approximately 167 000 V, and decided corona until approximately 190 000 V between phases had been attained.

Special towers have been designed for the Cart, Clyde and Forth crossings. The height of the Forth crossing towers is 338 ft., and the span is 3 050 ft. For this crossing special conductors are used, having nineteen 0·125 steel and eighteen 0·125 aluminium wires.

The Board have obtained permission for their primary 132 000 V lines to cross roads and railways without any fundamental change in the standard construction. The design data gives sufficient factor of safety to minimise risk of failure. Each sub-station has two sources of supply at all times, and reliability of supply is considered to be of first importance. Each sub-station has also stand-by transformer equipment.

The transmission system consists of two rings of overhead lines joined at Dalmarnock, together with a branch up to Dundee. At Dalmarnock, where the two rings join, the sub-station is of the double busbar type. At Bonnybridge, where the branch is taken up to Dundee, a single busbar station with five switches is provided, and it is a modified type of the 3-switch station to be described below.

The normal 3-switch station has a section switch in the line, from either side of which switch a connection is taken off to a transformer through a transformer switch. Every switch has an isolator on either side of it, and there is an isolator on each incoming line, and one next each transformer. Security of supply is maintained even if the section switch of a sub-station should open, as it is intended that the two transformers at each sub-station should always be in service.

The reliability of the 3-switch sub-station is also safeguarded by means of a by-pass fitted with two isolating links connecting the h.t. side of the transformers. This by-pass enables one transformer to be supplied from either side of the station should the other transformer, with or without its switch, be out of action. All the switches are designed for 1 500 000 kVA breaking capacity, which is sufficient for all calculated fault conditions. The design of the 3-switch sub-station is of the "ground floor" type, in which no overhead steelwork is employed. All the switches stand at ground level, and the isolators are erected on reinforced concrete platforms so that the lowest part of any insulator is at least 9 ft. above ground level.

Transformer equipment at each sub-station is arranged so that one of the two transformers would be able to deal with the maximum normal load transfer occurring at the sub-station up to the year 1935-36. The sizes of transformer at each sub-station range from 60 000 kVA to 10 000 kVA. The 60 000 and 45 000 kVA banks of transformers consist of three single-phase units. They are naturally cooled up to 50 per cent. of their rating, and forced oil circulation with forced air blast in separate coolers, is used above 50 per cent. The 30 000 and 20 000 kVA and 15 000 kVA transformers are three-phase, and the method of cooling is similar to that described above, except that separate coolers are not used, and the air blast plays on the radiators. The 10 000 kVA three-phase transformers are naturally cooled.

All h.v. windings are star connected, with the neutral point earthed direct at each transforming station. The l.v. windings are delta connected, and will be earthed through resistances by special earthing transformers where no existing earth connection is available. The earthing transformers will be provided with auxiliary windings for 400 V a.c. three-phase supply for lighting, switch operation, etc.

### Tap Changing under Load.

All the transformers are provided with on-load tap changing equipment for varying the voltage ratio through a total range of 20 per cent. in fourteen steps. All control switches on the lower or secondary side of the transformers will be on the undertaker's generating station switchboard, as will also be the complete metering equipment.

The h.v. and l.v. windings of the transformers will be supplied with separate leakage protection and overload relays. The protection of the l.v. windings includes the protection of the l.v. connections to the switchgear.

The shorter lengths of transmission line will be protected by means of a modified opposed voltage 2-core pilot system. The relays are of the induction type. The longer lengths of line (above approximately 12 miles in length) will be protected without pilots by means of definite impedance relays combined with impedance time relays. This latter system gives discrimination with very short clearance times, as compared with other impedance systems in use.

Each area, when completed, will be controlled from one central office, which will be manned continuously by control

* Being extracts from the Presidential Address delivered before the Association of Supervising Electrical Engineers on October 2nd.

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engineers. In this office will be the control room, and in this control room will be the series of panels giving indication of the output given by any selected station to the grid, or the input to any other station from the grid. The panel for each station will also show the primary grid voltage and wattless current. By means of a diagram with moving switches representing the grid, the control engineer will be able to see the position of main oil switches at the various transforming stations. There will also be an indication of the position of the transformer tap changing device at each sub-station. Directions will be given by the control engineer by telephone for any necessary operation of switches or tap changing gear.

A section of any transmission line between two transforming stations is, as already mentioned, protected against faults, and if such a section becomes automatically switched off, this will be indicated in the control room, and instructions can be given from the control room to remedy the defects. The control room will be in telephonic communication with each selected station and any sub-station, so that the system of power transfer required best to fulfil the economic operation of the grid can be carried out under the control of the engineers.

It is intended that there will be periodic meetings of the Board's staff of the particular area and the engineers of the district, so as to ensure complete unanimity of opinion as to co-operation in carrying out the scheme.

# THE FUEL CONFERENCE.

## Low-Temperature Carbonisation in Great Britain as Applied to Generation.

WE continue below a brief abstract of papers read at the Fuel Conference.

Whilst in Great Britain coal processing is generally considered as an independent operation, the primary products, namely, coke, tar and gas, being sold in the open market, there are projects for operating low temperature carbonisation plants in conjunction with electricity generation. Dr. P. Rosin, in his paper on "The Possibilities of Co-ordination between Coal Processing and the Production of Electricity," dealt in much detail with the underlying principles of combined operation and its practice so far as it is developed in Germany. It will be necessary to consult the original paper to obtain a clear idea of the details involved in co-ordinating coal processing with power production, but the salient points have been brought out in the general report.

Four principles are laid down as governing all co-ordination. Firstly, co-ordination must lead to a lowering of the cost of the main product, as compared with that in independent works. Secondly, one of the processes to be co-ordinated must be dominant and the others subordinated to it. Thirdly, as many as possible of the main, intermediate and by-products must be used interdependently, and lastly, the economic weaknesses of the individual processes must be neutralised as far as possible.

In applying these principles to the production of electricity it is clear that co-ordination must lead to a cheaper kilowatt hour. The demand for current is the dominating factor, and the processes co-ordinated with electricity generation must facilitate the supply of peak load requirements and raise the average load.

There are several examples in Germany of the combination of a brown coal briquetting plant with electricity generation. In this case, the lignite for the briquetting works is dried by steam or flue gases. The dust is screened out and used in one part of the boiler plant, whilst the other is fired by crude lignite.

From a consideration of the values of the products from various forms of thermo-chemical coal processing, such as low-temperature carbonisation, high-temperature carbonisation, gasification, etc., P. Rosin concludes that the only forms which can be economically co-ordinated with electric power production are :—

(*a*) Low-temperature carbonisation of lignites, and

(*b*) Low-temperature carbonisation of *non-coking* coals.

The restriction of co-ordination of low temperature to non-coking coals is due to the fact that the co-ordinated process must always compete with the burning of raw coal, and that low temperature coke from coking coals will always be able to command a better price if sold for household purposes than could possibly be paid by the electricity works. In consequence, the combination of low-temperature carbonisation with electric power generation is essentially confined to lignite, and there are now power stations in Germany operating under these conditions.

The detailed arrangements of such plant are subject to variation. The lignite semi-coke is used as fuel in the boilers of the electric power station. The gas can be used for heating the ovens, but is better employed in supplying the community or other industries. The tar is sold. Fluctuations in the demand for electricity are taken up by storage bunkers for the lignite semi-coke. A very interesting suggestion is put forward in the paper, in which the generators would work at constant load, the surplus over demand being used in an intermittently operating electric carbonisation process.

It is obvious that the economics of the co-ordination between low-temperature carbonisation and electric generation depend largely on the amount of tar for sale, and the relation between the cost of lignite semi-coke and raw lignite for varying yields of tar is given in the form of curves.

Reviewing the information given in the general report, it may be said that low-temperature carbonisation in Germany is largely confined to the treatment of lignites, and this has successfully been combined with the production of electricity. In Great Britain, low-temperature carbonisation is concerned mainly with the production of a solid smokeless fuel for domestic purposes. There are several forms of apparatus receiving semi-commercial investigation; but their economic success, either as independent plants or in association with established industries, is still to be proved.

A paper entitled "Diesel Engines fitted with Exhaust Turbine Driven Superchargers," by M. A. Büchi, dealt thoroughly with the application to large slow-running Diesel engines of exhaust-driven superchargers of the type developed for aircraft during the war. The first part of the paper dealt with theoretical considerations and reiterated the arguments put forward by the exponents of exhaust-driven superchargers for aircraft. The author made a great point of the scavenging of the exhaust products after completion of the exhaust stroke, and advocated a valve timing giving an appreciable overlap between the opening of the air inlet valves and the closing of the exhaust valves. It was pointed out that the scavenging effect obtained thereby served both to increase the weight of air in the cylinder and at the same time to cool internally the cylinder walls, piston head, and more particularly the exhaust valves, thus to a large extent compensating for the increased heat flow due both to the greater volume of heat and to the higher initial air temperature.

The author next described a comprehensive series of tests carried out on a large six-cylinder four-cycle Diesel engine to which this system of supercharging was applied. The test results obtained bore out the arguments advanced above, and showed that as the power output is increased by supercharging the heat flow to the cylinder walls, pistons, valves, etc., is increased at a somewhat lower rate. Since the mechanical losses are virtually unaffected by the addition of the turbine supercharger, it follows that the mechanical efficiency increases steadily with increase of load. The maximum load recorded during the tests corresponds to a brake mean pressure of about 133 lb. per sq. in., which was obtained with a supercharge of 7·11 lb. per sq. in. (gauge) with the turbine running at slightly over 6 000 revs. per min. under these conditions.

### Diesel Locomotives.

"Experiments with Diesel engine-driven locomotives on Russian railways," was described by P. Yanauschevsky, who dealt with a number of extremely interesting experiments carried out in Russia with a view to the development of a full scale main line Diesel locomotive. It is evident that the experiments have been carried out with skill and courage.

Three types of experimental main line locomotives were described. The first was made up from existing units and consisted of a ten-cylinder 1 000 H.P. Vickers engine, apparently a standard war-time submarine engine, and electrical drive with two generators fitted, one at either end of the main engine. The Diesel engine was started electrically from one of the generators, a small battery being installed for this purpose and for the electrical drive of certain auxiliaries. No data was given as to the actual performance of this locomotive, which was built up merely for the purpose of experiment.

Later, and on the basis of the experience gained, two more locomotives each of about 1 100–1 200 B.H.P. were built, and put into service. Of these, one had electrical transmission and the other gear transmission, through the medium of magnetic clutches. The author was cautious as to drawing conclusions as yet from the tests on either of these locomotives.

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# SELF-CONTAINED TURBO-GENERATOR SETS.

## A New British Power Plant Development—Novel Governor Gear—Additional Over-speed Safeguards Provided—Additional Economies Possible in Foundation and Housing Costs.

STRIKING changes in existing practice with regard to power plant installations of small and medium capacity are foreshadowed by a new line of self-contained high-pressure turbo-alternator sets which has been developed by the Metropolitan-Vickers Electrical Co. Throughout a wide range of applications, on board ship and in every type of industrial power plant, the new development constitutes a marked advance on previous practice in simplicity, cheapness and efficiency.

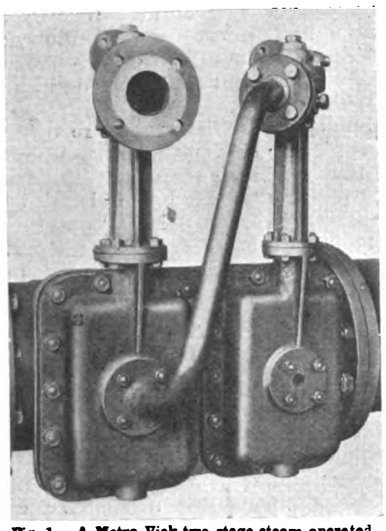

Fig. 1.—A Metro-Vick two-stage steam operated air ejector.

The principal features of the new sets to which these improvements are due are :—

(1) The use of a highly efficient high-speed turbine with speed reduction gear and a slow-speed alternator, giving a high combined efficiency.

(2) The combination of turbine and condenser in one unit, the reduction of dimensions, and the compact arrangement of the plant and its auxiliaries making possible the elimination of foundations as ordinarily understood.

(3) The drive of all auxiliaries direct from the set, giving simplicity of control and contributing with (1) to a high overall efficiency.

(4) A novel design of governor gear of extreme sensitivity.

The units at present developed cover a range of from 300 to 4 000 kW maximum continuous rating. All the sets are similar in principle, differing only in size and in detail of design ; the 1 000 kW set, which is here described and illustrated, may be taken as typical.

The general arrangement of the 1 000 kW set is seen in Fig. 2, which shows at once the simplicity and compactness of the arrangement. The combination of the turbine and condenser is effected by having the upper half of the condenser casing—or in some sets the whole of the condenser casing—integral with the lower half of the turbine casing. The combined unit is supported at the h.p. end by a specially strengthened bearing on the gear box and at the l.p. end by flexible I beams under feet provided on the condenser casing. The alternator, exciter and circulating pump are all coupled in line and driven from the slow-speed shaft of the reduction gear. The extraction pump in this set is driven by geraring from the slow-speed shaft of the reduction gear, and the oil pump is arranged immediately below the governor gear and driven by an extension of the vertical spindle. In the smaller units the position of these two auxiliaries is interchanged. The air ejectors are of the steam-operated type, and are mounted on the circulating water pipe near the intake to the condenser.

The turbine is designed to give its rated output at 5 000 revs. per min., and is suitable for a wide range of steam conditions. It is of the single-cylinder impulse type, having one velocity stage and eight impulse stages. The diaphragms are of cast iron with cast-in blades or, where necessary on account of steam conditions, of the built-up type with machined guide and steel centres. The nozzles are built up of steel angles and accurately fitted vanes, and are machined all over. They are arranged in two groups separately supplied with steam and controlled by separate valves. One group of nozzles provides for an output up to the economic rating of the turbine, the other group providing for additional load above this value.

The rotor has forged steel wheels, machined all over. The first wheel carries two rows of blades compounded for velocity. The other wheels each carry a single row of blades. The blades are of nickel steel, with the exception of those at and near the dew point, which are of stainless steel.

The steam chest is of cast steel or cast iron according to the steam conditions. It is fitted with a combined stop and emergency valve, a steam strainer and two automatic governor valves. The valves are operated by an oil relay system and control respectively the supply of steam to the two groups of nozzles. By an ingenious mechanical arrangement the sequence of opening of the governor valves can be changed by a single movement of a hand lever. This allows the smaller group of nozzles, ordinarily used for the overload output, to be used alone as an efficient arrangement for light load conditions.

### Speed Regulation.

The governor is of an interesting type introduced some years ago by the Metropolitan-Vickers Co., and extensively used for the regulation of high-speed turbines. In this connection it is interesting and important to note that the modern tendency to greater outputs at given speeds of turbine operation has necessitated a reconsideration of methods of

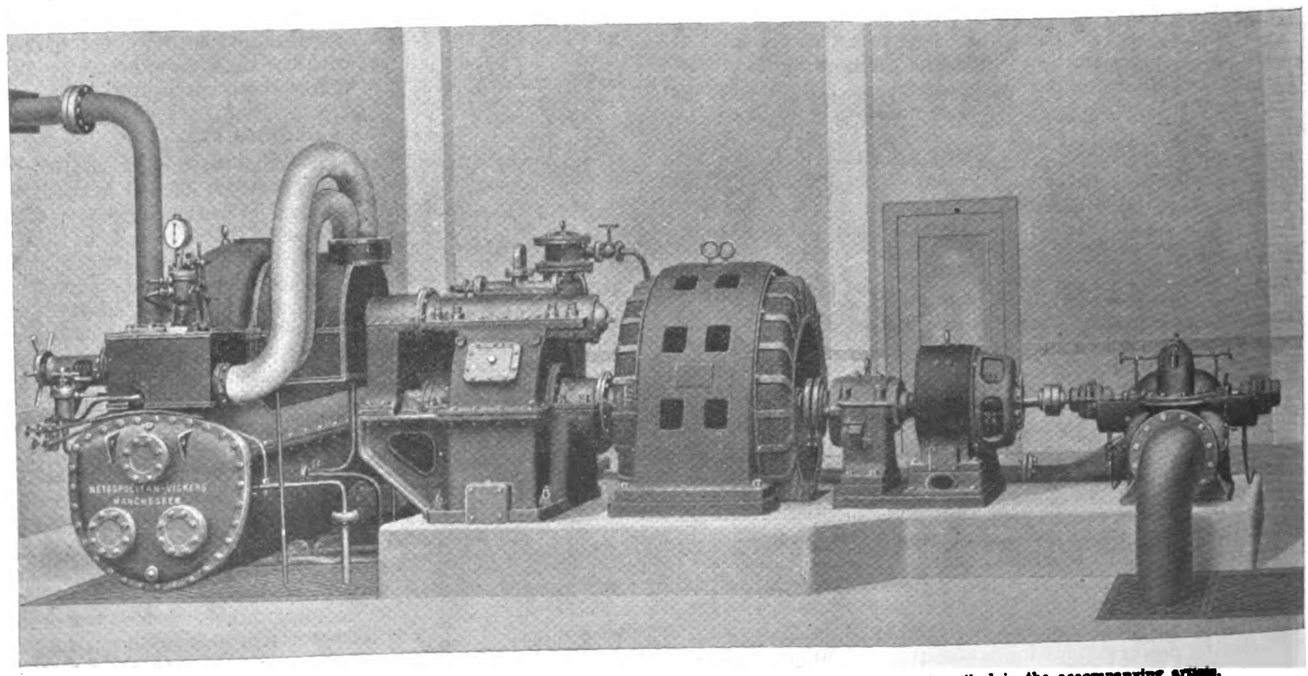

Fig. 2.—A view showing the general arrangement of the 1 000 kW self-contained turbo-generator set described in the accompanying article.

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speed regulation. The reason for this is that the comparatively small mass and diameter of the high-speed rotor make its flywheel effect much less than that of the larger slower speed machines formerly used, and the reduced inertia necessitates speed-regulating gear of extreme sensitivity and rapidity of action. It was primarily in order to give more rapid action of control for high-speed machines that the development of the new Metrovick governor was undertaken. The success which the company experienced with this type of governor led to its application being extended to a considerable proportion of the turbines manufactured, including machines of much larger output than those here described.

The verticle spindle of the governor is driven by worm and wheel from the turbine spindle. The control is effected by means of an oil relay valve which is operated by the governor, and regulates the oil pressure in a power piston operating the valves. A compensating sleeve device on the relay valve is adjusted by a lever coupling from the power piston. This provides the differential system essential to stable relay governing. An important feature of the arrangement is that the oil relay valve rotates with the spindle, while the compensating sleeve is free to rotate between the valve and the casing, thus reducing to a minimum the friction resisting vertical movement. The close association of the governor and relay valve elements and the extremely rapid communication which is thereby effected between the governor and the governor valves gives a very close speed regulation with no trace of hunting.

Additional safeguard against over-speed is provided by a bolt type emergency governor mounted in the turbine spindle. The spring-retained bolt, when moved out by excessive centrifugal force, engages with a lever which is connected to valves in the relay oil pressure system of the governor. These valves effect an immediate release of the oil pressure in this system, without, however, reducing the pressure of the lubricating oil. The release of oil pressure not only closes the governor valves but also releases an emergency trip device on the main stop valve.

## Lubrication System.

The supply of oil for operation of the governor relay valve and power piston, and for lubrication of the main governor parts, the speed reduction gear and the turbine and gear bearings, is maintained at pressure by the oil pump, which is driven from the governor spindle. The pump is of the rotary gear valveless type, drawing oil from a tank placed beneath the condenser. The supply to the relay valve is delivered direct, but the supply to the bearings is through an oil cooler, the oil flowing back to the tank by gravity. An auxiliary pump is provided for flooding the bearings on starting up.

The condenser is of the surface type, arranged for the steam to flow over, and the water through, the tubes. The tubes are of solid drawn brass secured in rolled brass plates. A suitable steel baffle plate is fitted to ensure that the incondensable gases are cooled on their way to the air ejector. The circulating pump is of the centrifugal type. It is connected by a flexible coupling to the exciter shaft, or, in the case of d.c. sets, to the generator shaft. The extraction pump is of the vertical type, arranged with split casing to enable the impeller to be conveniently examined and removed if necessary.

The air ejector is shown in Fig. 1. It is of the two-stage steam-operated type provided with inter and after coolers of the surface type. It is mounted in the circulating water main leading from the discharge of the circulating pump to the inlet of the condenser, so that on starting up the set the cooling medium is immediately available, since the circulating water pump is coupled to the generator shaft. Full vacuum is thus built up very rapidly. Each stage of the ejector is provided with a steam operating valve and the necessary gauge, which is conveniently mounted at the turbine end of the set. The gauge board also carries the other instruments, comprising steam-pressure, vacuum and oil pressure gauges.

A speed reduction of 5 000/1 000 revs. per min. is given by a gear of the double helical single reduction type, arranged with the pinion vertically above the wheel. Fig. 3 shows the gear with the top half of the casing removed. The teeth of both the pinion and the wheel are of involute form, hobbed on a machine which has been specially modified by the Metropolitan-Vickers Co. to give an exceptionally high degree of accuracy.

The sets can be supplied with either a.c. or d.c. generator as required. In either case the machine is connected by solid coupling to the slow speed shaft of the gear.

The new set, owing to its comparatively small dimensions, light weight, and extremely compact arrangement, requires merely a concrete floor reinforced with steel joist grillage, with a small pit about 2 ft. 6 in. deep for the condenser and oil tank. The total foundation cost for the 1 000 kW set here described, is only about one sixth of the foundation cost for an old type set of equal capacity.

Valuable saving is also effected in building cost, owing to reduced height requirements. Needing no basement, the set

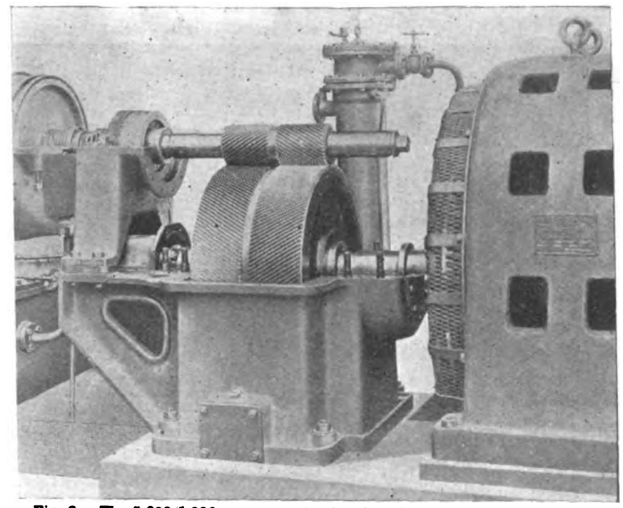

**Fig. 3.—The 5 000/1 000 revs. per min. double helical single reduction gear.**

can be accommodated in a building about half the height of that required for the old types. The saving in space is even more marked in the case of the two smaller sizes, the 300 kW and 500 kW sets, which occupy only about 30 per cent. of the space required for old type sets of equal capacity.

The set is extremely robust and flexible in operation. Its properties in this direction are illustrated by the claim that, after being shut down with all valves on the whole system closed, it can be run up to normal speed ready for load in less than a minute.

The importance of the improvements effected is indicated by the makers' estimate that these sets can be installed at a lower initial cost per kW and will have a considerably higher efficiency than it has hitherto been possible to obtain except on installations of the super power-station type. While the supply of power from municipal and other large electricity undertakings will always appeal to those users who would rather be relieved of the responsibility of operating their own power plant, the small power user at home or abroad who has no such supply available, or who for any other reason finds it convenient to provide his own power supply, has much to gain by the possibility now presented of doing so on extremely favourable terms.

# 220 kV TRANSMISSION.

## Progress with Pioneer System in Ontario.

ACCORDING to a report issued by the Ontario Hydro-Electric Power Commission, the total estimated cost of the transmission line between Toronto and the Gatineau Power Co.'s plants on the Gatineau River in the Province of Quebec, and of the transformer station at Leaside, Ontario, is about £2 800 000, and the estimated cost of the initial installation is £1 320 860, divided into £666 140 for the 220 kV line, £573 600 for the 220 kV terminal station, and £81 120 for the interconnection of the two systems. The amount of power available under the contract with the Gatineau Power Co. is 260 000 H.P.

"The problem of transmitting this block of power 230 miles to Toronto and there providing an interconnection with the present system was practically entirely new," states the report, "few systems in the world to-day providing a parallel case which would provide a check on any decisions made. Economic and engineering studies were undertaken, and, based on these studies, it has been decided to provide two single-circuit transmission lines with 795 000 circ. mil. conductors operating at 220 000 V with 180 000 kVA of transformers in four banks of 45 000 kVA each, stepping down at Toronto."

The first of the two lines has just been completed by the Commission's construction department, and was to be put into operation on October 1st. In the 202 miles in Ontario there are 994 towers.

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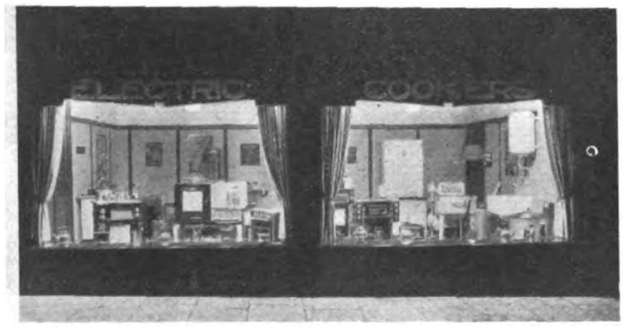
# RUGBY ELECTRICITY.

## Twenty-fifth Anniversary Inaugurates New Development Policy.

ON completing its twenty-fifth year of existence, Rugby U.D.C. Electricity Department, of which Mr. T. S. Shenton is electrical engineer and manager, has embarked upon an active policy of developing the domestic uses of electricity, has opened new showrooms for cooking and



**Rugby's new cooking and domestic appliances showroom at Litile Church Street.**

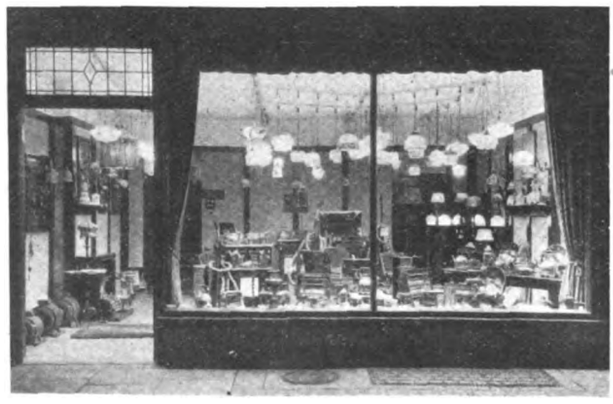
domestic appliances, and has also organised an electrical exhibition, which opened on October 5th for a fortnight.

The undertaking took its supply for some 20 years from the British Thomson-Houston Co.'s Rugby works, but developments by 1923 made it necessary for the department to purchase a bulk supply from the Leicestershire and Warwickshire Electric Power Co. The undertaking, which at the outset adopted the then unusual 220 V three-phase, 50-cycle system, has throughout operated without any generating plant of its own, and is in the fortunate position of having a fine distribution network entirely free from debt. Energy is taken from the Power Co. at 33 000 V and transformed at the Rugby boundary to 12 000 V. It is further reduced to a pressure of 2 200 V at the Council's Union Street sub-station, and passes to eight distribution sub-stations in various parts of the town for transformation to the consumers' voltage.

Favourable rates are quoted to consumers. There is a domestic tariff of 1d. per kWh, plus a low fixed charge, for all domestic purposes. Alternatively, there are flat rates of 4½d. to 3½d. for lighting, 2d. for after-hours' window lighting, 1½d. for heating, and 1¾d. for power.

A wiring branch was inaugurated in 1919,and to the activities of this department the increased progres s of recent years is ascribed.. An increasing number of new consumers is being added to the mains by means of the Council's hire-purchase wiring scheme, and the present exhibition is designed to stimulate this development.

Mr. Shenton explained at a luncheon held in connection with the opening of the exhibition, that the undertaking's



**The office and showrooms at Dunchurch Road, Rugby.**

sales of energy during the last five years have been equivalent to the entire output of the preceding 20 years, and he predicted that sales in the next five years would be considerably beyond the total for the past 25 years.

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Siemens Brothers and Co., Ltd., have issued Section VII of Catalogue No. 160, dealing with Tee service boxes.

# E.P.E.A. DINNER.

## New I.E.E. President Emphasises Need for Energetic Development of Supply Output.

LIEUT.-COL. K. EDGCUMBE, the new President of the Institution of Electrical Engineers, made his first public appearance in that capacity at the tenth annual dinner of the Electrical Power Engineers' Association (Southern Division), held at the Hotel Cecil, London, on October 6th, when Mr. W. Cornet presided over a large attendance of members and guests, including Ald. W. Walker, Mr. F. W. Purse, Mr. A. Cramb, Mr. L. L. Robinson, Mr. W. C. P. Tapper, and Mr. P. F. Rowell.

Proposing the toast of "The Association," Lieut.-Col. Edgcumbe stressed the importance of the supply side of the industry. If they made a mistake the public suffered by being "plunged into darkness." The supply industry had a very good commodity, and he thought there was room for improvement in the methods adopted for selling that commodity. It was of the greatest importance to the whole industry that the output of electricity should continue to increase.

### The I.E.E. and the E.P.E.A.

Under the new schemes some displacements and changes of personnel were inevitable, but if only the rate of increase were maintained such dislocations would be trivial. He congratulated the E.P.E.A. on its high ideals, and he was glad to see the progress that was being made by the technical groups, and to learn that a large number of the Association's members were also members of the I.E.E.

Mr. A. C. STEWART (the President of the E.P.E.A.), in responding, said that although that was not the first occasion on which they had been honoured by the presence of the President of the Institution, it was the first on which he had proposed that toast. He recalled that in the early days the Institution realised that the economic, as well as the academic, interests of technical engineers needed safeguarding, but instead of attempting to form an organisation itself, it extended its official recognition to the E.P.E.A. The E.P.E.A. came into being not to supplant or to compete with the parent body, but to perform a function which, by its constitution, the I.E.E. was precluded from attempting. The two bodies were complementary, and it was not without significance that since the inception of the E.P.E.A. the membership of the Institution had increased by leaps and bounds.

Col. Edgcumbe had referred in an appreciative manner to the number of members of the Association who were also members of the Institution. It had been one of the primary objects of the Association to increase the technical knowledge of its members. The Association paid particular attention to its junior members, and provided as far as possible ample facilities for their obtaining, not only technical knowledge, but also the benefits of the practical experience of the present occupants of the higher positions. In the early days of the Association it was necessary to allow a fair amount of latitude to the junior members, but during the past few years the regulations of the Association had been drastically tightened up until at the present time the position of the junior member who, arrived at an age of full membership, was, that he had, to use a colloquialism, "to get on, or get out." Whilst maintaining this definite standard of membership, they endeavoured at the same time to provide ample opportunities for the "getting on" process.

Referring to the National Technical Groups Scheme, which the Association initiated last winter, Mr. Stewart emphasised its unique character. The membership of these groups consisted, on the one hand, of members of the Association who made specific application for membership of the Group, and on the other, of engineers engaged with manufacturing firms connected with the electrical industry. Thus they were endeavouring to bring into mutual contact, engineers engaged in the design and manufacture of machinery and those engineers who were responsible for its supervision and operation.

A mutual discussion on technical problems amongst such a body of men could only result in the interchange of information which would be to the advantage of all. It was perhaps desirable to refer to the fact that engineers engaged with manufacturing firms, who might be members of the technical groups, would not be concerned in any way with the protective activities of the Association.

The operation of the Central Electricity Board's schemes was likely to have far-reaching effects on the technical staffs,

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particularly those employed in the power stations, and some of their members were regarding the future with a certain amount of misgiving. It was encouraging to note, however, that the National Joint Board was alive to the possibilities, and had appointed a Displacement Committee, whose function would be to act as a clearing house and to establish contact between engineers who were about to be displaced and undertakings where vacancies were likely to arise. The Central Electricity Board had expressed its approval of this step, and was prepared to do all in its power to assist.

It was hoped that undertakings also would co-operate by notifying the Central Committee or the Area Committees which were to be set up, of possible vacancies, thus giving an opportunity for the committees to put forward suitable men.

It was impossible to mention the National Joint Board without pausing to say a word of praise for the excellent service it continued to render to the electricity supply industry, in smoothing out difficulties, preserving amicable relations between employers and staffs, and generally contributing to the welfare of those upon whom the efficient conduct of the industry so largely depended.

In conclusion, Mr. Stewart expressed regret that many of the supply authorities throughout the country were not observing the advice to "Buy British Goods." This was an axiom of self-interest, as we could not expect to get load for our supply undertakings unless industry was in a healthy condition; how could industry be in a healthy condition if orders which could be placed at home were placed abroad? The supply industry was not in such an unhealthy condition that it was compelled to economise to the last halfpenny, and it seemed a matter of common sense that some attempt should be made to aid those industries which were in such an unhealthy condition.

The toast of "Our Guests" was proposed by Mr. Cornet, and Ald. W. Walker replied.

During the evening a presentation was made on behalf of the members to Mr. and Mrs. A. W. Crompton.

A photograph of the members and their guests at the dinner is reproduced on page 417.

# AMERICAN LETTER.

## The Work of New York's Electrical "Czar."

By FRANK C. WELLS, News Editor, "The Electrical World."

NEW YORK, September 15th, 1928.

MUCH interest is being taken in electric lighting circles in the visit to America of about sixty-five lighting engineers from abroad. These delegates arrived in New York two weeks ago, and, after inspecting public lighting and visiting illumination laboratories in and around this city, left on a ten-days' tour of inspection. Boston, Philadelphia, Washington, Cleveland, Detroit and Chicago have been visited, and the delegates leave the last-named city to-night for Niagara Falls, whence they will journey to Toronto for the annual convention of the Illuminating Engineering Society. This will last from September 17th to September 20th, and then there will be a trip to Saranac, in the Adirondack Mountains of New York State, for an International Illumination Congress which promises to be of much value. An unusually comprehensive programme covers many phases of lighting and associated matters. The European nations represented are England, the British delegation being headed by Mr. Clifford C. Paterson, president of the international body; France, Germany, Austria, Holland, Russia, Sweden and Switzerland. Japan, too, has sent delegates.

Nor will this be the only group of distinguished foreign engineers and scientists to cross the Atlantic this Fall, for from November 19th to 24th the second international conference on bituminous coal will be held at the Carnegie Institute of Technology, Pittsburgh, with about a hundred delegates from abroad, representing nearly all the European nations, as well as Japan, Chile, and other distant lands. The importance of scientific investigation of economy in the use of this most nearly universal of industrial fuels need not be pointed out.

* * *

Reports from England, as contained in the "London Letter" of the "Electrical World," that the idea of centralisation is spreading apace in electrical circles there, and that "at the conference of the Electrical Contractors' Association the director of a well-known electrical manufacturing firm had the temerity to suggest that the British electrical industry needs an electrical 'czar' to guide it toward saner and more closely co-ordinated methods of trading," provoke the thought that a reference to the success of the movement in New York City that began five years ago with the appointment of Charles L. Eidlitz as "commissioner" of the New York Electrical Board of Trade—of whose board of governors he is now chairman—might not be destitute of interest.

Mr. Eidlitz's powers are not so sweeping as those suggested by the English letter, which says that the proposal "has at least given rise to a growing body of opinion in favour of so altering the organisation and personnel of the British Electrical Development Association that it will be able to function through existing sectional trade associations as the supreme electrical body governing trading conditions, sectional relationships, prices and other matters of mutual interest to the industry, in addition to the purely educative and propaganda work which it now undertakes." In the first place, the functions of Mr. Eidlitz are limited to the city in which he dwells, though that community, with its six million inhabitants, is no mean kingdom. In the second place, he has no authority to make decrees outside of the contractors' and dealers' branch, in which he was for twenty years or more a leader.

These limitations being understood, Mr. Eidlitz's work as a regulator may be pronounced an entire success. The New York Electrical Board of Trade embraces in its membership 612 corporations and firms. The aggregate wiring business done by electrical contractors in the metropolitan district ranges from $20 000 000 to $25 000 000 yearly. His specific job was to reorganise contracting methods and eradicate bad trade practices. He has had nothing to do with price fixing, to attempt which would almost surely have brought him within the scope of Federal laws aimed at such practices.

After six months' work Mr. Eidlitz reported the following as the activities in which his office had engaged in handling individual and group trade problems: "Speeding up the granting of inspection certificates, eliminating the illegitimate transfer of contractors' licences, promoting the abolishment of one-dollar permits for work by building electricians, settling bankruptcy cases without legal costs, putting an end to price-cutting on appliances between rival department stores, insuring elimination of the 'all-saving' clause in engineers' specifications; reporting on moral risks of electrical business men, restoring stolen goods to owners, adjusting complaints against utility companies and contractors, establishing building loans and group insurance for electrical employees, and abolishing special privileges." He estimated that the saving made in the six months was $500 000.

A year ago seventy-five prominent electrical men from all branches of the industry gathered at a luncheon complimentary to Mr. Eidlitz, and expressed their satisfaction with his efforts. In his response the chairman of the New York Electrical Board of Trade said: "I undertook the organisation of the Electrical Board of Trade at the request of the contractors, and the idea was to try to benefit the contractor, and if this was also helpful to the other branches of the industry there was no harm done. I have found that the utilities and the manufacturers have been the main strength of the whole effort, ready to help and to take their profit through the effect of the increased prosperity of the contractor upon the local electrical business." In an appreciative editorial printed at that time, "The Electrical World," pointing out that 1 921 cases has been settled out of court by Mr. Eidlitz in four and a half years, declared that similar work in other large cities was a pressing need of the day.

# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## "Ten Electrical Commandments."

[TO THE EDITOR.]

SIR,—I am interested to note your publication of "Ten Electrical Commandments," issued by the Society for Electrical Development. I think the following "Ten Commandments of Electricity Service" which have been printed on cards, may be more to the point as to starting at the beginning, i.e., arranging for the house to be wired and dealing with the various points in their usual order until the payment of the account.:

I. Thou shalt arrange for thy house to be wired for electricity that thy days may be long in the land.

II. Thou shalt not accept the cheapest tender, unless it includes good material and workmanship, and thou shalt make sure that the tender thou acceptest includes for Pernax, or Olonite, or v.i.r.t.

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and b., or v.i.r., l.c. cables made by the Greenwich Cable Works Ltd., of Crooms Hill, Greenwich.

III. Thou shalt arrange thy fittings so that the lamps will light thy house by night without dazzle to thine eyes, to thy wife's eyes, and the eyes of the stranger who is within thy gates.

IV. Thou shalt arrange for a power supply, so that thy wife's life and the lives of her maidens be eased of their toil.

V. Thou shalt not overtax thy circuits with current, nor shalt thou overtax thy switches with many points.

VI. Thou shalt make use of electric vacuum cleaners, electric irons, electric toasters, electric water-heaters, electric kettles, electric washers, electric fans, electric fires, and electric cookers; yea, and even electric cigarette lighters, for the utility and convenience that is in them.

VII. Thou shalt keep divers spare lamp bulbs handy where they will not be broken.

VIII. Thou shalt put the telephone number of thine electrical contractor in thine address book, for perchance dealing urgently with that which no man can foretell.

IX. Thou shalt tell thy neighbours of the joy of thine electrical installation that they may go and do likewise.

X. Thou shalt pay thine electrical bills within six days, for in six days the Lord made Heaven and earth, the sea, and all that in them is.

I am, etc.,

J. H. C. Brooking.

## "The High Speed Circuit Breaker."

[To the Editor.]

Sir,—In the above article there was given, under formulæ (1), an equation for radiation loss. As given, there was no allowance made for emissivity or convection loss, and to avoid misinterpretation, the fuller treatment of this point is given below:—

Let $R_0$ = energy emitted per sec. per sq. cm.

Then $R_0 = \sigma e (\theta^4 - \theta_0^4)$ watts per sec.

The constant $\sigma$ is approx. $5{\cdot}7 \times 10^{-12}$. $\theta$ is the temperature of the body, and $\theta_0$ the ambient temperature; both on the absolute scale. $e$ is the emissivity factor, which for tarnished copper varies between 0·5 and 0·7.*

There is also the loss due to convection to be considered, and this is generally accepted as varying to the order of $(\theta - \theta_0)^{5/4} \times$ superficial area $\times$ constants depending upon whether the surfaces are vertical or horizontal, etc. Therefore, assuming square section—length of side $= \sqrt{A}$;

$$\frac{I^2\rho}{A} = \sigma e(\theta^4 - \theta_0^4)4\sqrt{A} + (\theta - \theta_0)^{5/4}\left\{2\sqrt{A}K_v + \sqrt{A}(K_t + K_b)\right\}$$

where $K_v$ = constant for vertical surface, and $K_t$ and $K_b$ = constants for top and bottom surfaces respectively.

From which:

$$A = \left[\frac{I^2\rho}{4\sigma e(\theta^4 - \theta_0^4) + (\theta - \theta_0)^{5/4}(2K_v + K_t + K_b)}\right]^{2/3} \quad (2)$$

I am, etc.,

W. H. Thompson.

Manchester.
October 6th.

[*Research Dept. M. V. Co.[

## Suggestions from Workmen and Staff.

[To the Editor.]

Sir,—That such suggestions for improvements are beneficial to a company is undoubted, but there is another aspect that, in my opinion, makes such a scheme imperative.

Unfortunately there are still Pecksniff's and Judas's who for their personal benefit are prepared to pose as the friend of the office boy or workman whilst utilising their brains. A man of considerable eminence died a few years ago whose reputation and fortune were largely due to the work of his juniors. When a suggestion was submitted to him he would say he "had been thinking of the same thing," or would suggest some trifling modification, then patent it in their joint names. He would then pose as the inventor and the junior would hear nothing more about it to his advantage, or that only in some trivial form.

Too often the ideas of the juniors are looked on as the perquisites of the seniors, and a suggestion committee would eliminate this to a great extent.—I am, etc.,

"A Sufferer."

London, N.
October 2nd.

## Contractors and Advertising.

[To the Editor.]

Sir,—If I may have space to reply to "Publicist":

(1) In mentioning certain retail tradespeople in my letter of September 28th, I was merely quoting them as other examples of retailers who are "spoon fed by manufacturers" besides the retail druggists and grocers, with whom "Publicist" bracketed contractors on September 14th.

(2) "Publicist's" "point against contractors is that they will not advertise themselves, their service, or their goods." That is a very definite assertion, and I wonder on what evidence it is based. The publicity policy such as he recommends is very much what I, and I believe a lot of my competitors, follow, if one may judge by competitors' leaflets which reach one's private address; to it may even be added a good deal of mail-leaflets of one's own composition, and personal canvassing.

All this, however, is the very small voice to which I referred, and if, in the huge babel of modern advertising, it may seem to pass unnoticed, it is none the less there, and should, I think, have been detected by a trained ear such as "Publicist's."—I am, etc.,

C. H. Flower,
Managing Director,
Tredegars, Ltd.

7, Brook Street,
London, W.1.
October 8th.

## Page Sizes of Technical Journals.

[To the Editor.]

Sir,—I should be all in favour of a universal size for technical journals, as it would save me a considerable amount of money a year in blocks. The size I would suggest as being a useful one would be approximately 13¾ in. by 8¾ in., but I can foresee all sorts of difficulties in the way of bringing any such standardisation about.—I am, etc.,

A. E. du Pasquier,
For Metropolitan-Vickers Electrical Co., Ltd.

Trafford Park, Manchester.
October 2nd.

[To the Editor.]

Sir,—May I express my thanks both to yourself and to various other friends who have been good enough to assist me in ventilating what is a source of much worry to most publicists.

I am particularly obliged to Mr. H. M. Goody for his suggestion as to buying an odd piece only of a complete page size, in case the proportions of the whole page are not altogether acceptable. This, if it can be done economically, is a sound idea.

The fact that the "Colliery Guardian" has already standardised its page size, and that another trade journal whose name it would be premature to mention has the matter under consideration, shows that public opinion, if expressed often and loudly enough, has, in the long run, quite a beneficial effect.—I am, etc.,

W. McWilliam.

Hayes,
Middlesex.
October. 6th

## How to Popularise Electricity?

[To the Editor.]

Sir,—My local electricity supply company advertises "Cheap electricity. One Penny per unit. (Plus fixed charge). Adopt 'all-in electricity service' annual contract."

Simultaneously it announces the withdrawal, after the Christmas quarter, of the special rate for separately metered heating and small power supplies. In future, I shall be required to pay in respect of my residence either a flat rate (for all purposes through one meter) of seven pence per unit, with the usual meter rent, or a fixed annual charge (for all purposes through one meter) plus one penny per unit.

The company's circular stated that the fixed annual charge would be quoted on application. I asked the rate in respect of my house, and was quoted what I consider an altogether exorbitant figure. I requested to be furnished with the basis upon which the figure was arrived at. In reply, the company state "the following factors are taken into consideration in arriving at the basis of the fixed charge in respect of the supply to your premises:—(1) Size of premises; (2) Class of premises; (3) Actual use made of available supply; (4) Use which might be reasonably anticipated from such supply; (5) Capacity of lighting and other apparatus installed."

The company would appear to place its own interpretation on (4), as, with continuance of consumption at the same rate as in the past year, the proposed all-in contract would increase my annual charge for electricity by 40 per cent., and this 40 per cent. increase in cost represents, at one penny per unit, an increase in my annual consumption of no less than 140 per cent.—I am, etc.,

Independent.

October 6th.

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# NEWS IN BRIEF.

## Barnsley and Domestic Appliances—Imports into the Irish Free State—Electrical Wages—Assistant Engineer for Chester—Blackburn's Motor Scheme—Electric Vehicles in the U.S.—A Substitute for Glass—The Next British Industries Fair.

THE consumption of electricity at Colwyn Bay has increased during the current year by 19 per cent.

Post Office telephones, available to the public, are to be installed at 262 Great Western Railway stations.

Battersea (London) Borough Council is to improve the electric lighting at the town hall, at a cost of £166.

A faculty has been granted for the installation of electric lighting in Bledlington (Oxfordshire) parish church.

The electric automatic street traffic control equipment recently established at Swansea is said to be giving great satisfaction.

Electrical imports into the Irish Free State during August amounted to £39 210, as against £33 273 for the corresponding month of last year.

Manchester Tramways Committee has decided to appoint a general manager of the tramways, in succession to the late Mr. Henry Mattinson, by open competition.

The Thames Valley (N.Z.) Electric Power Board has accepted a German tender for cables and boxes for a sub-station. The lowest British tender was 80 per cent. higher than the German one.

Owing to the extra work entailed by extensions in country districts Chester Electricity Committee has decided to appoint an assistant electrical engineer for three years at a salary of £500 per annum.

On the motion of Dr. G. W. Bury, Darwen T.C. has referred back a recommendation of the Electricity Committee that no contribution be made to the Incorporated Municipal Electrical Association for the maintenance of research work.

The ninth dinner of the Institute of Transport will be held at the Savoy Hotel, London, on March 14th next. The Annual Congress will probably be held in May, 1929. An inspection of the transport arrangements of a continental country is being contemplated.

In view of the fact that considerable extensions of the Hull municipal telephone undertaking are contemplated, a deputation has been appointed to interview the Secretary to the General Post Office regarding a renewal of the licence to work the system which expires in 1932.

In addition to the submarine telephone cable which is to be laid between Great Britain and the Isle of Man, a contract has been placed with Siemens Bros. and Co., Ltd., for a cable from the Isle of Man to Ballyhornan, near the mouth of Strangford Lough, from which point the line will be continued underground to Belfast, via Downpatrick.

Rochdale T.C. has accepted a recommendation of the Electricity Committee to buy Swiss meters. An amendment to refer the question back was defeated by 34 votes to 8. The cost of the Swiss meters is £2 745 and the British tender recommended by the sub-committee—not the lowest British tender—was £4 275. A representative of the British firm which sent in the recommended tender, said he could not promise any reduction beyond about £150.

The North Eastern Students' Section of the I.E.E. has arranged for a lecture on October 12th, at 7.15 p.m., in the Engineering Lecture Theatre, Armstrong College, Newcastle, when an address will be given by the chairman, Mr. I. H. Hedley. On October 13th, at 3 p.m., a visit will be paid to the L.N.E.R. electric car running sheds at Gosforth. On October 26th, at 7.15 p.m., a lecture will be given in the Electrical Engineering Lecture Theatre, Armstrong College, on "Post Office Telephones and the Public," by Mr. L. B. Harmer, student.

The representatives appointed by the National Federated Electrical Association and the Electrical Trades Union (in accordance with national wages agreements under dates August 7th, 1920, and September 22nd, 1921) as the Sub-Committee whose duty it is to give effect to the agreements by ascertaining and declaring at four-monthly intervals the variations due (if any) and the net rates of wages payable under the terms of the agreements to each grade for the ensuing period of four months, have declared that the variation in cost of living justifies a 28½ per cent. reduction in the basic rates of wages (April 1921) and that the net hourly reductions and rates of pay applicable to the respective grades of the agreements will remain as at present until and including the period covered by the first pay day in February, 1929.

Cheltenham Corporation require a power house superintendent.

Telephone communication between London and Belgrade, via Paris, has been established.

Capt. W. J. Liberty will lecture on "The Romance of Artificial Lighting" before the Argyle Guild at Bath on October 22nd.

The annual reception and dance of the Institution of Engineering Inspection will be held on November 27th, at the Hyde Park Hotel, at 8.30 p.m.

The next meeting of the Rugby Engineering Society will be held on October 18th, when Lt.-Col. W. A. Vignoles will give an address entitled "Electricity in the Home."

Plans to generate additional power to meet the growing demand for hydro-electric energy in the Georgian Bay system are being formulated by the Ontario Hydro-Electric Commission.

Blackburn Electricity Department has appointed a deputation to report on the letting out, on hire purchase, of motors for the electrification of Higher Mill, Audley Street, Blackburn.

With the object of encouraging the use of electric commercial vehicles, the New York Edison Co. is now supplying consumers with battery charging plant for such vehicles on the hire-purchase system.

Prof. R. E. C. Baly, of Liverpool University, is engaged on research work in connection with a substance called "plass," which is a substitute for glass, inasmuch as it is pervious to light, while it is difficult to break, and is less brittle. A factory is being erected at Nottingham in which such articles as electric wall plugs will be manufactured of the new material.

Austrian electricity undertakings have been freed from all taxation for a minimum of 10 years, provided that their construction was commenced after January 1st, 1927, that their capacity is not under 5 000 H.P., that their equipment is (subject to certain conditions) of Austrian manufacture, and that at least 55 per cent. of the energy produced is offered for sale.

The Council of the British Industries Fair at Birmingham is planning to speed up business for the 1929 Fair. Exhibitors are to be urged to despatch goods from the factory at the earliest possible date, and to send by road wherever possible, so as to avoid rail congestion. One way traffic is to be introduced throughout the Fair grounds. A special department is to be set up to secure hotel and private accommodation for exhibitors and buyers.

A special course of centenary year public lectures to be delivered before the King's College, London, includes on October 31st a lecture by Mr. E. Wilson, entitled "Electrical Science and Industry," with Sir John Snell in the chair. On November 21st, Prof. E. V. Appleton, F.R.S., will give an address entitled "Electrical Communication and Its Indebtedness to Physics," with Senatore G. Marconi in the chair. The course will be opened on October 17th, with an address by Sir Oliver Lodge, F.R.S., Admission is free without ticket.

In the report of the Parliamentary Committee to the Labour Party Conference on Tuesday, it was mentioned that the front Opposition bench in the House of Commons had warned the Government that it would be in no way responsible for what it considered the reactionary policy followed by the Government in regard to the proposed amalgamation of the cable companies and the Marconi Co. Mr. George Hardie said it was an effort to steal a successful system of wireless developed by State money, and State engineers. Mr. Clynes said the Labour Parliamentary party would act in the spirit of the discussion.

Barnsley Electricity Committee has considered the further progress of the propaganda scheme for electric cookers and domestic electrical apparatus, and recommends the extension of the scheme to include certain domestic centres under the Education Committee. Details of the organisation and work carried out by the newly formed contracting department have been submitted to the Electricity Committee, which has expressed satisfaction with the progress made.—The Committee recommends that the borough electrical engineer formulate a scheme for the hire purchase of certain domestic electrical apparatus.

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# PERSONAL.

SEAHAM Harbour U.D.C. has increased the salary of Mr. H. Adam, electrical engineer, from £350 to £400 per annum.

Leeds Council appointed Mr. R. L. Horsfield tramways manager and engineer, on Wednesday.

Estate of the gross value of £4 800, with net personalty £2 688, was left by the late Mr. E. Cox-Walker, a pioneer telephone engineer.

Bromley (Kent) T.C. has appointed Mr. E. R. Scott as temporary junior mains assistant at the electricity works, at a salary of £200 per annum.

Estate of the gross value of £4 485, with net personalty £4 252, was left by the late Mr. W. A. Chamen, engineer and general manager of the South Wales Electrical Power Distribution Co., who died on August 13th, aged 65 years.

Messrs. Baughan and Co., electrical engineers, of Duke Street, Reading, presented a cheque, and the staff of the firm a standard lamp, to Mr. David J. Varley and Miss Margery Joslyn, on the occasion of their marriage at St. Leonard's, Woodcote.

Amongst new members whom the Parliamentary Secretary to the Department of Overseas Trade has recently appointed on his Advisory Committee are Mr. W. L. Hichens, chairman of the English Electric Co., Ltd., and Sir George Sutton, chairman of W. T. Henley's Telegraph Works Co., Ltd., and vice-president of the Federation of British Industries.

Mr. J. Sinclair Terras has been presented by his colleagues in the North-Western District of the Engineering Department of the Post Office, with a pedestal gramophone. The presentation was made by Mr. J. M. Shackleton, superintending engineer of the North-Western District at a social gathering. Mr. Terras is leaving Preston to take up the position of superintending engineer in South Wales.

Miss Evelyn Roxburgh, who received her training at the Heriot-Watt College, Edinburgh, and who subsequently worked at Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, and recently at the British Thomson-Houston Co., Ltd., at Rugby, has been appointed an Inspector of Factories. This, we believe, is the first occasion on which a trained woman engineer has been appointed in this capacity.

## Obituary.

MR. HAROLD JOHN HALL, on October 4th, aged 31 years, from complications arising from malaria contracted in Palestine and Egypt during war service. He was chief engineer and works manager of the Electric Street Lighting Apparatus Co., of Canterbury.

## NEW ZEALAND TELEGRAPHS.

### Financial Position of the Postal Department.

THE revenue of the New Zealand Post and Telegraph Department for the year 1927-8 was £3 329 511, made up of postal revenue £1 439 586, telegrams, £435 514, and toll and other telephone calls, £1 454 411, and the expenditure was £2 299 571, leaving a surplus of £1 020 940 available for interest and depreciation, compared with £874 392 in the preceding year. The total receipts for 1027-8 were £1 088 845 in excess of those for the previous year. At December 31st, 1927, the number of radio receiving licences issued in the Dominions was 38 125, and at March 31st, 1928, the total approached 40 000. The automatic telephone service has been applied to rural lines in the Wellington exchange area, and the extension of the system to other rural districts is being considered. The number of subscribers' main telephone stations on March 31st, 1928, was 114 079, and toll and service stations, public call offices and extension stations brought the total up to 139 740.

### N.-E. COAST INSTITUTION OF ENGINEERS.

A handbook containing general information relating to the Institution has been issued. Particulars are given as to the origin of the Institution, which was founded in 1884, its incorporation in 1914, its offices, usual meeting place and objects, members' privileges, grades and conditions of and fees for membership, the Institution scholarship, George Mitchell Harroway scholarship, the Institution gold medal, awards to graduates, etc. A list of papers for the 1928-29 session is also obtainable from the Secretary at Bolbec Hall, Newcastle-on-Tyne. The first general meeting of the session will be held on October 19th.

# LEGAL INTELLIGENCE.

## The British Thomson-Houston Co., Ltd., and Alleged Gasfilled Lamp Infringement.

IN the Vacation Court on October 3rd, Mr. Tookey, on behalf of the British Thomson-Houston Co., Ltd., moved ex-parte before Mr. Justice Maugham, to restrain an alleged infringement of their patent for gasfilled lamps by R. Okers, Beaumont Square, Mile End Road, London, E., and to restrain the defendant from parting with the alleged infringing goods pending the trial or further order.

Mr. Tookey stated that in recent proceedings against a firm in the Commercial Road it was found that the infringing lamps were purchased from Okers. For some time past there had been a considerable trade in foreign made lamps which were an infringement of the plaintiffs' patents. That trade was carried on chiefly by small people, and if the plaintiffs issued a writ without first getting an ex-parte order the lamps were disposed of to other people who dealt in them in the same way.

His lordship granted an injunction over the second motion day of next Sittings restraining the defendant from infringing plaintiffs' patent and from disposing of any infringing lamps in his possession meanwhile.

### Claim for Wireless Goods.

In the Mayor's and City of London Court, on Tuesday, before Mr. Registrar Dell, a claim was made by G. Bowerman, Ltd., London, E.C., against Messrs. Gilbert and Son, wireless goods dealers, London, S.W., for £2 15s. wireless goods supplied. Mr. G. Bowerman, director of the plaintiff company, said the defendants originally ordered goods to the extent of £5 7s. 3d. A quantity of goods were sent on November 19th, a note being placed on the invoice that "condensers will follow." The condensers were sent by Carter Paterson on December 7th, the carman's signature being obtained for them. There had been other transactions with the defendants, and it was the usual mode of procedure for Carter Paterson to deliver the goods. The defendants had declined to pay for the condensers alleging that they had never received them. Mr. Gilbert had called at their place of business, and having been shown the carriers' signature for the goods, was apparently satisfied and left stating that he would look into the matter, the account, however, was not paid and the present proceedings were brought. He (witness) did not think the defendants were trying to evade payment for the goods, but that there was a misunderstanding about their having received them. He had tried to prove to their satisfaction that they had them. Mr. Gilbert, and Mr. Walter Moody, his manager, declared that the condensers, for the price of which plaintiffs were suing, had never reached them, and they had not been satisfied by the plaintiffs that the signature shown of Carter Paterson's carman was given for the goods now sued for.

The Registrar pointed out that in law the carriers were the agents of the defendants. Having requested the plaintiffs to send them goods once those goods were proved to be handed over to the railway company or carrier their liability ceased, and if anything happened to those goods it was the consignees risk. The matter would have to be taken up by the defendants with the carriers if they wanted it settled. Eventually the case was adjourned for the defendants to be satisfied about the signature of the carman for the goods sent on December 7th, liberty being given to either party to restore the case to the list for trial.

### ELECTRICITY SUPPLY IN VICTORIA.

A report of the State Electricity Commission of Victoria recently presented to the Australian Parliament recommended that approval be given to the increase of the existing generating capacity of the State Electricity Scheme by 75 000 kW installed capacity or 50 000 kW available capacity, the first unit of 25 000 kW to be available for service early in 1931; the whole installation to be completed in 1933; that the generating plant be located at Yallourn, and be based upon the combustion of brown coal from Yallourn open cut; that the main transmission line from Yallourn to Melbourne be duplicated with two additional circuits, the first to be ready for service by 1930; that a terminal station be erected at the Richmond site; and that immediate authority be given for the preparation of designs and specifications and calling of tenders for the whole of the works embraced in the scheme. The Australian Parliament has approved the recommendations.

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# BUSINESS ITEMS.

THE Victoria Radio Stores have opened premises at Victoria Parade, Maidstone.

Mr. Lionel Calisch announces that he has changed his address to 107, Avenue Louis Lepontre, Brussels.

William Raine and Son, electricians, of 27, Coniscliffe Road, Darlington, announce that they have given up business as from September 1st.

Considerable extensions are being made to the works of J. Stone and Co., Ltd., electrical engineers and manufacturers, of Deptford, London, S.E.

The Compagnie Energie Electrique Indo-Chinoise, which is making big extensions in its plant, has decided to instal a new 9 000-12 000 kW turbo-alternator group.

Llandudno U.D.C. has consented to proposals of the Broadcast Relay Service, Ltd., to open a broadcast relay station in the town and erect wires where necessary.

The Radio Electric Stores, Carr's Lane, Birmingham, owned by Stratton and Co., were broken into last week, and a receiving set and components valued at £30 were stolen.

It is reported that the Shinetsu Electric Power Co., the Tohoku Electric Power Co., and the Kanto Hydroelectric Co., three of the biggest Japanese power companies, have decided to amalgamate.

The Poso-Graph (Parent) Corporation has placed orders with Metro-Vick Supplies, Ltd., for a large quantity of electrical accessories and electric light fittings for continued use as standard equipment.

An exhibition of cooking, heating, and domestic electrical appliances was opened last week and will be continued until to-morrow, Saturday, at the Calverley Grounds Pavilion, Tunbridge Wells, and a number of local electrical firms are making special displays.

The stand number of the Marconiphone Co., Ltd., at the forthcoming Manchester Radio Exhibition, will be No. 40. The apparatus displayed will be substantially the same as that shown at Olympia, London, and the company will probably be demonstrating from the common amplifier provided.

Mr. E. E. Garrard, of 82, Victoria Street, S.W.1, announces that he has secured the agency in the British Isles and Dominions for the Forges et Ateliers de Constructions Electriques de Jeumont, manufacturers of super-tension and low-tension cables, electrical apparatus and machinery, and invites inquiries.

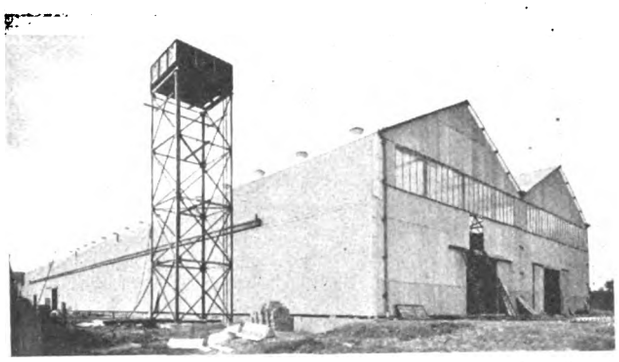
Newton Bros., Ltd., of Alfreton Road, Derby, are to design and manufacture the electrical equipment for the Government's passenger airship which is being constructed at the Royal Airship Works, Cardington. Newton Bros., Ltd., have also secured the contract for generator equipment for the German Post Office.

Barcelona has been equipped with the latest system of automatic telephones, and has been linked up with Madrid

**The accumulator exhibit of the Edison Swan Electric Co., Ltd., at the National Radio Exhibition.**

and nineteen other cities situated in all parts of Spain through a modern toll switchboard. Barcelona is the seventh Spanish city in the programme of the Compañia Telefonica Nacional De España to convert nineteen cities to the automatic system in two years. The rotary type automatic plant has been installed, consisting of 26 000 lines located in four specially constructed buildings, which were instantly made available for service on 17 300 lines with a total of 23 750 telephones.

A new method of illuminating picture galleries has been adopted by the Parker Picture Galleries of 28, Berkeley



**The new heavy machinery department of Petters, Ltd., in course of erection at Yeovil. The majority of the plant used for manufacturing purposes will be driven by electricity.**

Square, W., incorporating "Gecoray" silvered glass reflectors. A system of tilted suspension by counterweight and cord, aided by a special method of support, permits easy manipulation of each unit. It forms an entirely new application of the reflector principle of lighting. In all, some 24 of these units are used for the picture lighting, the main lighting being carried out by means of G.E.C. 24 in. ogee dustproof pendants. The installation was carried out by E. Wight and Co., of Muswell Hill, and Church End, Finchley. See page 420.

The Kuala Lumpur branch of the General Electric Co., Ltd., had a stand of considerable dimensions at the Malayan Exhibition held at Ipoh in the Federated Malay States in August, an electrical section being included for the first time. In this particular section the company secured first prize for the exhibit. Two of the items shown which attracted most attention were the "Magnet" Wizard (the first appliance of the kind seen in the country), and a 45 H.P. 400 V three-phase 50 cycle slip-ring motor and switchgear, the latter being shown running. It is probable that there will be a big increase in the use of motors in Ipoh in the near future, as a result of the opening up by the Perak Hydro-Electric Co. of one of their own stations within the next two or three months. The motors will, of course, be used for driving gravel pumps in tin mines, and the usual equipment is a motor between 45-180 H.P.

A further step in the development of Yeovil has been taken by Petters, Ltd., whose Westland works are on the outskirts of the town. An addition to these works is a new heavy-oil engine department, which will be devoted to the manufacture of large size engines, and some idea of its dimensions may be gained from the fact that the overall length is 332 ft., with two bays each 53 ft. 6 in. Heenan and Froude dynamometers will be used for testing the large engines made, and the necessary pressure will be maintained by means of a 3 000 gallon overhead tank erected on a tower about 50 ft. high over a sump with a capacity of 10 000 gallons. The machine bay will be equipped with a large number of modern electrically driven machines including one of the largest turret lathes in this country—a product of H. W. Ward and Co., of Birmingham, which was a notable exhibit at the recent Machine Tool Exhibition at Olympia. To the south of the building a gantry with two power cranes of five tons capacity will serve the core box and casting dumps.

## ELECTRICITY SUPPLY ORDERS

BLACKBURN Corporation has applied to the Electricity Commissioners for a Special Order to supply electricity in the parish of Pleasington in the rural district of Blackburn. Any objections must be sent to the Commissioners by October 22nd. The Minister of Transport proposes to confirm Special Orders made by the Electricity Commissioners on the applications of the following companies. Any objections must be sent to the offices of the Ministry of Transport, London, by the dates mentioned: (1) West Cornwall Electricity Supply Co., Ltd., for the boroughs of Helston, St. Ives and Penrhyn, the urban districts of St. Just, Madron, Paul, Ludgvan, Hayle, Phillack, Padstow and Wadebridge, the rural districts of West Penwith, Helston, East Kerrier, Truro and St. Columb Major, and part of the rural district of Redruth (October 12th); (2) Lynton and Lynmouth Electric Light Co., Ltd., for urban district of Lynton and part of the rural district of Barnstaple (October 10th).

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# RADIO SELLING LINES.

A NEW 3-valve short wave receiver is made by Stratton and Co., Balmoral Works, Bromsgrove Street, Birmingham. It utilises a screen grid h.f. valve detector of high amplification, Mullard transformer, and a pentode l.f. valve. Its normal range is 15 to 100 metres, with provision for adapting to the broadcast band. Its retail price is £14 10s., with cabinet.

An example of one of the new "Lion" loud speakers by Graham Amplion, Ltd.

Graham Amplion, Ltd., have added to the range of Amplion loud speakers a new series termed the "Lion." These instruments, incorporating a moving iron mechanism, embody, we understand, a number of new principles, giving results which are claimed to be equal to those obtained with a moving coil. The instrument was shown at the National Radio Exhibition for the first time in a variety of finishes, with cones of different sizes, and attracted a considerable amount of attention. The instrument works without batteries or current from sources other than that fed into it by the set, and is manufactured in table, pedestal cabinet, and cabinet designs. There is also a series of "chassis" models intended for embodying in sets during the course of manufacture where desired. In this range there are two types of "chassis," the standard and the power type. The former is rather more sensitive with a low power and the latter possesses rather greater ability to handle extreme volume. The standard chassis, L.14, comprises a complete assembly of 14 in. cone diaphragm and "Lion" unit housed within a rigid frame. It is offered without cabinet for use by set manufacturers and those desirous of fitting a loud speaker in an existing piece of furniture. In this form the chassis is sold mounted in a plain wooden demonstration box, and apart from external appearance, is a complete loud speaker ready for connecting up to a receiving set. The power chassis, L.18P, has the same mechanical construction as the standard chassis, but embodies an 18 in. cone diaphragm with "Lion" unit. This type is suitable for heavy power, its handling capacity, we understand, being such that it will deal with the output of a power amplifier dissipating 20 to 25 W in the last stage. This chassis is also sold mounted in a demonstration box, and is suitable for mounting by the user in a cabinet or upon a baffle—the latter method being recommended as enabling the best possible results to be obtained. The standard chassis is incorporated in the finished series comprising two table cabinet models and two pedestal cabinet models, each being offered in oak and mahogany. The power chassis is incorporated in pedestal cabinet models, in oak and mahogany, known as the Concert type. These models may be obtained with or without a power amplifier arranged for working direct from the mains.

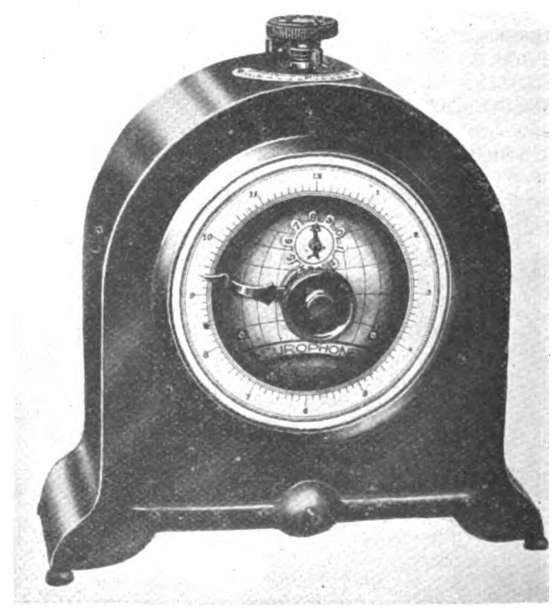
The General Electric Co., Ltd., has placed on the market a range of new Osram valves fitted with filaments treated with "tenacious" coatings. It will be remembered that in the early days of the dull-emitter valve it was the usual practice to treat the filaments with a coating of thorium; these early valves however, possessed the disadvantage that after a comparatively few hours' heating the emission dropped, with the result that the anode output became less and signals weakened; the filaments also could be very easily overrun in that they were over-critical as to voltage. The new valves which have been developed by the G.E.C., on the other hand, claim to possess a full emission without subsequent loss of anode current resulting from filament exhaustion, and to be of as robust construction as other types of valves. The filaments are we understand, treated with barium, are long as to length, so giving a large emitting area, and are low in current consumption. It is a long time since the first dull-emitter made its appearance, but even so those who had experience with the early examples cannot be but all the more impressed with the developments which have been made, both in robust construction and technical efficiency.

The British Thomson-Houston, Ltd., has just placed on the market a range of 2, 4 and 6 V valves with special nickel filaments. Details of these valves have come to hand and their characteristics are as follows:—

| Type. | Fil. current. A | H.T. Volts. V | Amplification. | Conductance. m A/V | Impedance. Ω |
|---|---|---|---|---|---|
| **2 V RANGE.** | | | | | |
| R.C. 210 | 0·1 | 150 | 40 | 0·47 | 86 000 |
| G.P. 210 | 0·1 | 40–120 | 13 | 0·9 | 14 000 |
| H.F. 210 | 0·1 | 150 | 20 | 0·7 | 28·000 |
| P. 227 | 0·27 | 120 | 4 | 1·4 | 2 900 |
| **4 V RANGE.** | | | | | |
| R.C. 407 | 0·75 | 150 | 40 | 0·4 | 100 000 |
| H.F. 407 | 0·75 | 150 | 18 | 0·85 | 21 000 |
| G.P. 407 | 0·75 | 120 | 14 | 1·0 | 14 000 |
| L.F. 407 | 0·75 | 120 | 8 | 1·4 | 5 700 |
| P.415 | 0·15 | 120 | 5·5 | 1·9 | 2 900 |
| **6 V RANGE.** | | | | | |
| R.C. 607 | 0·75 | 150 | 40 | 0·45 | 90 000 |
| G.P. 607 | 0·75 | 120 | 14 | 1·1 | 12 500 |
| H.F. 607 | 0·75 | 150 | 20 | 1·0 | 20 000 |
| L.F. 607 | 0·75 | 120 | 9 | 1·7 | 5 300 |
| P. 615 | 0·15 | 120 | 6 | 2·3 | 2 600 |
| **SPECIAL RANGE.** | | | | | |
| P.X. 650 | 0·5 | 200 | 3·5 | 2·0 | 1 750 |
| B. 12 (7·5 V) | 1·25 | 425 | 2·85 | 0·98 | 2 900 |
| **HALF-WAVE RECTIFIER.** | | | | | |
| R.H. 1 (7·5 V) | 1·25 | 550 | maximum d.c. load 65 m A. | | |

Priestly and Ford, 3, Carrs Lane, Birmingham, are producing a new 3-valve receiver, a high quality instrument which is a notable example of modern design. It is mounted in a robust cabinet of exceptionally good finish, the cabinet proper being of mahogany polished dark, and the panel of oak in a light shade. The set is fully screened, the connecting wires being completely hidden from view, and there are three controls, a thumb drive tuning condenser, centrally mounted, a reaction condenser, and a switch which brings the batteries into circuit in the first position, the low wave inductances in the second position, and the high wave inductances in the third. This set will probably retail at about £12.

A new wireless receiver which should prove a good selling line is being marketed by the Europhone Radio Co., 9, The Parade, Birmingham. It breaks away from orthodox design, being mounted in a metal case of brown crystalline finish having the appearance of a clock. As shown in the illustration on this page, an unusually elaborate slow motion condenser has two readings, a small indicator moving over a dial marked 0 to 9 recording each complete turn over the whole condenser capacity, and a larger indicator recording on a bigger scale minute portions of a turn. Reaction control is provided by a knob at the top moving over an ivorine scale, and an all-wave tuning inductance is tapped out to two sockets, a plug giving the alternate use of the low or high wave band. The set is made as a 2 or 3-valve model, the coupling in the latter being one R.C. and one transformer. The price is exceptionally low—3-valve, £3 3s.; 2-valve, £2 10s., plus royalty.



The new receiver developed by the Europhone Radio Co.

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# ELECTRIC CLUB NEWS.

## Opening of New Premises at Leeds—Birmingham Commences New Session.

THE official opening of the premises of the Leeds Electrical Club at Quebec House, took place on October 1st, when an inaugural dinner was held to commemorate the acquisition of the premises. Members believe that Leeds is the first purely electrical club to have premises of its own. The dinner was attended by Mr. C. N. Hefford, the engineer and manager of Leeds Corporation Electricity Department, and in the unavoidable absence of the President, Mr. W. B. Woodhouse, engineer and manager, Yorkshire Electric Power Co., the chair was taken by Mr. J. E. Storr. The guests included the Lord Mayor, Alderman G. Ratcliffe, the Chief Constable, Mr. R. L. Mathews, and the President of the Leeds and County Liberal Club, Alderman Brow Dickinson. The Lord Mayor proposed the toast of "The Leeds Electrical Club," and in his remarks mentioned that the progress of the electrical industry was almost like a fairy story. He, himself, remembered the first electric tram to be run in Leeds, and the strides since that time were, in his opinion, truly remarkable. Mr. J. E. Storr, the chairman, in responding, agreed that the growth of the industry had been remarkable, and if as some people said, electricity was only now in its infancy, electricity would be a very difficult "old man" to handle. Mr. J. Douglas Green proposed the toast of "The Visitors," and expressed his satisfaction that the Club had made such a good beginning. Alderman Brow Dickinson, in responding, expressed his surprise that an electrical club had not been formed before this, but was sure, from the number present, that the club was assured of a successful future.

The company present, which included 60 members, had a very enjoyable evening, being suitably entertained by Messrs. Dick Wilson, George Lister and Richard Freeman.

The Birmingham Electric Club opened its second half session with a meeting at which Mr. G. Rogers, of Birmingham Corporation Electric Supply Department, gave an address on "Automatic sub-stations."

Mr. Rogers dealt fully with the various types of sub-station equipment in use in Birmingham, and described the automatic control apparatus in use on the Lickey tram route, the longest route in the City, the traffic of which, on occasions, is possibly heavier than on any other route in the country.

Mercury-arc rectifiers, which are in extensive use in Birmingham, were described and illustrated, and incidentally Mr. Rogers made the interesting claim that Birmingham has the largest amount of automatically controlled sub-station gear in the country, possibly in the world.

The Club will hold its annual Ladies' Evening on Friday next at the Grand Hotel.

All members who intend to compete for the club snooker handicap are requested to notify Mr. G. H. Westwood not later than October 17th, on which date the list will be closed. Four prizes have been offered by members of the club, these being for the first, second, highest break, and highest score in any one game, excluding handicap points.

### PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.

The opening meeting of the session of the Paisley Association of Electrical Engineers was held on October 2nd, at the Town Hall, when Mr. J. R. Bisland gave his Presidential Address.

The next meeting will be held on October 23rd, when a lecture with lantern illustrations will be given by Mr. D. Macfarlane Macleod on the "Falls of Clyde Hydro-Electric Plant." Other lecturers are: Mr. A. W. Johnston, "Some Notes on Pulverised Fuel"; Mr. Thos. Robertson, "Engineering Insurance"; and Mr. J. S. Kilpatrick, "Domestic Electrification." The following visits to public works have been arranged:—Glasgow Corporation Refuse Power Works, Govan; Babcock and Wilcox, Ltd., Renfrew; Glengarnock Iron and Steel Works; India Tyre and Rubber Co., Ltd., Inchinnan; Barclay, Curle and Co., Ltd., Diesel Engine Works, Whiteinch; Clyde Valley Electrical Power Company; Hydro-Electric Power Station at Bonnington, Falls of Clyde.

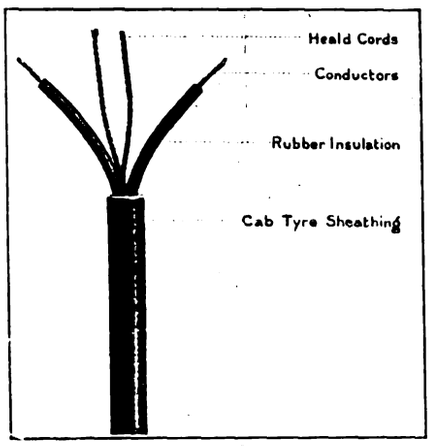
A general meeting of the Institution of Mechanical Engineers will be held on October 19th, at 6 p.m., when Mr. Richard W. Allen will deliver his Presidential Address.

# NEW FLEXIBLES.

## A Method Whereby Heald Cords are Introduced as Strengtheners.

CALLENDER'S Cable and Construction Co., Ltd., have sent us particulars of a new range of C.T.S. flexibles with heald cord strengtheners for domestic and other purposes. The company points out that it is usually found that breakdowns with domestic electric appliances are due to the householder's careless treatment of the flexible cable connections. When cab tyre sheathed flexibles are used with portable appliances, or for wandering leads, they are often subjected to severe strain and a certain amount of rough usage. This is principally due to the cable's robust outward appearance, as such a flexible looks capable of withstanding a greater strain than the comparatively weak conductor can be expected to resist. A C.T.S. flexible used as a wandering lead, if fouled or held momentarily by some projection, may receive a sudden jerk sufficiently severe to break the copper conductors, or at least fracture a number of the individual wires. In the latter event a failure soon follows owing to conductivity having to be maintained by a few wires only, which gradually heat up, or to arcing occurring as the strands intermittently make contact. Some engineers endeavour to avoid this trouble by using flexible of a much larger size of conductors than is necessary to carry the current, but this is expensive and not always an efficient remedy; moreover a bulky flexible is considered objectionable. By the provision of heald cord strengtheners in C.T.S. flexible, the difficulty is claimed by Callender's Cable and Construction Co. to be overcome, as the cords pass underneath the sheathing throughout the entire length of the flexible and can be utilised in the manner illustrated in order that the strain may not fall directly on the conductors. Such flexibles are primarily intended for making connections for electric cookers, cleaners, heaters, irons, pendants, etc.

Below.—The new flexible showing the heald cords.
Right.—Illustrating the method of fixing.



### MANCHESTER ELECTRO-HARMONICS.

The Manchester Electro-Harmonic Society commences its tenth season this month, arrangements having been completed for a series of smoking concerts on the basis of previous years. The society continues to progress and the membership to increase to such an extent that larger accommodation has been secured, and this year the society will meet in the large hall of the "Manchester Limited." The concerts are to be held on October 19th, November 16th, December 14th, January 18th, February 15th and March 15th. The programmes are being organised by a Music Committee consisting of Messrs. H. R. Taylor, W. A. Barnes, L. H. Marlor, H. Povey and W. Tuke Robson. Not the least interesting feature of the society's meetings is the inter-visitation with the Liverpool Electro-Harmonic Society which has now become an annual affair, and a reunion is expected at the December meeting, which will take the form of a "Hot-Pot" supper and concert. A ladies' evening, to be held on February 2nd, is being arranged.

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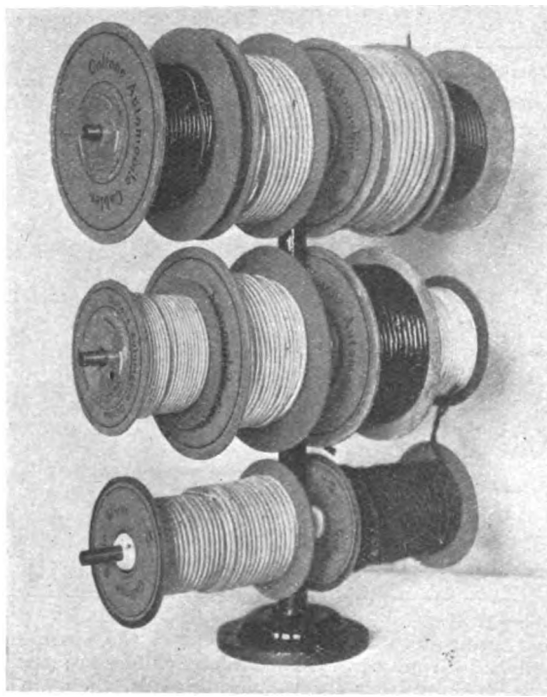
# CABLE STANDS.

## A Novel Sales-Aid which has been Developed for the Cable Stockist.

IN order to popularise their system of cable handling and distribution, Ward and Goldstone, Ltd., are offering to the trade, free of charge, on conditions stated below, cable stands as illustrated. Each stockist will be entitled to one stand



**Illustrating the larger of the cable stands offered free by Ward and Goldstone, Ltd.**

only, and the advantage of this system for cable storage will be quickly appreciated. The stand is constructed of seamless steel tube with adjustable cross bars and is suitable for counter, showroom, garage or workshop. The stand is supplied free upon ordering ten drums each of 100 ft., of automobile cables in regular demand.

In addition to the large stand, Ward and Goldstone, Ltd., are also offering a smaller stand to hold 6 to 8 drums. This latter type is supplied upon ordering six drums each of 100 ft. of popular automobile cable.

A special stand for wires of interest to the radio trade has also been designed and is being offered on much the same terms as the stands described above.

### POWER DEVELOPMENT AT SEVEN SISTERS FALLS.

The North Western Power Co., Ltd., a subsidiary of the Winnipeg Electric Co., has been granted by the Dominion Government a lease of the Seven Sisters Falls on the Winnipeg River within the province of Manitoba. The lease will be nominally for a period of 50 years with a provision that the Manitoba Government take over the property at the end of 30 years on specified terms. The Dominion Government in issuing the lease is carrying out the provisions of an agreement entered into with the province of Manitoba on July 4th, 1928, under which—pending the transfer of unalienated natural resources in Manitoba to the provincial Government—the administration thereof was to be in accordance with the wishes of the provincial authorities. An agreement has already been arrived at between the Manitoba Government and the Winnipeg Electric Co. for the supply of power by the North Western Power Co. to the provincial hydro-electric distribution system. The company will supply the provincial "hydro" with power up to 30 000 H.P. at a rate which shall not be more than $13.80 per H.P. per annum nor less than $11·00, and within these limits at the rate of one-half cent. per kWh. New power development is expected to reach 225,000 H.P. when installation is completed. The licence stipulates that 60 000 H.P. must be developed in three years. The Winnipeg Electric Co., which had a licence in perpetuity at the Pinawa channel, gives up its rights there, the present development of 37 800 H.P. to be replaced by the larger development to be carried out by its subsidiary at the Seven Sisters Falls.

# A NEW INDICATOR.

## New Current Indicating Device for Domestic Electrical Appliances.

WITH the increasing use of electricity in the home for heating, domestic appliances and supplying current for wireless apparatus, there is a need for some means of indicating whether or not these various appliances are in circuit, other than by the use of a carbon lamp or 20 W vacuum lamp on switch boards, electric cookers, and the like. To meet this need, Philips Lamps, Ltd., have introduced a neon indicator which, small in size, measuring only 55 mm. by 17 mm., has a rated current consumption of ½ W; it emits a light which, though subdued, is easily discernible both in daylight and strong artificial light, but does not throw out any heat. One of the electrodes takes the form of a small disc and the other that of a ring, the small glass cylinder in which they are contained being filled with neon gas, which becomes illuminated when the electrodes are subjected to a difference of potential. The Philips neon indicator also provides an adjunct to switchboards in use in factories, theatres, and other buildings having elaborate lighting systems. It is not always possible to quickly ascertain which lamps or groups of lamps are alight by the position of the switches, but by equipping the switchboard with neon indicators the operator can ascertain this information at a glance. The indicators are wired by a special type of auxiliary circuit, and light simultaneously with the lamps or groups of lamps in the circuit. Thus it will be seen that if a fuse blows it is possible to immediately locate the lamp or lamps affected. This use is specially valuable with three-phase motor circuits. The indicators are made for 100-250 V a.c. and for 150-250 V d.c., and are fitted with either S.B.C. or S.E.S. caps. For power installations and switchboards a double-ended, 400-650 V indicator is available.

## THE SOCIAL SIDE.

THE 1928 series of golf competitions organised by the staff of Siemens Lamp Works, Preston, was brought to a successful conclusion on September 15th by an "Eclectic" competition for the "A. M. Hicks" prize. The competition was played over the Ashton Park course and was won by H. Ruddick with an eclectic score of 43-7-36, W. G. Creasy being second with 46-9-37.

An interesting ceremony took place at the Broad Green Club House of the A.T.M. Sports and Social Organisation on September 22nd, when the John Lee Bowls Challenge Cup and associated prizes were presented to the winners. The cup

**Presenting the John Lee Bowls Challenge Cup and associated prizes at the A.T.M. Broad Green Club House.**

is a silver trophy, presented by Mr. John Lee, a director of the Automatic Telephone Manufacturing Co., Ltd., and was won by Mr. F. Massey of the Framework Department, who retains a replica. There were 79 entrants, the second prize, a silver cake dish, being won by Mr. R. Neal, the third, a clock, by Mr. P. Jarvis, and the fourth, a salad bowl, by Mr. A. Borrell. The proceedings were opened by Mr. W. Bibby, chairman of the sports and social organisation who called upon Mr. H. H. Harrison to present the cup and prizes.

Eston U.D.C. has appointed a sub-committee to tour the district with the electrical engineer to ascertain what economies can be effected in public lighting.

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# ELECTRICAL WOMEN.

## The Rising Generation and the Domestic Use of Electricity.

THE opening meeting of the Manchester and District branch of the Electrical Association for Women was held on October 4th, Mr. H. C. Lamb, engineer and manager of Manchester Electricity Department, presiding.

Mr. Llewelyn B. Atkinson spoke on the future of electricity as it would be affected by the Act of 1926. One heard, he said, an outcry against the so-called hideous electrical wires that were being strung all over the country, but he would suggest that it was really a matter that could be studied under a different aspect. If only people would regard these wires as agencies designed to carry comfort and convenience to the homes of many thousands of people, as something that was contributing an essential part to the beauty of the country by abolishing smoke, he was confident that the dislike would vanish. The greatest benefits of the Act would be found in the smaller areas. Enthusiastic people had rather overdrawn the line in suggesting that electricity in the future would practically be given away.

Women could play a big part in popularising the use of electricity, for there was a great field in the home. Every city suffered from the amount of coal smoke that issued from its chimneys. It was a nuisance that could and would be overcome, and when that day arrived the benefits to the health of the community would be considerable. There would have to be a revolution in the method of housekeeping. The new ideas in the use of modern appliances should be instilled into the young children in the schools. Education was needed in the uses of electricity in the houses. Apparatus was installed in the homes which if installed in a factory would involve severe fines and imprisonment. It was in teaching the best and safest ways of applying electric power that their Association could perform a serviceable duty.

### The Outlet Campaign.

At Queen's College, Birmingham, on October 4th, Lady Brooks presided over a large meeting of members of the Birmingham and Midlands branch of the Electrical Association for Women to launch the "Electrical Outlet Campaign." The Association considers that there is a great lack of electrical outlets or plugs in the average house, and, at the meeting referred to, it was explained that the object of the campaign is to impress upon architects, builders, local authorities and electricity supply undertakings the advantages of the provision of an adequate number of "outlets" during building. Miss C. Haslett (London, Director of the Association) explained the women's national specification (based on the plan of a standard house), showing the suggested position of outlets in the various rooms. The scheme was discussed by Mr. R. A. Chattock (city electrical engineer) and others, and it was apparent that some of those present were of opinion that the "national specification" would involve too high a cost for small houses, in which the number of outlets in each room should be reduced. It was agreed that the time had passed when such facilities for the ready use of electricity for labour-saving in the home should be regarded as luxuries.

A branch of the Electrical Association for Women is at present in the course of formation at Rugby. The inaugural meeting was held yesterday in the Benn Buildings, Rugby. The chair was taken by the branch President, Lady Fielding, and Mr. T. S. Shenton, electrical engineer, Rugby, extended a welcome to the branch.

Miss C. Haslett outlined the objects of the Association and spoke of its past work. The provisional programme of the branch will be announced later by the provisional honorary Secretary, Miss N. Pedlar.

Two successful meetings were held in connection with the inauguration of the North Wales branch of the Association, at Wrexham and Llandudno, on October 5th and 6th. In the case of the former meeting, the chair was taken by Ald. Ed. Hughes and at Llandudno by Mrs. Price White.

The following officers were elected:—President: Mrs. S. Z. de Ferranti; Chairman: Mrs. Price White; Hon. Treasurer: Mrs. E. H. Paton; Hon. Secretary, Mrs. E. H. Klitz, Tan-yr-allt, Llanddulas, Denbighshire.

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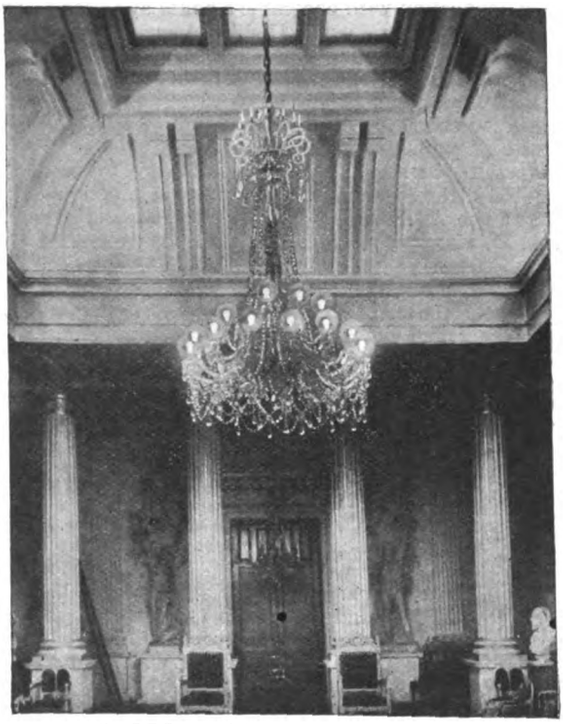
The Secretary for Mines has given notice that any safety lamp, flame or electric, which has been approved for use in mines is also suitable for use in petroleum spirit stores or in the presence of the vapour of such spirit.

# MANSION HOUSE LIGHTING.

## Improved Lighting Arrangements in the Home of London's Lord Mayors.

THE lighting installation at the Mansion House has recently been improved by the General Electric Co., Ltd., and we give below a brief description of the arrangements. The principal apartments include the drawing room, the long



One of the G.E.C. crystal fittings in the reception saloon at the Mansion House.

parlour, the Venetian parlour, the Justice Room, the Egyptian Hall, and, on the floor above, the old ball room. The Egyptian Hall is 59 feet wide and 88 feet 5 inches long, and affords dining accommodation for 400 guests. It is upwards of 100 feet in height, and is illuminated throughout by 40 W Pearl Osram lamps, which are installed along each of the four sides at clerestory level. Below this cornice lighting are installed 18 6-light pendant fittings similarly lamped. The reception saloon has four crystal fittings, one of which we illustrate here. This is equipped with 40 W Pearl lamps. The smaller fittings, which at present have clear lamps, are supplemented by a system of concealed strip lighting. The drawing room is illuminated entirely by concealed strip lighting. The long parlour or small luncheon room is illuminated by three English alabaster pendant fittings, each equipped with eight 20 W candle lamps and three 60 W clear gasfilled lamps.

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A remarkable assembly gathered at the Kensington Town Hall on September 20th, when 500 of the employees of Rawlings Bros., Ltd., and of the Rawlplug Co., Ltd., gathered to celebrate the silver wedding of Mr. J. Kirkham, one of the joint managing directors of the former company. The social evening, which included a musical programme organised by Mrs. Will Rawlings, as well as dancing until a late hour, was carried forward under the chairmanship of Mr. W. R. Rawlings. Mr. and Mrs. Kirkham were presented with a silver-faced clock and illuminated address from the employees, and a solid silver tea-pot, milk jug, sugar basin and inscribed salver from Mr. Kirkham's fellow directors. In addition, the occasion was taken by the companies as being one suitable for presenting cheques to no fewer than 126 employees of over seven years' service. Sixty-two employees of over seven years' service received a cheque equivalent to one week's salary; 21 employees of over 14 years' service received one-and-a-half week's salary; 27 employees of over 21 years' service received two weeks' salary; 12 employees of over 28 years' service received two-and-a-half weeks' salary; and four employees of over 35 years' service received three weeks' salary.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

EAST LOTHIAN COUNTY COUNCIL.—Electric lighting installation in connection with constable's house at Gifford. Specification, etc., from Messrs. Dick Peddie and Walker Todd, 8, Albyn Place, Edinburgh.

SALFORD CORPORATION, October 12th.—Supply and erection at Agecroft power station of two three-phase step up transformers, 12 000 kVA each, ratio 6 600/33 000 V. Specification, etc., from City Electrical Engineer.

FIFE AND KINROSS DISTRICT BOARD OF CONTROL, October 13th.—El ctrical work in connection with erection of nurses' home at the Asylum, Cupar-Fife. Specifications, etc., from Mr. A. D. Haxton, 3, High Street, Leven; deposit, £2 2s.

SIDMOUTH URBAN DISTRICT COUNCIL, October 13th.—Erection of l.t. overhead electricity main about 1½ miles in length from the electricity works at Sidford. Details from the engineer and manager, Mr. Henry Burgess.

DARLINGTON CORPORATION, October 15th.—Cooling tower, with foundations and tank. Specification, etc., from the Borough Electrical Engineer, Houghton Road, Darlington; deposit £1 1s.

EDINBURGH CORPORATION, October 15th.—Coal and ash plant, for Portobello generating station, including weighbridge, truck tippler, three electric capstans, belt conveyors and elevators and two ash telpher hoists. Specification, etc., from Mr. E. Seddon, city electrical engineer and manager; deposit £2 2s.

ERITH URBAN DISTRICT COUNCIL, October 15th.—Supply, laying, etc., of h.t. and l.t. cables for working pressures of 3 300 V and 600 V respectively, at 50 periods. Tender form, etc., from the Electrical Engineer, Walnut Tree Road, Erith.

WEST RIDING EDUCATION COMMITTEE, October 18th.—Electric light installation at Thorne Grammar School. Particulars from Education Department, County Hall, Wakefield

GLASGOW PARISH COUNCIL, October 20th.—Twelve months supply of electric fittings (item 62) and electric lamps (item 62A). Forms of tender, etc., from Mr. M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 23rd.—Supply of electric cables during 12 months ending November 30th, 1929. Further particulars from the Electrical Engineer, Electricity Works, Penrose Street, Walworth Road, S.E.17.

ROCHDALE CORPORATION, October 31st.—Wiring installation work for 12 months, by registered electrical installation contractors. Tenders to the Engineer and Manager, Electricity Works, Rochdale.

LONDON COUNTY COUNCIL, November 12th.—Four electrically-driven sewage-pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc.; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £5.

ROCHDALE CORPORATION, November 13th.—Supply of single-phase prepayment meters for twelve months. Specifications from Mr. F. H. Rudd, Electricity Works, Dane Street, Rochdale.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, October 12th.—Installation of electric motors, etc., in mechanical transport workshops, Island Bridge Barracks, Dublin. Specification, etc., from Office of Public Works, Dublin; deposit £1.

SOUTH INDIAN RAILWAY CO., LTD., October 12th.—Supply of electric cables and wires. Specification, etc. (5s.) from the Company's offices, 91, Petty France, Westminster, S.W.1.

DUBLIN CITY COMMISSIONERS, October 13th.—(1) Supply and erection of transformers, (2) supply of h.t. oil immersed circuit breakers and (3) supply of flame arc carbons. Specifications (5s. for each) from the City Electrical Engineer.

STATE ELECTRICITY WORKS, MONTEVIDEO, October 15th.—Electrician's pliers, wire-drawing machines, etc. (Reference B.X. 4 702.)

INDIAN STORES DEPARTMENT, October 16th.—Supply of oil engine-driven alternator sets, and switchgear (order No. N. 8 729), for Ahmednagar. (Reference B.X. 4 714.)

INDIA STORE DEPARTMENT, October 16th.—Supply of porcelain insulators for 11 000/33 000 V. Forms of tender (5s.) from Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND POST AND TELEGRAPHIC DEPARTMENT, October 16th.—Supply of flame proof, jumper wire (specification P. and T. 151/1076). (Reference B.X. 4770.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 16th.—Register coils and mounting plates (contract S.28/543; schedule C.356). (Reference B.X. 4 639.)

CHILEAN STATE RAILWAYS, October 17th.—One year's supply of electrical materials. (Reference C. 2 885.)

INDIAN STORES DEPARTMENT, October 17th.—Supply of water turbine and two oil engine driven generating sets, for Mardan power station. (Reference B.X. 4 733.)

STATE ELECTRICITY WORKS, Montevideo, October 17th.—Automatic voltage regulator. (Reference B.X. 4 699.)

RANGOON MUNICIPALITY, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on closed circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

WATERFORD HARBOUR COMMISSIONERS, October 19th.—Supply of 20-ton electrically operated hoisting and slewing travelling crane. Specification (21s.) from the Harbour Engineer.

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44.) (Reference B.X. 4 637.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

PORT ELIZABETH MUNICIPALITY, October 25th.—Steel cross arms for transmission line. (Reference A.X. 6 892.)

PORT ELIZABETH'S MUNICIPALITY, October 25th. Transformers. (Reference B.X. 4 760.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 25th.—Supply of two 6½ kW crude oil driven generating sets.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., October 26th.—Supply of gasfilled and vacuum lamps Specification, etc. (10s., not returnable) from the company's offices, The White Mansion, 91, Petty France, Westminster, S.W.1.

DURBAN MUNICIPALITY, October 26th.—Supply of single-phase transformer. (Reference B.X. 4 762.)

DURBAN MUNICIPALITY, October 26th.—Supply of 10 single-phase and two three-phase transformers. (Reference B.X. 4 761.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

MELBOURNE CITY COUNCIL, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944). (Reference B.X. 4 698.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

ANGORA RAILWAYS AND PORTS DEPARTMENT, October 30th.—Supply of overhead electric travelling crane. (Reference A.X. 6 954.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water-tube boilers

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with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of six induction voltage regulators. (Contract No. 55.) (Reference B.X. 4 768.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of truck type switchboard cubicles (contract No. 54). (Reference B.X. 4 782.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of transformers (contract No. 53). (Reference B.X. 4 783.)

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, November 5th.—Supply and erection of switchgear and two transformers, each 5 000 kVA (38 000/10 000 V) for the Shannon transformer station at Milltown, Co. Dublin. Specification, etc., from Mr. P. J. Dempsey, secretary, Electricity Supply Board, 60–62, Upper Mount Street, Dublin; deposit, £5.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Supply of 22 000 V armoured type switchgear. (Reference B.X. 4 763.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Steel lattice towers, with cross arms, insulators, etc. (Reference A.X. 6 897.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically-driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C., deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories, for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

NEW ZEALAND PUBLIC WORKS DEPT., November 13th.—Supply of transformers. (Reference B.X. 4 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362). (Reference B.X. 4 396.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Supply of switchboard keys and parts (schedule C. 362.) Reference B.X. 4 752.)

MELBOURNE CITY COUNCIL, November 14th.—Supply of totally enclosed, metal clad type switchgear and spares (specification 952). (Reference B.X. 4 748.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of galvanised wire and aerial cable (tender No. 132). (Reference A.X. 6 950.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 749.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of indicators (schedule C. 371). (Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). (Reference B.X. 4 753.)

VICTORIAN RAILWAY COMMISSION, November 28th.—Supply of 10-ton overhead electric crane. (Contract No. 42 090.) (Reference A.X. 6 951.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

## Tenders Accepted.

CHESTER GUARDIANS.—Commercial Electrical Co., electrical supplies.

BREWOOD PARISH CHURCH.—Truman, electric light wiring and fittings, £80.

HALIFAX CORPORATION.—E. Mitchell, electric light installation in 94 houses.

PLYMOUTH CORPORATION.—Willoughby (Plymouth), Ltd., supply of lamp standards.

STIRLING CORPORATION.—P. H. Cossar, electric light installation at 36 houses at Raploch.

WATLINGTON PARISH COUNCIL.—Chiltern Estates Development Co., for electric street lighting.

HULL GUARDIANS.—Newton and Wright, Ltd., supply of X-ray apparatus, £1 126. (Recommended).

BARNSTAPLE CORPORATION.—Mirrlees, Bickerton and Day, Ltd., 300 kW Diesel generating set, £5 926.

MAIDSTONE CORPORATION.—Peter Brotherhood, Ltd., cooling tower, at the electricity works, £2 155.

SOUTHPORT CORPORATION.—C. Shaw, electric light installation at Ainsdale branch library, Southport.

BIRKENHEAD CORPORATION.—Bolckow, Vaughan and Co., Ltd., 150 tons of tramway rails and fishplates.

ASHFORD (KENT) GUARDIANS.—Wallace and Sons, wiring children's homes for electric light, £28 17s. 6d.

ISLINGTON (LONDON) BOROUGH COUNCIL.—D. P. Battery Co., Ltd., supply of electric vehicle battery, £189.

YORK CORPORATION.—Barber and Colman, Ltd., installation of automatic traffic signals, £296. (Recommended.)

WILLINGTON URBAN DISTRICT COUNCIL.—M. A. Robson, electric wiring in connection with housing scheme, £137.

POPLAR (LONDON) BOROUGH COUNCIL.—Johnson and Phillips, switchgear for High Street sub-station, £193 5s.

WILLESDEN URBAN DISTRICT COUNCIL.—Standard Time Co., Ltd., synchronising Jubilee clock, at Harlesden, £73.

CARLISLE SCHOOL MANAGEMENT COMMITTEE.—R. M. Hill and Sons, electric light installation at Caldewgate Schools.

NEW SOUTH WALES RAILWAYS AND TRAMWAYS DEPARTMENT.—Babcock and Wilcox, Ltd., supply of boilers, £19 000.

INVERLEITHING CORPORATION.—J. Scott, electrician's work in connection with erection of 16 houses at Spencerfield, £96.

EDINBURGH CORPORATION.—Pratt Bros. (Edinburgh), Ltd., electric light and power installation, at Craigleith Hospital, £514.

HACKNEY (LONDON) BOROUGH COUNCIL.—Sturtevant Engineering Co., Ltd., supply of two fans for sub-stations, £85 10s. each.

RIPON CORPORATION.—Crompton Parkinson, Ltd., supply of transformers, e.h.t. and l.t. switchgear and cable connections, £2 318.

GLASGOW CORPORATION.—Allan Arthur and Ure, electrification of pumping station at High Street, £199 8s. 8d. (Recommended.)

LURGAN URBAN DISTRICT COUNCIL.—Portadown Foundry, Ltd., two motor-driven pumps, to be erected at Castor Bay works, £400.

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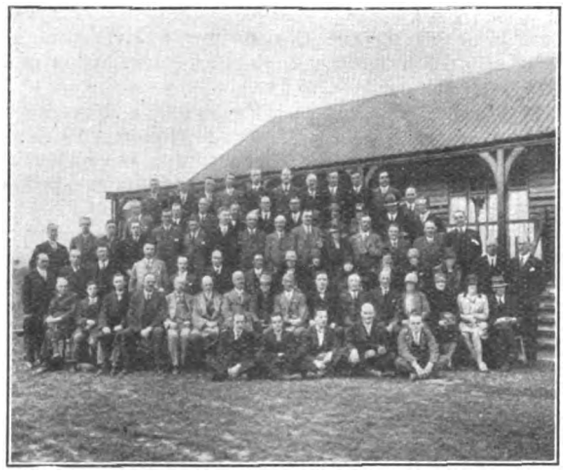
BRISTOL CORPORATION.—Colston Electric Co., Ltd., provision of 14 poles, for lighting roads at Ham Green Hospital, £131 5s. 4d.

SHEFFIELD CORPORATION.—Moorwoods, Ltd., supply of lamp pillars required by lighting department during one year, £1 15s. each.

WARRINGTON CORPORATION.—George Ellison, supply of sub-station switchgear; British Insulated Cables Ltd., supply of cables.



*A NUMBER of members of the E.C.A., with central station engineers from the districts of Cardiff, Bristol and Bath, visited Southampton recently with the object of inspecting the works of the Pirelli-General Cable Works, Ltd. The party, numbering sixty-five in all, included eighteen ladies.*

VICTORIAN ELECTRICITY COMMISSION.—English Electric Co., Ltd., two 10 000 kW turbo-generators, for Yallourn briquetting plant.

YARMOUTH EDUCATION COMMITTEE.—J. W. Lamb and Son, electric light wiring and fitting in boys' department of St. Nicholas School, £127.

SOUTHAMPTON CORPORATION.—Pirelli-General Cable Works, equipment for supplying electricity to Newtown, Netley, and Hamble, £3 984 2s. 4d.

LIVERPOOL CORPORATION.—D. Brayshaw, electrical installation in connection with erection of houses on Knotty Ash estate. (Recommended.)

LIVERPOOL CORPORATION.—English Electric Co., Ltd., supply of 70 40 H.P. D.K. 30 2 H tramcar motors, £190 each, including roller bearings.

TRURO CORPORATION.—Hosken, Trevithick, Polkinhorn and Co., Ltd., electric light installation in municipal buildings and clock tower, £156 13s.

WALTON-ON-THAMES URBAN DISTRICT COUNCIL.—W. Lucy and Co., feeder pillars, £486; Hackbridge Electric Construction Co., Ltd., transformers, £115.

GLASGOW CORPORATION.—Thos. Bolton and Sons, Ltd., copper bonds; Dyer and Young, Ltd., commutators; Hackbridge Cable Co., Ltd., v.i.r. cable.

HULL CORPORATION.—H. Smith and Co., for electric light installation in open market-place, £1 050. Highest tender, £1 492; city engineer's estimate, £1 175.

BRIGHTON CORPORATION.—Siemens Bros. and Co., Ltd. 1 600 yards of e.h.t. cable, £1 127 10s.; W. T. Glover and Co., Ltd., 6 000 yards of l.t. cable, £2 616.

SALFORD GUARDIANS.—E. M. Evans and Son, Ltd., electric lighting and power installation in new garage and east-end rooms at Eccles New Road Institution, £98.

VICTORIAN RAILWAY COMMISSION. Metropolitan-Vickers Electrical Co., Ltd., traction motors, motor gearing and control equipment, £300 000 (approximate).

WALTON-ON-THAMES URBAN DISTRICT COUNCIL.—W. Lucy and Co., Ltd., feeder pillars, £486 5s.; Hackbridge Electric Construction Co., Ltd., transformers, £115.

LIVERPOOL CORPORATION.—Tramway track work: Titan Trackwork Co., Ltd., £919; Hadfields, Ltd., £650; Edgar Allen and Co., Ltd., £1 407.

WILLESDEN GUARDIANS.—W. H. Allen, Son and Co., Ltd., supply of two generating sets, £2 400; Cochran and Co., Ltd., supply of boiler, £1 629, for Park Royal Hospital.

DERBY CORPORATION.—C. A. Parsons and Co., Ltd., 20 000 kW turbo-alternator, £54 650; International Combustion, Ltd., two boilers and pulverising mill, £46 086.

COLCHESTER CORPORATION.—English Electric Co., Ltd., 300 kVA transformer, £280; Electric Construction Co., Ltd., three feeder panels, etc., £827. (Both recommended.)

WILLASTON PARISH COUNCIL.—Electricity Distribution of North Wales and District, Ltd., public lighting by 53 lamps, £3 11s. each, for 1 070 hours, under ten years' contract.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD.—English Electric Co., Ltd., supply of 32 kiosk type sub-stations, for use in connection with the Shannon hydro-electric scheme.

SYDNEY CIVIC COMMISSIONERS.—British General Electric Co., Ltd., supply of 102 500 yards of 33 000 V cable and 101 000 yards of pilot cable, for Bunnerong power house, £149 331.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Enfield Cable Works, Ltd., supply of cables, £12 290 6s.; W. T. Henley's Telegraph Works Co., Ltd., 14-way unit-type feeder pillar, £149 4s.

GENERAL POST OFFICE.—British Insulated Cables, Ltd., 32 miles of 160/40 lb. star quad telephone cable, between Manchester and Preston.

LONDON COUNTY COUNCIL.—English Electric Co., Ltd., supply and erection of 50 double-deck electric tramcar bodies, for reconstructed subway cars, £102 025. Also tendered: Hurst, Nelson and Co., Ltd., £102 025; Brush Electrical Engineering Co., Ltd., £105 275.

MANCHESTER CORPORATION.—Brown and Co. (Electrical Engineers), Ltd., electric light installation at houses at Thirlmere; J. and E. Hall, Ltd., installation of electrical refrigerating plant at Baguley sanatorium.

ESSEX COUNTY COUNCIL.—Macintosh Cable Co., Ltd., cables, distribution and street lighting work, in connection with first portion of scheme for installation of electricity at Brentwood Mental Hospital. £6 911 17s. 4d.

LEICESTER CORPORATION.—Davidson and Co., Ltd., grit arresters for eight boilers, £9 344, and eight forced draft fans, £1 144; English Electric Co., Ltd., 16 motors and starters for forced and induced draught fans, £3 538.

MANCHESTER EDUCATION COMMITTEE.—Electric light renewals at Central High School for Girls, Sudlow and Co.; electric light installation at Cheetham Special School, H. Crossley; alterations and additions to electric lighting at School of Art, Sudlow and Co.

LONDON COUNTY COUNCIL.—Woolwich Borough Council electric light wiring and fitting of Ealdham Square School £621. Also tendered: A. Higginbotham and Sons, £630; Anderson, Angell and Co., £645; A. Dean and Co., Ltd., £655; Burdette and Co., Ltd., £725; T. Clarke and Co., Ltd., £729; Fordham Electrical Engineering Co., Ltd., £733; Pinching and Walton, £811; Eastern Armature Winding Co., £889.

HORNSEA URBAN DISTRICT COUNCIL.—Napier and Wheldon, electric lighting of Floral Hall and grounds, £275. Other tenderers: Tarran and Abbott, £396; A. H. Clark, £453; A. Hardy, £350; A. Shaw, £363; Porte Bros., £599; W. L. Harrison, £331; H. Huge and Co., £420; Beanlands, Ltd., £325; City Electrical Co., £427; British Electrical Installations, £480; Hall and Stenson, £370; King and Co., £392; Hanorah, £303.

CAPE TOWN CORPORATION.—British General Electric Co., supply of 5 000 25 A ironclad service cut-outs, £430; South African General Electric Co., supply of 12 relay automatic tap-changing transformers, £246; Metropolitan-Vickers Electrical Co., Ltd., supply, for trial purposes, of 250 type N.E. meters, £215 12s. 6d.; F. W. Searle, supply of 4 000 10 A, 220 V, 50 cycle single-phase house service meters, of Sangamo type, £3 466 13s. 4d.; E. A. Shaw and Co., electric installation at Hour Street baths, £109 7s. 8d. (All recommended.)

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Ferguson, Pailin, Ltd., and Metropolitan-Vickers Electrical Co., Ltd., supply of switchgear for sub-stations for 12 months; Metropolitan-Vickers Electrical Co., Ltd., and British Electric Transformer Co., Ltd., supply of transformers for 12 months; Watson and Sons, Ltd., supply of h.t. testing equipment, £442 14s.; Davidson and Co., Ltd., supply of four auxiliary grit collectors for power station; Chamberlain and Hookham, Ltd., and Ferranti, Ltd., supply of meters for 12 months. (All recommended.)

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# WORK IN PROSPECT.

BAWTRY.—Post office, for H.M. Office of Works, King Charles Street, London, S.W.

BILLINGHAM.—Housing scheme (75), for the Urban Council. Particulars from architects, Kitching and Archibald, 21, Albert Road, Middlesbrough.

BREDBURY AND ROMILEY.—Housing scheme (36), for the Urban Council. Particulars from Surveyor.

BROMSGROVE.—Extensions to infirmary, including operating theatre, etc., for the Board of Guardians. Particulars from Clerk.

CLAYTON (MANCHESTER).—Cinema theatre, for a syndicate comprising Mr. A. L. Ward, Mr. Alfred Snape, and Mr. B. Cramer.

CREWE.—Additional 150 houses, for the Town Council. Particulars from Borough Surveyor.

CROYDON.—Block of eight shops and dwellings, South End, for the Town Council. Particulars from Borough Engineer.

EAST HAM.—Sunday schools, for the Parish Church. Particulars from Vicar.

ELLESMERE PORT AND WHITBY.—Housing scheme (232), for the Urban Council. Particulars from clerk, Mr. Francis.

GRANTHAM.—Extensions to casual wards, for the Board of Guardians. Particulars from contractor, Mr. G. Kettle, 110, Harlaxton Road.

HAMILTON.—Extensions to Beckford Street Maternity Home, to cost £4 600. Particulars from architects, Cullen, Lochhead, and Brown.

## Electricity Sub-Station.

HAWARDEN.—Electricity sub-station, Penyffordd, for the Rural Council. Particulars from clerk, Mr. A. K. Wroe, Carlton House.

HEBDEN BRIDGE.—Post office and telephone exchange, for H.M. Office of Works, King Charles Street, London.

HUDDERSFIELD.—Business premises. Particulars from architects, Abbey and Hanson, 11, Cloth Hall Street.

KIDDERMINSTER.—Housing scheme (18), for the Town Council. Particulars from borough engineer, Mr. J. Hawcroft, 110, Mill Street.

KIRKCUDBRIGHT.—Housing scheme, for the Town Council. Particulars from Burgh Surveyor.

LITTLE SUTTON.—Housing scheme (18), for East Elloe Rural Council. Particulars from clerk, Mr. S. S. Mossop, jun., Holbeach.

LONG SUTTON.—Houses, Seagate Road, for the Urban Council. Particulars from architect, Mr. A. E. Palmer, Fulney Bridge, Spalding.

LUTON.—Block of shops, Dunstable Road, for Mr. A. Mardle.—Factory extensions, for the Reginald Hat Manufacturing Co., Ltd., Reginald Street.

LUTON.—Offices, for the Northampton Town and County Benefit Building Society. Particulars from architect, Mr. F. H. Allen, 26, Abington Street, Northampton.

MAIDSTONE.—Church hall, Grove Road, for the Free Church Council. Particulars from Secretary.

MITCHAM.—School, Lonesome, for Surrey Education Committee. Particulars from secretary, Mr. W. W. Finney, Kingston-on-Thames.

OAKHAM.—Housing scheme (16), for the Urban Council. Particulars from Surveyor.

PENGE.—Boys' secondary school, for Kent Education Committee. Particulars from education architect, Mr. W. H. Robinson, Sessions House, Maidstone.

PORT ERIN (ISLE OF MAN.)—Repeater telephone station. Particulars from contractors, Joseph McArd and Sons.

ROMFORD.—Houses (36), Fairholme Avenue, for Mr. P. J. Watts.

SPALDING.—Housing scheme (20), for the Urban Council. Particulars from Surveyor.

ST. HELEN'S (ISLE OF WIGHT).—Houses, for the Urban Council. Particulars from Surveyor.

STOURBRIDGE.—Church, St. Thomas's parish. Particulars from vicar, Rev. Canon Newland.

STOURBRIDGE.—Picture house, for the Stourbridge Central Theatre, Ltd. Particulars from contractor, Mr. A. J. Crump, Dudley.

TODMORDEN.—Casual wards, to cost £6 000, for the Board of Guardians. Particulars from Clerk.

WINCHESTER.—School, Stanmore, for the City Education Committee. Particulars from clerk, Mr. Thomas Holt.

WINDSOR.—Playhouse. Particulars from contractors, W. Creed and Co., Maidenhead.

# THE MOTOR SHOW.

## Some of the Exhibits of Electrical Interest at Olympia.

AMONG the many exhibits to be seen at the Motor Show which opened at Olympia, London, yesterday, are a number of electrical items, including batteries by the leading makers.

Exhibits of interest on stand 442 include not only magnetos, both of the rotating armature and polar inductor types, but other products of the British Thomson-Houston Co., Ltd. By means of the company's impulse starters, which can be supplied as an integral part of all but the smaller magnetos, even large engines can be started with ease, while with the B.T.H. automatic ignition timing device driving is simplified and gear-changing minimised, as the engine timing is varied automatically according to the speed without in any way affecting the quality of the spark. In the combined magneto-coil ignition sets for four, six and eight cylinder cars, a magneto of the polar inductor type has high and low tension terminals to permit of the contact breaker and distributor being used in conjunction with a separate ignition coil, a high and low tension change-over switch, controlled from the dashboard, enabling the driver to change quickly from one ignition system to the other. In cases where coil ignition is preferred to magneto ignition, the coil ignition equipments for four, six and eight cylinder cars are available. These equipments are suitable for 6 or 12 V circuits on either the insulated (two pole) or earthed (single pole) system. Manual control or automatic ignition advance control may be provided to suit individual requirements. Reference should also be made to the "R.N." patent flexible adjustable magneto coupling, which possesses the qualities of a positive drive combined with easy adjustability for any ignition position, the adjustment being variable over the entire range. Among the features claimed for it are quiet running, ease of fitting and interchangeability with other standard couplings, and elimination of the possibility of the constituent parts becoming detached when the magneto is removed. There is a large area of contact between the driving and driven members, and as the flexible element, a special rubber and fibre compound which is unaffected by oil, petrol, or water, is only under compression, no end thrust can be set up due to torsion or any slight swelling.

## Other Exhibits.

On stand 441, occupied by Rotax, Ltd., is also shown a complete range of automobile electrical equipment, including many types of dynamos suitable both for belt or direct drive. A feature is made of coil ignition, and many dynamos have a distributor incorporated in their design. Self-starters suitable for cars of all horse power and employing all the usual forms of attachment are exhibited, while switchboards of various types are represented, including many elaborations in which the faceplate has been enlarged to include other instruments, such as clocks, speedometers, etc., countersunk in such a manner that these can be flooded with light at night-time without the source of light being visible. The company is also showing a complete dynamotor which performs the functions of both the dynamo and starter, a complete range of road lamps, dash, interior and inspection lamps, in addition to electric horns, spotlights and fog lamps. There is also a complete range of Rotax batteries, both of the wood crated type and those in moulded containers.

The exhibit of C. A. Vandervell and Co., Ltd., stand 487, includes a complete range of lighting dynamos suitable for belt or direct drive, and including coil ignition attachments; starter motors with proprietary and standard drives, with special pinion engagement controls; switch-boxes of flush-fitting design for the control of lighting, starting and ignition, with switch-lock; a complete variety of lamp bulbs, including standard types and anti-dazzle bulbs; accessories, including dash, interior, instrument and inspection lamps, horns, hand-lamps and spotlights. The chief feature of the stand is a display of C.A.V. car batteries, including the all-moulded range. This class of battery gains its name from the fact that the container is made of special acid-proof material, which enables the cell cases and outer box to be moulded in one piece. Many of the batteries shown are fitted with threaded rubber separators.

The Hart Accumulator Co., Ltd., is displaying on stand 246, representative samples of motor starter and lighting batteries suitable for replacement purposes on all of the best-known makes of British and foreign cars.

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# ELECTRICITY SUPPLY.

## Loans for Electricity Supply—New Plant for Rochdale—Birkenhead and the Wirral Scheme—Street Arc Lighting to be Discontinued at Glasgow—Progress at Bristol Power Station—The North-West England Scheme.

EAST Ham Electricity Committee is to lay cables at a cost of £2 265.

Bath Corporation has received sanction to a loan of £35 770 for electricity purposes.

York Electricity Committee has agreed to supply electricity to Nun Monkton Priory.

The work of converting the system of supply in Liverpool from d.c. to a.c. is being rapidly carried on.

Croydon Electricity Committee has obtained sanction for a loan of £50 000 for electricity mains.

Coventry C.C. has applied for a loan of £42 000 for mains for the Greater Coventry area.

Birkenhead T.C. has applied for a loan of £25 000 for mains and services in connection with the Wirral scheme.

Hastings Electricity Committee has obtained sanction to borrow £10 000 for house services.

Rochdale Electricity Committee is seeking powers to borrow £11 000 for expenditure on new plant.

Brighton Corporation has received sanction to borrow £8 000 for buildings and £2 700 for plant at Southwick power station.

Croydon Electricity Committee has authorised mains extensions at a cost of £4 350 for the supply to new housing estates.

Burnley T.C. has authorised application for sanction to borrow £40 000 for mains extensions during the next three years.

Blackpool Electricity Committee will apply for permission to borrow £80 000 for new electricity mains and £21 000 for services.

Glasgow Lighting Committee has authorised the conversion of the remaining street arc lamps to gasfilled lamps, at a cost of about £12 000.

Blackburn Electricity Committee is applying to the Electricity Commissioners for permission to change over from d.c. to a.c. in certain areas.

Bolton Markets Committee has deferred consideration of a request for electric lighting to replace oil and spirit lamps in the wholesale market place.

Heston and Isleworth Electricity Committee is to carry out mains extensions, and instal transformer plant at two sub-stations, at a cost of £21 542.

Cannock U.D.C. has decided to allow persons who have acquired electric light installations on the hire basis to become purchasers at the end of six years.

Formby U.D.C. has arranged with Messrs. Downes and Davies to canvass the district with a view to educating consumers in the use of electrical domestic apparatus.

Bermondsey (London) Electricity Committee has decided to supply electricity to stallholders in Southwark Park Road who are connected to the special supply columns at £2 10s. per annum per 100 W lamp.

Bristol Electricity Committee reports that it is now necessary to proceed with the second instalment of the Portishead power station, the cost being £790 736.—The Committee is to seek sanction for a loan of £36 000 for meters.

Stretford Electricity Committee seeks authority to erect two e.h.t. transmission lines between Barton power station and the Stretford undertaking, to meet the requirements of the scheme of the Central Electricity Board, at a cost of £30 000.

Swansea Electricity Committee has arranged to give a bulk supply to the Brynamman and District Electric Supply Co. at an estimated cost of £4 580. The Committee is to lay a main from the sub-station at the British Oxygen Co.'s premises to the Uplands sub-station, at a cost of £2 248.

It is expected that the Central Electricity Board will in about a week adopt the Electricity Commissioners' scheme for the north-west of England, which embraces Cumberland, Westmorland, Lancashire, Cheshire and North Wales.

Application is being made by Lytham St. Annes Corporation for permission to borrow £35 000 to cover prospective requirements of the electricity undertaking for mains, services and meters and £11 000 for mains and services, etc., in connection with the supply to certain outlying districts.

Holker Lower P.C. recently convened a meeting of ratepayers to consider the expediency of adopting the Watching and Lighting Act for the township. The Cark and District Electric Light Co. had offered to erect 12 lamps at £7 10s. per lamp and light them for £3 per lamp per annum. A resolution was passed adjourning the meeting for 12 months.

The Shannon Electricity Supply Board announces that the charge for current to 23 small towns in Leinster will include a fixed sum based on poor law valuation, plus 2d. per kWh. The fixed rate per house will range from 6d. per week to 2s. 6d. per week. The Board offers to wire houses in the towns referred to, the cost being repayable by instalments of 3d. or 6d. per week.

The Central Electricity Board has conceded some of the claims made by Liverpool Electricity, Power and Lighting Committee. Lister Drive No. 3 station will be regarded as a first-class station for the purpose of allocation of load, Clarence Dock station will be proceeded with immediately, and Liverpool supply stations are not to be called upon to import any portion of the required load.

The revenue of George Town, Penang, Municipal Electricity Department for 1927 was £139 088, compared with £132 667 for 1926; total costs were £78 158, against £76 627. Electricity sold was 9 583 048 kWh, against 8 475 154. The net profit was £23 078. Motors on hire amount to 2 216 H.P., increase 571 H.P., and cookers on hire number 159, increase 29. Cost of fuel per kWh sold was 0·81d., compared with 1d.

The Borough Electrical Engineer of Battersea (London) has prepared a report showing the estimated cost of laying electric mains for private service in all streets in which they are not at present laid; laying public lighting mains and converting gas lamps in such streets; and providing services for consumers likely to be obtained during the first year if such mains are laid. The estimate is £56 000 for laying mains for private consumers; £16 000 for laying mains for public lighting and converting 653 gas lamps; and £11 000 for providing service. The Committee has selected certain streets to be dealt with at once, at a cost of £24 500. The Committee recommends the adoption of a two-part tariff for premises separately rated, as an alternative to the flat rate, and that the charge be 12½ per cent. per annum of rateable value, plus ¾d. per kWh.

Mr. John Christie, borough electrical engineer of Brighton, reports that he has had several interviews with the officers of the Central Electricity Board with reference to fixing up a suitable basis for charging for a bulk supply to Worthing Corporation. It was tentatively agreed to offer a supply to meet the present needs of Worthing, at 8 000 V, three-phase, 50 periods, at £2 10s. per annum per kW of maximum demand, plus cost of coal, with a sliding scale, and 0·05d. for other expenses. The cost of coal last year was 0·295d. per kWh generated. Mr. Christie says this arrangement will only hold good for two or three years, or until the southern area section Electricity Board's scheme has been fully developed.—The Electricity Committee has declined to accede to a request from the Western Road and District Traders' Association for reduced charges for lighting shop windows after business hours.

Fulham (London) Electricity Committee proposes to adopt as the basis of the allowance of discount the number of units consumed rather than the amount of the account, so that when the price per kWh is reduced the consumer may still obtain the discount, although his payments are less.—The Committee proposes that the minimum charges to electricity consumers be reduced to 3s. 4d. for the summer and 6s. 8d. for the winter quarters.—The Committee has decided to enter into contracts with wiring contractors for wiring premises in accordance with a specification prepared by the borough electrical engineer. Eight tenders have been received, and the following were decided upon as set prices: Schedule 1 for 600 M. Ω cable lead covered; up to 7 points, £1 2s. per point; above 7 up to 10, £1 1s. per point; above 10, £1 per point; plugs, 17s. per point; 7/·044 main above 10 ft., 1s. per ft.; 2-way switching, half point extra. Schedule 2, 600 M Ω cable screwed barrel; up to 7 points, £1 1s.; above 7 and up to 10, £1; above 10 points, £1 9s.; plugs, 15s.; main above 10 ft., 1s. extra; and 2-way switching, half point extra. These terms have been accepted by the following contractors: Mr. J. L. Shadwell, Mr. E. T. Perrett, Messrs. Prentice and Broan, Messrs. Leather and Strong, and Mr. George Hill.

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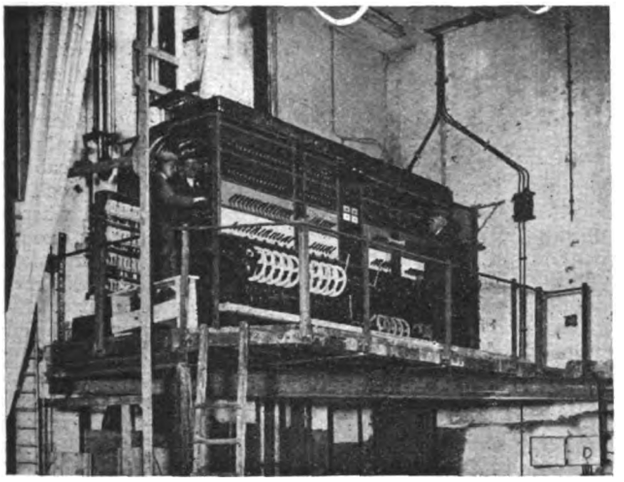
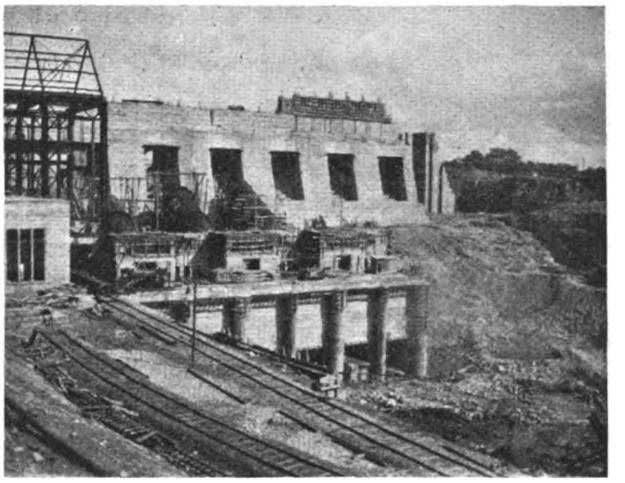
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

A contribution to the recent Leeds civic week business and advertising display. The feature of the decorated motor lorry was a monster "Hoover," in every detail an exact replica of the ordinary working model.

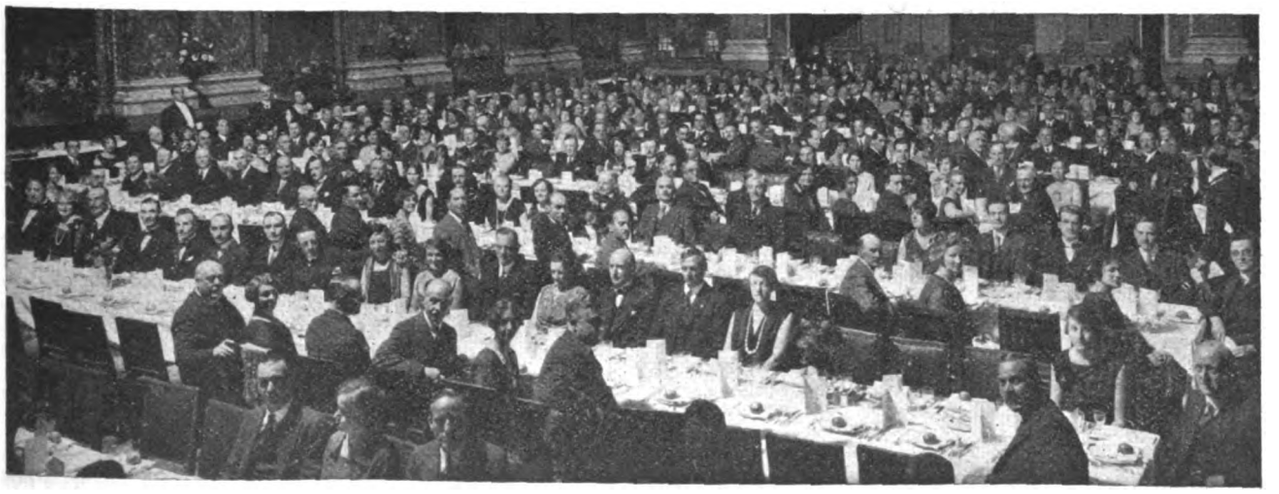
The new showrooms of the electricity department of Leeds Corporation which were opened recently. The premises are in the shopping centre of Leeds, and the principal frontage is in Albion Street.



The intricate switchboard arrangements, controlling the elaborate lighting system by special devices for direction and volume, which has been installed at the New Empire Theatre, Edinburgh. The installation is said to be one of the finest in the country.



Work on the Shannon Electricity Scheme is now taking definite shape and our photograph shows a section of the dam and turbine house. Comparison of this picture with those which we published in the early days of the scheme indicates the progress made.



Members and guests of the Electrical Power Engineers' Association at the annual dinner at the Hotel Cecil, London, on Saturday, October 6th. Mr. W. Cornet, chairman of the Southern Division, presided, and Lt. Col. Edgcumbe, the new I.E.E. president, was among the distinguished visitors. (See page 402.)

The annual report of the Shoreditch electricity undertaking states that 3 296 new consumers were connected to the mains during the past year, the total connected being 7 127. A large number of residents have availed themselves of the opportunity of obtaining a supply of electricity under the rental wiring scheme, 3 501 applications for supply having been received, and 3 468 connected. The estimates for the year ending March, 1929, assuming a sale of 20 000 000 kWh for all purposes, show an estimated surplus of £23 088. From the experience of the last five months, it is evident that the total sales will exceed this number, and the surplus is likely to be larger. In these circumstances the Electricity Committee is of opinion that consumers should be given the benefit of the improved conditions by about another 10 per cent.

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# TRADE PUBLICATIONS.

THE current stock list of Higgs Motors has been received.

A new "Typerlite" fittings catalogue has been issued by the Typerlite Co.

The October blotter of Mavor and Coulson, Ltd., illustrates the Samson coal cutter.

The new Herculene folder by the W. T. Henley's Telegraph Works Co., Ltd.

The October blotter of J. G. Statter and Co. illustrates oil switches and other circuit breakers.

Vol. 8, No. 4, of "Houghton's Radio News" is a special Olympia number dealing with the National Radio Exhibition.

W. T. Henley's Telegraph Works Co., Ltd., has published folder No. 306, describing the merits of Herculene insulating material. The folder was printed, we are informed, with special new process blocks, and is on cartridge paper. It is claimed that the folder is the first two colour publicity matter in which this new type of process has been used.

Philips Lamps, Ltd., have issued new literature relative to receiving sets, type Nos. 2501 and 2502, while leaflet No. 113 dealing with rectifying valves has also been published.

We have received from Siemens Electric Lamps and Supplies, Ltd., Catalogue No. 247, dealing with wireless valves, and catalogue No. 400 describing Xcel domestic electrical appliances.

The Jackson Electric Stove Co., Ltd., has published a new fire folder and booklet giving the reduced prices, new leaflets describing the Atom and boiler fires, and a price list of safety switch kettles.

The General Electric Co., Ltd., has published a new folder regarding the "Osram Music Magnet," a three-valve receiver for home construction. Wiring diagrams and all constructional and operating details are given.

## WIRELESS NOTES.

### Wireless Apparatus on New Court Line Steamers—Television and the B.B.C.

FIVE complete wireless installations for the new Court Line steamers have been ordered from the Marconi International Marine Communication Co., Ltd., by Messrs. Haldin and Co., Ltd. The equipment, comprising 1½ kW transmitters, emergency transmitters and two valve receivers, will be installed in the "Geddington Court," "Rossington Court," "Tilsington Court," "Quarrington Court," and "Sinnington Court." The range of the apparatus will vary according to local conditions, but transmission can normally be expected in daylight over distances of from 500 to 600 miles. The two-valve receiver, consisting of three units, is able to receive messages on any wavelength within the range of 300 to 25 000 metres, thus placing at the disposal of the navigator facilities for obtaining useful information regarding weather and navigation warnings and time signals.

According to the "Daily Telegraph" an important announcement was made last week with regard to the broadcasting of television pictures. It was based on an application by the Baird Television Company to the Postmaster-General for a licence for general television broadcasting, when the suggestion was made that the B.B.C. stations might be used for experimental purposes. The Post Office authorities consulted the B.B.C., which issued the following statement:—"The B.B.C., with the approval of the Postmaster-General, has required a specific demonstration of the Baird television apparatus before considering experimental transmissions from its stations." It will be recalled that before the Fultograph system was tried from B.B.C. stations a demonstration was given to Captain P. P. Eckersley and another of the B.B.C. engineers.

# ELECTRICAL INVENTIONS.

### Some of the Exhibits of Electrical Interst at Westminster.

THE International Exhibition of Inventions, organised by the Institute of Patentees, which opened at the Central Hall, Westminster, on Wednesday, and will remain open until October 20th, includes a number of interesting new electrical inventions, for which the patent rights may be sold, or licences may be granted. Captain G. Drury Coleman, Organising and General Secretary, Institute of Patent Agents, 39, Victoria Street, London, S.W.1, will put applicants in touch with the inventors.

### Some New Ideas.

These new inventions include: (1) A device which will answer the telephone in the absence of the subscriber, and which, in case of a fire or burglary, will ring up the exchange and indicate the location of the trouble. It will also receive messages and record the time of receipt. (2) A means of cutting out noises in a wireless receiver caused by the running of electric motors or generators, vacuum cleaners, refrigerators, etc. (3) A device for providing a steady source of h.t. current for a wireless set from the l.t. accumulator. It consumes little current and is smaller, lighter and cheaper to produce and maintain than h.t. batteries or h.t. eliminators. (4) A device by means of which all metals can be electro-plated without removal. (5) An antiseptic device for telephone mouthpieces. It consists of paper which is drawn from a roll through clips and over the mouthpiece. The paper is perforated, so that it can be torn off after use. (6) A dual purpose anti-thief code switch for motor cars, etc. (7) A cabinet to contain a complete wireless set, together with a clock which may be used for control purposes. (8) A switch whereby a plurality of circuits may be opened or closed with one movement. (9) The provision of a plurality of coils or transformers as a single unit, so constructed that any of the coils may be inserted into the circuit without removing the unit or altering the external connections. (10) Magnetic gearing which permits of indicating or recording the changes of any phenomenon with which the movements of a small magnet may be associated without contact or friction between magnet and recorder or indicator. (11) A slow motion indicator for wireless condensers. The device consists of two discs, one of which is revolved by means of a knob, and engages with the other, which carries a pointer and revolves in the opposite direction. (12) A lamp lock which requires no special key. (13) A high frequency amplifier, for connection to a wireless receiver, preferably one using one stage h.f., with tuned anode and reaction. (14) An electric advertising sign in which flashing lamps are replaced by pivoted reflectors actuated and controlled by electromagnets. The reflector units can be operated on 2 W, and it is stated that a shop facia board can be completely illuminated on 200 W. (15) Apparatus for checking the time taken on trunk telephone calls.

In the Trade Section the exhibitors include: Bower Electric (1926), Ltd., artificial sunlight and radiant heat apparatus; F. G. Knapton and Co., a lamp for either light or heat purposes; St. James' Electrical Co., a bell for use on a.c. or d.c. lighting circuits; British Smokeless Cooker Co., the "Royal" electric griller; J. A. Brook, electric lamp locks; Miss E. L. Long, the "Eezefit Dayanite" signalling device for motor cars. An attractive feature of the show consists of demonstrations of the principles upon which the automatic telephone system in London is operated. A complete switchboard has been erected in a separate section of the exhibition, and talks and practical demonstrations explaining the working of the system are given at hourly intervals by officers of the London Telephone Service.

A somewhat strange and at the same time interesting incident occurred to a buyer of one of the large business houses in London while he and his family were on a business tour this summer in the States and Canada. Prior to leaving the shores of this country the buyer purchased for the use of his wife from the Electric Heating Co., of Croydon, one of their Universal voltage irons. While in conversation one day with an American friend, the English buyer was asked if by chance he could put an electric iron, which had just failed, in working order. When the iron was brought to him for his inspection he was considerably surprised to find that it was of the same make as the one he had brought from the old country, and that it was made in 1918. This being the first time during ten years it had given a day's trouble.

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# ELECTRIC TRACTION.

## Liverpool Tramways and Rates—Bradford and Railless Traction.

THE Haslingden tramways show a net loss of £48 for the past year, against a loss of £155 for the previous year.

Out of profits for the year ended March last the Liverpool tramway undertaking is contributing £115 000 to the relief of rates.

The New South Wales railways show a loss of £1 609 267 for the year ended June 30th last, and the tramways a profit of £27 808.

Bradford Corporation's tramways show a net profit of £28 764 for the past year, compared with £7 935 for the previous year.

On the Preston Corporation tramways last year the total revenue was £88 299, the gross profit was £22 512, and the net profit £7 028.

It is stated that the new Piccadilly Circus tube railway station will probably be completed and opened for traffic by the end of this year.

Walthamstow U.D.C. has applied to the Ministry of Transport for a loan of £22 810 for fitting new roof covers and seating to 38, and new electrical equipments to six tramcars.

Dundee Tramways Committee recently resumed consideration of the question of the purchase of the Broughty Ferry tramway undertaking. It was decided to continue negotiations.

York Tramways Committee has decided to carry out extensions and alterations at the Fulford Road car depot at an estimated cost of £5 000, exclusive of track and electrical equipment which will be carried out by the tramways staff.

Croydon Corporation tramways show a deficit of £58 879 for the year ended March last, compared with £66 338 in the previous year. The improvement is attributed to improvements in rolling stock and abolition of cheap penny mid-day fares.

## Extensions at Sunderland.

Sunderland Town Council has accepted the recommendation of the Tramways Committee to extend the Durham Road tramway route from its present terminus a further 1 234 yards to a new housing estate at Humbledon, at an estimated cost of £19 326.

The receipts of the electric tramway undertakings controlled by the Underground Railways Group and the Tramways (M.E.T.) Omnibus Co. during the week ended September 8th amounted to £44 600, an increase of £4 300, and the aggregate from January 1st to date was £1 515 100, increase £120 400.

The Traffic Committee of Berlin Municipal Council has approved a Bill to amalgamate the existing tramway, electric railway and omnibus companies into a single undertaking, under the name of the Berliner Verkehrs A.-G., with a capital equivalent to £20 000 000.

At a recent Musselburgh T.C. meeting, correspondence between the Town Clerk and the Ministry of Transport in regard to the cessation of the running of tramways over the Musselburgh Co.'s system between Levenhall and Port Seton, and also regarding tramway fares which the T.C. considered were excessive, was read. The Ministry of Transport stated that if a closing Order for that part of the system which was not being operated was sought by the local authorities interested, the Ministry would consider the request. In regard to fares, the Ministry pointed out that the company was charging the rates allowed under the Order expiring with this year, and as the company had lost £4 026 in six months this year without making provision for renewals, the Ministry would not interfere.

Bradford Tramways Committee and Bingley U.D.C. have agreed to vary the lease of the Bingley tramway, dated 1913, so as to give the Corporation the option of operating the tramway from year to year on the expiration of the present lease, on the understanding that the Corporation relieves the Council of its liability to purchase the tramway lines and equipment; and that the Council grants all proper facilities in the event of another type of transport being adopted which would necessitate the adaptation of the overhead equipment and feeder cables. On the route from Five Lane Ends to Thackley railless traction is to be substituted for the existing tramway. Application is to be made to the Minister of Transport for sanction to borrow £28 220 for this purpose and £29 560 for the equipment of the Allerton section as a railless vehicle route.

# COMPANY NEWS.

## General Market in Electrical Descriptions shows Activity.

THE past week's changes in electrical share prices present no outstanding features. Callender's Cable ordinary shares are half-a-crown up, at 85s., and British Insulated, at the same figure, have improved 1s. 3d., as also have Henley's‡ at 117s. 6d. Crompton Parkinson preferred ordinary have risen a shilling, to 19s. County of London Supply ordinary shares have fallen 2s., and London 1s. Central London Railway stock is a point to the good, and District ½. Underground Electric shares are up to 27s. again. Marconi's Wireless shares have recovered last week's loss of 1s. 3d. International Marines are 2s. down.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. | 92½ | 92½ | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. | 38/6 | 40/6 | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1) | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) | 27/- | 28/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. | 46/10½ | 46/10½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) | 10⅜ | 10⅜ | 10½ | 6/13/9 |
| (c) | St. James' & P.M. Ord. (£1) | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B.Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, 4½ % C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. | 38/- | 38/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 72 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. | 92½ | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. | 67 | 67 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. | 79½ | 79 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. | 115½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/- | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. | 85/- | 83/9 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. | 23/6 | 23/6 | 21/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. | 85/- | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. | 26/3 | 26/3 | 27/6 | 16/6 |
| 6 | Crompton Parkinson Pref. Ord. | 19/- | 18/- | 18/- | 8/- |
| 8 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. | 6/10½ | 6/10½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. | 28/- | 28/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. | 41/6 | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. | 117/6 | 116/3 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. | 37/6 | 37/6 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. | 34/4½ | 35/- | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. | 30/- | 30/- | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3¾ | Anglo-Am. Tele. Ord. Stk. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. | 264½ | 262½ | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. | 70½ | 69½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) | 26 | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) | 38 | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. | 77/6 | 76/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. | 55/- | 57/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) | 26 | 25½* | 23 | 11/3/6 |

(a) 1s. 7⅛d. per share. (b) £8 8s. 6.66d. per cent. (c) 1s. 6·949d. per share. (d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. ·912d. (g) 1s. 7·223d.

‡ Including 1s. bonus. * Ex. dividend.

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SYMPHONY GRAMOPHONE AND RADIO CO., LTD.—Subscriptions h. bn. invited during the present week for 1 750 000 2s. shs. out of a total cap. of 2 000 000 2s. shs. The co. has bn. formed to mfre. and sell gramophone motors, gramophones, radio gramophones, radio receivers and electro-magnetic recordg. and reproducg. devices.

STOCK EXCHANGE NOTICES.—The Stock Exchange Committee has ordered 45 054 £1, fully paid, ord. shs. of the Underground

*ILLUSTRATING a new method of illuminating the Parker Picture Galleries, in Berkeley Square, London, W. The system incorporates Gecoray reflectors, there being no less than 24 units devoted exclusively to picture lighting. The installation was carried out by E. Wight and Co., of Muswell Hill, London, N.* *See page 427.*

Electric Railways Co. of London, Ltd., to be quoted in the Official List, and dealings have been specially allowed in 200 000 1s. fully paid, dfd. ord shs. of Cliftophone and Records, Ltd., and 250 000 4s. fully-paid shs. of Wireless Pictures (1928), Ltd.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Cap. expenditure to Dec. 1927, £3 695 650, received or paid off, £2 972 029. Rev. for 1927, £893,451, blce. to net rev. acct., £351 475. After provisn. for int. on mtges. and loans and deb. stk., redemptn. and reserves, and divs. on 6 p.c. cum. pref. shs. and 8 p.c. cum. 2nd pref. stk., div. of 10 p.c. on ord. shs. was declared and £220 542 carried fwd.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—Intm. div. of 7½ p.c. (equal to 1s. 6d. p. sh.), less tax, on shs. numbered 1 to 1 192 726, on account of the year endg. Dec. 31, 1928, will be payable on Oct. 17. In authorisg. paymt. of this div. the directors state that the estimated pfts. for the year will enable them to recommend a fin. div. at the same rate, making 15 p.c. for the whole year. Notice will be given in due course, by advertisement in newspapers in London, Brussels and Italy, regardg. deposit of coupons for paymt. of th intm. div. on bearer shs.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—In view of the statemt. issued by the board under date of August 3, 1928, and at the instance of an influential body of £1 ord. shhldrs., a committee has been formed for the purpose of concerted actn. if necessary. The committee consists of the Hon. W. B. L. Barrington (chairman), and Messrs. Bernhard Heymann Binder, Sidney Russell Cooke, and Henry A. Vernet, with power to co-opt. Messrs. Binder, Hamlyn and Co., River Plate House, 12 and 13, South Place, London, E.C.2, will act as secretaries to the committee.

BUELL COMBUSTION CO.—The first balance sheet, covering period to June 30, 1928, shows a loss of £4 724. The co. was formed on May 4, 1927, to acquire a pulverised coal system. The directors state that, in their opinion, practically all initial difficulties have recently been overcome and the co. is in a postn. to undertake the installatn. of varying types of plants. The foreign rights of the co. have been disposed of to Buell Combustion (Foreign) for a net cash consideration of £57 000 and 65 000 dfd. ord. shs. The directors consider that the above terms were distinctly advantageous, as, apart from the cash consideratn. thus received, the co. has retained a substantial interest in the foreign patents.

GREAT NORTHERN TELEGRAPH CO., LTD.—Shareholders are requested to send as soon as possible, to the Privatbanken, 4, Boersgade, Copenhagen, K, Denmark, their shs. in the Great Northern Telegraph Co. (with coupons from No. 47 to No. 57 inclusive. Corresponding shs. in the Great Northern Telegraph Co.'s Holding Co. will then be issued in the proporion of one £3 share in the Holding Co. to each £10 share held in the Great Northern Telegraph Co. New talons and coupon sheets will be affixed to the Great Northern Telegraph Co.'s shs., which will also be endorsed to the effect that the Holding Co. shs. have been duly delivered. The sh. certificates, with the new Holding Co. sh. certificates, will then be returned to the shhldr. or his nominee.

WHITEHALL ELECTRIC INVESTMENTS, LTD.—The directors announce that a provisional arrangement to sell the co.'s hldgs. in the cos. operating in Chile and Mexico has been entered into with Electric Bond and Share Co., of New York, by means of an agreemt. with American and Foreign Power Co., Inc., the holding co. for that Co.'s operatng. interests outside the U.S.A. The transactn. disposes of the whole of the Whitehall Co.'s investmts. at a price substantially in excess of the figure at which they stand in the Co.'s balance sheet. The Co.'s main purpose will continue to be the hldg. of investmts. in electrical and other public utility undertakgs. Whilst in the past, however, the Co.'s interests have been confined to investmts. in Chile and Mexico and in cos. in which sh. control was held, its future interests will be more widely distributed and will not necessarily carry sh. control. It is contemplated that the Co. will make certn. investmts. in associatn. with the Electric Bond and Share Co. The directors intend, when the Companies Act, 1928, comes into force, to propose to the pref. shhldrs. the conversn. of their shs. into shs. of the same nom. value of 20s., but redeemable by the Co. at any time at 25s. p. sh., or repayable on liquidatn. at 25s. p. sh., in lieu of their present positn. of repaymt. at 20s. on liquidatn.

## Company Meeting.

ASSOCIATED FIRE ALARMS, LTD.—Mr. Gordon H. Brown, presiding at the meeting on Tuesday, said what the shareholders would probably consider the most important point in the accounts was the fact that the board were able to recommend the payment of a dividend in respect of the past year at the rate of 8 per cent., which was an improvement of 2 per cent. on the rate at which they had been able to distribute for the last three years. Once again their record of actual fire stops during the year had been quite satisfactory. The variety of places from which the calls were given went to illustrate the wide distribution of their business. About 50 per cent. of last year's fire calls originated in London, 28 per cent. in the provinces—at Manchester, Liverpool, Birmingham, and Leicester—and 20 per cent. in Scotland—at Edinburgh, Glasgow, Aberdeen, and Ayr. More than 25 per cent. of the calls were given between midnight and 5 a.m. In every case the signal was promptly given, and the damage which in all cases might, and in some cases undoubtedly would, have resulted in very serious losses, was kept down to nominal figures. They had carried out a satisfactory number of new installations during the year, and their export trade was well maintained. They were at the moment making regular fortnightly shipments of thermostats to Australia. Their works at Walthamstow had been kept fully employed. They had to manufacture still more during the current year, and he thought that in the near future they would be justified in building a further extension of their works. Their prospects for the current year were encouraging, and they had a satisfactory amount of new business in hand and of fresh orders on their books. The report was adopted and the dividend approved.

## New Companies.

H. A. MCQUEEN AND CO., LTD.—Cap., £10 000. Electrical engineers, manufacturers of electrical switchboards, gear and appliances, etc. Reg. Office: 190, West George Street, Glasgow.

HEALEY MOULDINGS, LTD.—Cap., £5 000. Manufacturers of any article made from moulding powders, celluloid, casein, and plastic substances, etc., manufacturers of electrical or other instruments, wireless parts, etc. Reg. office:—47, Temple Row, Birmingham.

J. H. HOLMES AND CO., LTD.—Cap., £100 000. To acquire business of electrical and general engineers hitherto carried on at Newcastle-upon-Tyne and elsewhere as J. H. Holmes and Co., with goodwill, trade marks and patents and all or part of the assets, and to carry on the same and that of electricians, manufacturers of and dealers in apparatus, appliances and machinery used in connection with generation, distribution, supply, storage and utilisation of electricity, etc. Solicitors; Watson, Burton, Booth and Robinson, Pilgrim House, Newcastle-upon-Tyne.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BURTON, Arthur, 226, Rice Lane, Walton, Liverpool, electrical contractor. £20 10s. September 6th.

ELECTRIC SERVICE CO., Jessop Street, Sheffield, electricians. £10 18s. August 10th.

EVANS, Thomas Henry, 116, High Street, Gorseinon, wireless engineer. £33 13s. 2d. August 7th.

FLAVELL, John Percival, Aston Road, Birmingham, wireless dealer. £26 1s. 10d. August 21st.

HARRISON, Mr. J. R., 11, Maples Street, Forest, Nottingham, electrical agent. £12 12s. 4d. August 23rd.

JENDEN, Mr., 41, Farnaby Road, Bromley, wireless expert. £12 18s. 0d. August 13th.

PARKINSON BROS., 125 and 127, Euston Road, Morecambe, electrical engineers. £16 13s. 8d. September 5th.

SIMMONDS, Mr. A., 153, Richmond Road, Kingston, wireless dealer. £11 17s. 3d. June 22nd.

## Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD. (SUSSEX).—Registered October 1st, £600 2nd debentures, part of amount already registered; general charge. *£13 800. April 26th, 1928.

### Satisfactions.

BEDALE AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Satisfaction registered September 28th, £2 000, registered May 18th, 1927.

BURNHAM AND DISTRICT ELECTRIC SUPPLY CO., LTD. (Som.).—Satisfaction registered September 27th, £2 000, registered July 18th, 1918.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

FIFIELD, (F. W.) electrical and wireless dealer, 2, Small Street, Bristol. The creditors were called together recently, when a statement of affairs was submitted which showed ranking liabilities of £1 297, made up as follows: Lloyds Bank, £44; cash creditors, £35; law costs, etc., £70; trade creditors, £606; and partly secured creditor, £542, the last named being the Midland Bank, who claimed £1,892, and they held security valued at £1,350. In addition, there were fully secured creditors for £232, holding security valued at £240. The assets consisted of stock at cost, £78, estimated to realise £66; office furniture, £52, expected to produce £39; book debts and claims, £275, valued at £182; commission earned, but not yet due, £30; cash advances to late travellers on account of commissions which were not earned, £429, estimated to realise £75; cash loans to friends, £568, valued at £55; motor car, £40; and surplus from fully secured creditors, £7. The security held by the fully secured creditors consisted of household furniture and a motor car. The partly secured creditor held the deeds of a private house. The deficiency was attributed to the cash advanced to travellers on account of commissions which were not earned, and also to the fact that the debtor had lent substantial sums of money to friends, which he had been unable to recover. A bankruptcy petition had been presented by one of the wireless creditors. The representative of that creditor, however, stated that the proceedings might be withdrawn. A resolution was passed in favour of the matter being dealt with under a deed of assignment with Mr. W. A. J. Osborne, of Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., and Mr. H. A. Snell, of Ware, Ward and Co., Bristol, as joint trustees. The principal creditors are: Leech and Co., Ltd., S. G., £182; Halcyon Wireless Co., £35; Hecht and Co., L., £57; Burns and Co., £40; Grothe and Son, £41; Maqua Wire and Cable Co., £21; Maggs and Son, £29; Lake, F., £21.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

ACCUMULATORS OF WOKING, LTD.—By reason of its liabilities, October 2nd. H. T. Witt, 5, Chancery Lane, London, W.C.2, chartered accountant, appointed as liquidator.

BRADNINCH AND DISTRICT ELECTRIC SUPPLY CO., LTD.—By Special Resolution, September 8th, confirmed September 24th. A. A. Gates, Christy Bros. and Co., Ltd., Broomfield Road, Chelmsford, appointed as liquidator. Meeting of creditors at the offices of the liquidator, October 15th, at 3 p.m. (All creditors will be paid in full.)

ELECTRICAL UNITS, LTD.—By reason of its liabilities, September 29th. C. S. Denham, chartered accountant, 4 and 5, Warwick Court, Holborn, W.C.1, appointed as liquidator. Meeting of creditors at liquidator's office, October 15th, at 12.45 p.m.

### Bankruptcy Information.

BEESLEY, Harry Walter, High Street, Brackley, Northampton, wireless engineer. Receiving order, October 3rd. Debtor's petition.

BLAIR, Edward Winnington, electrical engineer and contractor, lately 6, Queen's Parade, Brent Street, Hendon, trading as BLAIR AND SON. Receiving order, October 5th. Debtor's petition.

CAVE, John, and BOWLER, Thomas William, trading as TAYLOR and WYNNE, Back 180, Green Lane, Small Heath, Birmingham, electrical engineers. Receiving order, October 2nd. Debtors' petition.

HARVEY, George Leonard, 255, Hurcott Road, Kidderminster, electrical engineer. Receiving order, September 29th. Debtor's petition. First meeting, October 12th, 3 p.m., The Lion Hotel, Kidderminster. Public examination, October 30th, 12 noon. Town Hall, Kidderminster.

### Notice of Intended Dividend.

NICHOLSON, Cecil, electrical engineer, 3, Lorne Terrace, East Boldon, Durham. Last day for receiving proofs, October 20th. Trustee, W. A. Ellis, 14, John Street, Sunderland, Official Receiver.

### Application for Discharge.

GRIGSBY, William Reginald, trading as the WENHAM LIGHTING CORPORATION, 184, Gray's Inn Road, London, electrical factor. Hearing, November 9th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

### Partnership Dissolved.

A. J. TARRANT AND CO. (Alfred James TARRANT and Alfred Edwin STREATHER), electrical engineers, William Street, Burton Latimer, by mutual consent as from June 30th, 1928. Debts received and paid by A. J. Tarrant.

## Bankruptcy Proceedings.

LITTLER, John, electrical and radio engineer, 5, Lansdowne Road, late 9, Hoghton Street, Southport. The public examination of this debtor was held last week at Liverpool, when the hearing was adjourned. Debtor said that some years ago he acquired about 1 000 shares in a cotton mill at a price of 2s. each. All of those shares were only partly paid. He paid £115 in respect of calls, and there still remained a liability of about £400 on them. In March, 1926, he acquired the electrical and radio business for £400, and owing to severe depression in trade his position became worse. The debtor's liabilities amounted to £1,505, against assets estimated to produce £802. The debtor was ordered to file more detailed accounts.

## METAL AND CHEMICAL PRICES.

TUESDAY, October 9th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £68 0 0 | — | — |
| Electro Wirebars | ,, | £71 15 0 | — | — |
| H.C. Wires, basis | per lb. | 10 ⅞d. | — | — |
| Sheet | ,, | 10 ⅞d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1 ⅛d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8½d. | — | — |
| Sheet ,, | ,, | 9¼d. | — | — |
| Wire ,, | ,, | 10½d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 10 0 | 5s. | — |
| Foreign or Colonial | ,, | £22 0 0 | 5s. | — |
| *Tin*— | | | | |
| Ingot | per ton | £219 0 0 | — | £9 0 0 |
| Wire, basis | per lb. | 2s. 10½d. | — | 1d. |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £23 17 6 | — | 5s. |
| *Mercury* | per bottle | £24 0 0 | — | £1 5 0 |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 15 0 *Boric Acid* (Crystals) ,, £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
*Sodium Bichromate*—Per lb. 3¼d.
*Rubber*—Para fine, 10¾d.; plantation 1st latex, 9½d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### September 20th.

26 942 E. Adamson and G. R. Croskell. Driving mechanism for electrically-operated reciprocating tools, etc.
27 019 Alloy Welding Processes, Ltd. and E. J. Clarke. Electrodes for welding, etc.
27 023 F. E. Bancroft and Metropolitan-Vickers Electrical Co., Ltd. Electrical connectors.
26 960 W. E. Beatty (Bell Telephone Laborotories, Inc.).—Volume control for sound recording, etc.
26 997 British Thomson-Houston Co., Ltd. Compasses. (22/9/27, U.S.)
26 984 G. W. Cussons, Solanite, Ltd and A. Wood. Illuminated signs.
27 005 A. M. G. Davidson. Illuminated signs.
27 007 A. Egger. Devices for connecting electric measuring instruments, etc.
26 983 Eversheb and Vignoles, Ltd. and C. Midworth. Dial reading measuring instruments.
26 987 E. D. Feldman. Electric motors.
26 998 International General Electric Co., Inc. Means of securing fine wire cables to massive metal parts. (23/9/27, Germany.)
26 999 International General Electric Co., Inc. Means for cooling electrical machines. (23/9/27, Germany.)
27 039 Marconi's Wireless Telegraph Co., Ltd. Coupling arrangements for high frequency circuits. (21/9/27, U.S.)
27 028 R. S. Miller and Oldham and Son, Ltd. Electrical conducting plugs, etc.
26 982 R. J. Musto and Quasi Arc Co., Ltd. Electric arc welding apparatus.
27 029 E. H. Naphtale and Oldham and Son, Ltd. Means for carrying galvanic batteries.
27 048 M. G. Scroggie. Wireless telegraphy, etc.
26 971 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Secret signalling methods.
27 024 L. Szilard. Electric condensers.
26 969 F. S. S. Wates. Electric meters.

### September 21st.

27 129 Almeida Accumulators, Ltd., and E. Almeida. Secondary cells.
27 130 Almeida Accumulators, Ltd and L. A. Levy. Electrodes for batteries.
27 131 Almeida Accumulators, Ltd. and L. A. Levy. Secondary cells.
27 182 J. F. Appleford, Reandco Ltd. and W. S. Veness. Electric connectors.
27 161 J. L. Baird and Television, Ltd. Television apparatus, etc.
27 168 F. W. W. Baker. Transmission of views, etc. by television.
27 190 Benjamin Electric, Ltd. Shock absorbing mounts for thermionic valves, etc.
27 122 H. H. Berry. Electric fires.
27 116 British Thomson-Houston Co., Ltd. Protecting electric equipments. (21/9/27, France.)
27 117 British Thomson-Houston Co., Ltd. Induction voltage regulators. (23/9/27, U.S.)
27 170 S. G. Brown. Recording, etc., sound.
27 163 R. F. Collinson and Colvern, Ltd. Coil mountings.
27 089 English Clock and Watch Manufacturers, Ltd. and H. N. Walford. Electrical fuses.
27 072 J. H. Erskine, Falkirk Iron Co., Ltd., H. J. Kennard and A. Kinnes. Imitation fires, etc.
27 127 F. C. Fahy, J. W. Parkinson and W. H. Wilkinson. Electric switches.
27 157 A. D. Ferguson and Metropolitan Vickers Electrical Co., Ltd. Electric traction control systems.
27 132, 27 133 Ferranti, Ltd., S. Z. de Ferranti. Electromagnetic acoustic devices.
27 114 O. Frick. Electric induction furnaces.
27 164 Ganz-Fele Villamossagi Reszvenytarsasag. Apparatus for indicating short circuits. (22/9/27, Hungary.)
27 113 General Electric Co., Ltd. Electrical resistances. (30/9/27, Germany.)
27 134 H. Green. Apparatus for interconverting mechanical and electrical impulses.
27 135 H Green. Thermionic amplifiers.
27 112 W. Greene and Portable Utilities Co., Ltd. Electrical recorders, etc., for gramophones.
27 107 H. W. Hamlett. Wireless installations.
27 193 Heraeus-Vacuumschmelze Akt. Ges. and H. Hiemenz. Electric furnaces. (23/1/28, Germany.)
27 192 A. Hinderlich. Piezo-electric crystals and circuits.
27 115 International General Electric Co., Inc. Electric protective devices. (21/9/27, Germany.)
27 109 J. Y. Johnson (I.G. Farbenindustrie Akt. Ges). Manufacture of metallic powders for cores of magnets.
27 198 A. E. Bowyer-Lowe. Wireless receiving apparatus.
27 199 A. E. Bowyer-Lowe. Tuning devices for oscillatory circuits.
27 188 Schoeller and Co. Elektrotechnische Fabrik Ges. Device for holding bodies in sleeve-like carriers. (21/9/27, Germany.)
27 104 Siemens and Halske Akt. Ges. Screw plug fuses. (24/11/27, Germany.)
27 080, 27 081 State Railways Radio Co., Ltd. and L. Zoltan. Radio receiving sets.
37 137 S. S. Stolp. Electrically operated track switches.

### September 22nd.

27 247 O. T. Banks. Portable electric lamp.
27 236 H. A. A. Brosse. Inductance coil formers, etc.
27 282 S. G. Brown. Loud speakers.
27 201 Dubilier Condenser Co. (1925), Ltd. Loud speakers, etc. (22/9/27, U.S.)
27 219 Dubilier Condenser Co. (1925), Ltd. and W. Dubilier. Electrical condensers.
27 275 H. Green. Electrical reproduction of sound.
27 276 H. Green. Control arrangements for electrical sound reproducing devices.
27,277 H. Green. Microphones.
27 221 J. P. Laker. Radio aerials, etc.
27 243 J. P. Laker. Radio aerials, etc.
27 284, 27 285 Metropolitan-Vickers Electrical Co., Ltd. and E. Y. Robinson. Vacuum electric tube devices.
27 203 W. J. Pitt. Electrodeposition of metals.
27 270 Siemens-Schuckertwerke Akt. Ges. Means for controlling electrical fault indicating devices.
27 268, 27 269 T. C. Standbrook and Stanfield Radio Co., Ltd. Potential supply means for wireless receiving apparatus.
27 240 J. Wotherspoon. Treatment of electrical contacts.

### September 24th.

27 336 W. E. M. Ayres and English Electric Co., Ltd. Electrical condenser.
27 326 W. E. Beatty (Bell Telephone Laboratories, inc.). Magnetic materials.
27 296 C. F. and H. Burton. Electric terminals.
27 307 F. J. Davies. Telephone mouthpieces.
27 361, 27 362, 27 363 S. G. S. Dicker (N. V. Philips Gloeilampenfabrieken). Wireless receiving sets.
27 667 S. G. S. Dicker (N. V. Philips Gloeilampenfabrieken). Methods for transmitting wireless signals.
27 327 Electrical Research Products, Inc. Manufacture of loaded conductors. (24/9/27, U.S.)
27 409 Electro-Mechanical Brake Co., Ltd. Machinery guards.
27 337 English Electric Co., Ltd., and E. H. H. Hassler. Dynamo-electric machines.
27 405 Igranic Electric Co., Ltd., and S. R. Wright. Adjusting devices for radio instruments, etc.
27 321 L. N. Lloyd. Variable speed electrical transmission gear.
27 339 S. Loewe. Loud speaker. (26/9/27, Germany.)
27 320 Metropolitan-Vickers Electrical Co., Ltd. Thermally responsive systems. (30/9/27, U.S.)
27 295 J. C. Morgan. Means for automatically lighting electric lamps of vehicles etc.
27 434 J. Neale. System of effecting electrical fluctuations by means of controlled beam of light.
27 436 T. L. Rimmer. Electrically heated crucibles for type-making machines
27 407 Siemens-Schuckertwerke A.G. Means for controlling electrical fault indicating devices. (12/3/28, Germany.)

### September 25th.

27 533 F. J. Alderson. Incandescent lamps. (1/10/27, Canada.)
27 534 Associated Telephone and Telegraph Co. Telephone systems. (26/9/27, U.S.)
27 492 British Thomson-Houston Co., Ltd. Electric steam generators (.26/9/27, U.S.)
27 493 British Thomson-Houston Co., Ltd. Condenser microphones. (18/6/28, U.S.)
27 497 Electrical Research Products, Inc. Magnetic materials. (15/6/28, U.S.)
27 477 T. M. Rogers. Portable hand lamps, etc.
27 503 M. Wilderman. Electric batteries.
27 504 M. Wilderman. Battery separators, etc.

### September 26th.

27 666 W. R. Bullimore. Cabinets for wireless receivers.
27 604 E. S. Cluderay. Alternating current relays.
27 562 R. J. Connolly. Electrical condensers.
27 667 S. G. S. Dicker (N. V. Philips Gloeilampenfabrieken). Methods for transmitting wireless signals.
27 551 A. B. G. and E. H. Horstmann, and Horstmann Gear Co., Ltd. Electrical winding mechanism for clockwork devices.
27 619 I.G. Farbenindustrie A.G. Electrical insulation.
27 669 P. H. L. Lepas. Electrical resistances, etc.
27 637 Marconi's Wireless Telegraph Co., Ltd. Thermionic valves. (27/9/27, U.S.)
27 587 H. B. Prentice. Make and break switches.
27 020 G. H. Preston. Imitation coal fires.
27 585 J. Robinson. Wireless signalling systems.
27 658 Siemens and Halske Akt.-Ges. Signal transmission systems. (31/10/27, Germany.)
27 608 Standard Telephones and Cables, Ltd. (Western Electric Co.). Electric circuit arrangements comprising piezo crystals.
27 602 W. Stirling. Electric switch operating device.
27 646 Telefonaktiebolaget L. M. Ericsson. Telephone receivers. (1/10/27, Sweden.)
27 558 A. Williamson. Illuminated advertising signs, etc.

### September 27th.

27 786 C. E. G. Bailey and Gramophone Co., Ltd. High frequency amplifiers.
27 769 T. Bailey. Fuse insulators.
27 688 P. C. Barton. Mounting insulator arms upon telegraph poles, etc.
27 707 T. Dickinson. Apparatus to prevent radiation of oscillations from dynamos, etc.
27 696 G. T. S. Dickson. Electric switchgear.
27 776 H. Diggle, A. G. Ellis, and Metropolitan-Vickers Electrical Co., Ltd. Gas treating devices for enclosed electrical apparatus.
27 751 Forges et Ateliers de Constructions Electriques de Jeumont. Mechanism for producing step-by-step movements. (8/5/28, France.)
27 785 Gramophone Co., Ltd., M. B. Manifold, and A. S. Radford. Amplifiers for use with light sensitive devices.
27 748 J. H. O. Harris. Television apparatus.
27 759 P. E. Lavell and J. R. Ward. Insulating cover for live rails.
27 756 G. Marconi. Wireless signalling apparatus.
27 706 R. Pearson. Rails for tramways, etc.
27 700 R. J. Sakal. Automatic road signalling apparatus.

## LEAD MARKET REPORT.

With regard to the lead market last week, James Forster and Co. state that a firm tone was in evidence, prices advancing during the first three days of the week 10s. per ton, up to £22 1s. 3d. for October and £21 17s. 6d. for January. On Thursday the tone became easier. Firm conditions prevail in New York, where the price is unchanged at 6.50 cents per lb.

Closing prices on October 5th were £22 for October, £21 17s. 6d. for November, £21 16s. 3d. for December, and £21 15s. for January, about 8s. 9d. per ton higher on the week.

## Coming Events.

### Friday, October 12th.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. F. Squirrell on "Boiler House Instruments." 7.30 *p.m.*

### Monday, October 15th.

Electrical Association for Women.—E.L.M.A. Lighting Service Bureau, Strand, London. Lecture by Mr. W. J. Jones on "Electric Light in Factories as it Affects Production and Hygiene." 7 *p.m.*

### Wednesday, October 17th.

Electrical Contractors' Association (Sussex Branch).—Midland Bank Chambers, Brighton. Ordinary meeting.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Annual general meeting. Paper by Mr. W. A. Turnbull on "Economic Rural Electrification." 5.30 *p.m.*

University of London.—King's College, Strand, London. Lecture I (Course of nine lectures) on "The Indebtedness of Industry to Pure Science." Introduction by Sir Oliver Lodge, F.R.S. 5.30 *p.m.*

Institution of Electrical Engineers (North Midland Centre, Sheffield Sub-Centre).—Royal Victoria Hotel, Sheffield. Address by the Chairman, Mr. R. G. Ward; to be followed by a smoking concert. 7.30 *p.m.*

### Thursday, October 18th.

Rugby Engineering Society.—Paper by Lieut.-Col. W. A. Vignoles, on "Electricity in the Home."

British Institute of Radiology.—32, Welbeck Street, W.1. Papers by (*a*) Dr. L. A. Rowden on "The Future of Medical Radiologists," and (*b*) Mr. W. V. Maynecord on "A Slide Rule for Radio Dosage Calculation." 8.30 *p.m.*

### Friday, October 19th.

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, London. General meeting. Presidential address by Mr. R. W. Allen.

Engineering and Scientific Club (Wolverhampton), Ltd.—Lecture by Mr. F. Youle on "The Screen Grid Valve." 7 *p.m.*

British Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Organising for Better Selling in Electrical Showrooms." Speaker, Mr. W. Millner. 7.30 *p.m.*

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## A National Apprenticeship Scheme.

CONGRATULATIONS to the Association of Supervising Electrical Engineers on the scheme which it has devised for putting apprenticeship on an industry basis. There are in existence several sectional schemes, but the A.S.E.E. scheme, details of which are given on another page, will, if it receives the support which it deserves, co-ordinate the existing schemes and make the task of training youths for all sections of the industry a far easier and more satisfactory matter than it is now. If it is agreed that in no branch is the electrical industry attracting the cream of the youth of the nation, it seems to us that the scheme in its broad lines cannot fail to have universal appeal. Those responsible for drafting the scheme fully expect criticism of details, and, if it is regarded as a general statement of what the electrical industry so badly needs, it should be fairly easy for the sectional interests to come to agreement over the detailed working of the plan. By the establishment of a Central Apprenticeship Board many of the troubles of both parties to an apprenticeship are removed, for the boy is apprenticed to the Board (or the industry) and not to an individual. Furthermore, a boy will have greater freedom to move about the industry, should he so desire. We do not propose at the moment to deal with the minute details of the scheme, as these must obviously receive the joint consideration of the parties concerned, but we do suggest that it should be carefully and sympathetically considered, and that criticism should be backed by a greater regard for the interests of the industry as a whole than for those of individuals or groups. Hopes for the ultimate adoption of the plan are intensified by realisation of the fact that the A.S.E.E. can have no private axe to grind in a matter of this kind.

## Solving a New Zealand Problem.

COMPLAINT is made in the "New Zealand Electrical Journal" that though most show-window lighting reflectors used in New Zealand are of American manufacture they are more often than not put up on lampholders of English manufacture, and as the reflectors are made for use with American type lampholders and galleries, the result is that the lamp filament is not at the correct centre of the reflector and so does not give correct illumination. Although our contemporary suggests that the difficulty could be overcome by informing the erecting contractor of the correct position for the lamp filament, we venture the suggestion that a still simpler corrective would lie in the use of British-made reflectors.

## "Architectural" Lighting.

WHEN, some two years ago, we were able to draw the attention of the British electrical community to the new art of decorative lighting for homes and restaurants, we were privately twitted on more than one occasion for introducing such revolutionary Continental ideas into this country. We were told that in this country lighting designers would never depart further from the traditional methods than to suggest a periodical ringing of the changes between, say, alabaster bowls and circular silk or decorated parchment shades of conventional design. Somewhat similar views appear to have been general in the United States, for we learn that the new development known as "architectural" lighting, first expounded in these columns by Mr. W. E. BUSH, was hailed with wondering interest at the recent convention of the Illuminating Engineering Society in Toronto. While we had no hesitation in blessing the idea of built-in low-intensity light sources on its first introduction, we have been a little puzzled to account for the resistance to change which has characterised the lighting fittings section of the industry in regard to a development which has already caught the imagination of the general public. It is therefore gratifying to know that vigorous efforts are being made in two directions to popularise the new lighting in this country. On these projects it is as yet too early to particularise, but there can be no doubt as to the ultimate success of a movement which will place home lighting on an entirely new and more artistic basis.

## The Æsthetic Side.

MENTION of artistry recalls to mind the lament of a correspondent, who, in a recent issue, deplored the illuminating engineer's devotion to the business of producing perfectly distributed illumination without reference to the needs of people who desire to enjoy the true form of objects seen under that light. While it would be quite easy to demolish the arguments of our friend, we propose to let him off because he has drawn attention to an aspect of our work which is frequently overlooked. For years and years the electrical industry has been selling its domestic appliances on arguments of efficiency and economy. Both are excellent and patently demonstrable in actual practice. But while the business man must always place efficiency

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and economy right in the forefront of his requirements, are we right in assuming that these are the only arguments that appeal to the average housewife who, in the majority of domestic applications never even thought of efficiency in the pre-electric era? Surely comfort is a thing which has real appeal for the housewife. As she sits by her blazing coal fire she is not worrying about the appallingly large percentage of the heat value of the fuel which disappears with valuable by-products through the chimney to the outer air; nor is she calculating how much an hour it costs to provide coal for this orgy of wastefulness. Why, then, should we constantly remind her how much she is paying for every hour that she enjoys the efficiently economical heat of an electric fire? Admittedly economic considerations will always figure prominently in the selling of domestic electrical appliances, but it is possible that in some cases we do not make quite enough of the comfort factor.

## Our Overseas Trade.

ACCORDING to the latest Board of Trade Returns, British overseas trade generally suffered a temporary setback during September. The import figures were the lowest recorded since April, 1924, with the exception of May, 1926, and only once this year (in April) has the value of exports stood at a lower figure than for September; but in a comparison of values for the first nine months of this year with those for the same period of 1927, an increase of £16 459 275 is shown, or a little over 3 per cent. In so far as the electrical industry is concerned we publish elsewhere in this issue detailed figures of the position as given in the Board of Trade Returns. These details show that as with general trade the overseas intercourse of our own particular industry was also less during September last than during the same month of 1927. On the import side the decline was largely due to smaller importations of electrical machinery and instruments, while the export figures show that our shipments of similar equipment were also smaller during the month just passed. In reviewing the figures for the nine months of the year, in comparison with last year's totals, it appears that exports have declined in railway and tramway motors, as well as in motors of all other sorts. Rubber insulated wires and cables, other than telegraph and telephone, also show a decrease, whereas submarine cables show an improvement. The total difference between electrical export figures for the nine months of the year, and those for the same period of 1927, is £167 451, but since it may be said that the electrical industry is only just recovering from its summer season inactivity, there is yet plenty of time to equal, if not exceed, the value of last year's business. It must also be remembered that though these details give some indication of trade in the electrical industry they naturally do not include the important orders which have resulted and others which are anticipated as an outcome of the placing of contracts by the Central Electricity Board.

## Defacing the Landscape.

OUR recent remarks on the desirability of taking all possible steps to prevent overhead transmission lines from interfering with the amenities of the countryside appear to be to the liking of our well-known American contemporary, the "Electrical World," which, after quoting from our note on the subject, voices the opinion that much may be done along this line with profit to the amenities and the betterment of the feeling between the utility and the community. Evidence that enlightenment is as necessary in the U.S.A. as it is over here is furnished by a reference to a recent supply development in the States which "has brought not one but several tower lines parallel with each other for miles, and rendered hideous, by an unforgivable iron and brick structure the land directly opposite a fine country club." Our contemporary hits the right nail on the head when it says that while transmission towers can be made inherently graceful and pleasing to the eye, and many qualify in these respects, yet through sheer incongruity of location they sometimes become a burden and highly distasteful.

## Refrigeration and Preservatives.

FOLLOWING a somewhat unusual number of cases of food poisoning during the summer months there has been a singularly ill-informed agitation against the new regulations prohibiting the addition of chemical preservatives to food which came into force this year. It seemed at first that these regulations would make every householder buy a refrigerator. Actually it needed more than the fear of trouble from contaminated food to convert a nation which has not yet acquired even the ice-chest habit. The domestic refrigerator was before its time; and, though the ban on preservatives was legally enforced, and on a certain day, no force can be brought to bear on the householder who stores perishable foodstuffs in the old careless way. Slowly the educational work is progressing, and we are glad to note that a propaganda committee has been appointed by the British Association of Refrigeration for the purpose of instructing the public on the necessity for refrigeration. Individual effort in this field should be sustained through the winter months, for the average kitchen in which perishable food is kept is maintained throughout the winter at a temperature quite favourable to the growth of dangerous bacterial organisms.

## A Telephone Grouse.

FROM personal experience we must admit there is reason for the complaints that are being made in the lay Press of the inaudibility of the bells provided for private telephone subscribers. Though the sound of these bells might seem startling in a monastery garden or other secluded retreat most of them are doomed to compete with the ever-increasing din of traffic, and when this noise is added to by the domestic noise machine used under licence from the Postmaster-General the telephone bell is quite out of the running. In an ideal state, of course, every telephone subscriber would have an instrument in each room, but while he has only one he must either be prepared to leave a proportion of calls unanswered or pay extra for an extension bell. The bell provided should be sufficiently loud to gain the attention of anyone of normal hearing who is reasonably near to it. If it is not sufficiently audible much of the convenience of "being on the 'phone" is lost, and the imposition of extra charges for doing something that should have been done in the first place does not materially improve the position.

## A Railway Scandal.

ALTHOUGH it cannot be decided until after the official inquiry whether the inflammable freight on the goods train or the gas lighting of the express train involved in the appalling railway accident at Charfield was initially responsible for the conflagration which so materially added to the death roll and to the sufferings of the survivors, it is certain that the gas cylinders on the express train were mainly responsible for the spread and long duration of the fire. That it should be possible for people to be subjected to the appalling risk of incineration following a railway smash in the year 1928 comes as a very disagreeable shock, especially when it is remembered that the use of gas for train lighting was unequivocally condemned following the Aisgill disaster fifteen years ago. One would have thought that once the danger was realised, the railway companies would have strained every nerve to ensure that no further loss of life should be occasioned by the use of such a potentially dangerous illuminant. Apparently the Ministry of Transport held that view, for without making any regulations requiring the substitution of gas by electricity, it was content to recommend that the change should be made as soon as possible. To say, as the railways are reported to have said, that "it was impossible to carry out the recommendation at once, because of the great expense involved," is merely to add insult to injury. Although a large proportion of the British passenger rolling stock is now electrically illuminated, it is imperative that the remaining coaches should be rendered safe with the minimum of delay.

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# NORTH WALES POWER.

## Inauguration of the Maentwrog Hydro-electric Works by Mrs. Wilfrid Ashley—Features of the New Generating Plant and Switchgear—Provisions against Runaway—The Overhead Transmission System.

ON Monday an ambitious development in the supply of electricity in North Wales was formally inaugurated by the opening, by Mrs. Wilfrid Ashley, of the hydro-electric power house of the North Wales Power Co., Ltd., at Maentwrog, Merioneth.

By the North Wales Electric Power Act, 1904, the North Wales Power and Traction Co., Ltd., was authorised to supply electricity in bulk and for power purposes within an area comprising the four North Wales counties of Carnarvon, Merioneth, Anglesey, and part of Denbigh.

### The Original Scheme.

The construction work of the original scheme for generating electricity from Llyn Llydaw and the watersheds of the Snowdon Range began in 1905, the contractors being Messrs. Bruce Peebles and Co., Ltd., and the first hydro-electric power station was built at Cwm Dyli, Beddgelert, this plant having been in continuous operation since August, 1906. The plant consists of four 1 000 kW 500 revs. per min. 50 cycles, three-phase generators (installed in 1906) and one 1 500 kW 500 revs. per min. 50 cycles, three-phase generator (1923). Each set has direct coupled exciters and is driven by a horizontal impulse type turbine operating under a head of 1 130 ft.

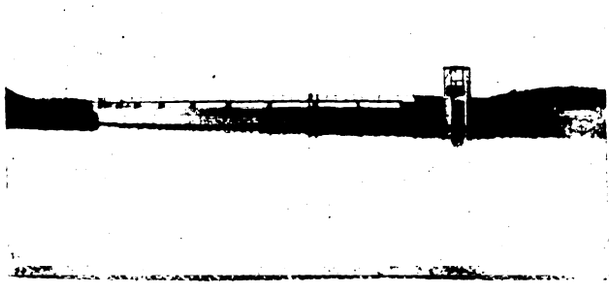
The total power available at Cwm Dyli generating station is 5 500 kW with an annual output of eight to ten million kWh, which is limited by the available catchment area.

The Snowdon area has a rainfall varying from 125 to 193 in. per annum, the heaviest precipitation in Great Britain.

From 1906 to 1918 the Power Co.'s system was supplied entirely from Cwm Dyli hydro-electric station and large consumers in the original area include a number of slate and granite quarries.

After the passing of the Electricity (Supply) Act, 1919, a scheme for supply in a largely extended area was put forward by the Power Company, and resulted in an Order dated August 3rd, 1923, constituting the North Wales and South Cheshire Electricity District and establishing the North Wales and South Cheshire Joint Electricity Authority.

Certain powers, rights and obligations of the Joint Authority were transferred by deed to the North Wales Power Co., which now operates under the provisions contained in the Act of 1904 and the Order of 1923 throughout the extended area of supply covering 4 080 square miles. The technical scheme put forward by the Power Company provided for the development of the water power resources of the district, and the



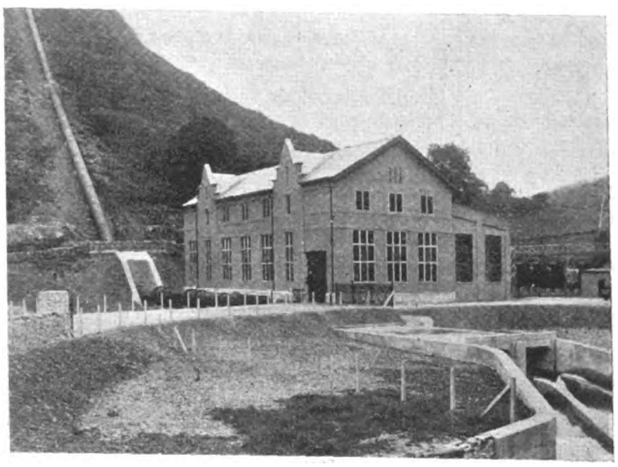
**The North Wales Power Co.'s main arch dam at Maentwrog impounding 1 200 million cu. ft. of water in an artificial lake two square miles in extent.**

establishment of the new hydro-electric power station at Maentwrog with an installed capacity of not less than 15 000 kW, which is now brought into official being.

During the period of construction the rapidly increasing demands on the Power Company have been met by the purchase of power in bulk from their associated company, the Aluminium Corporation, Ltd., Dolgarrog, and the Mersey Power Co., Ltd., Runcorn.

The Aluminium Corporation, Ltd., constructed an entirely new hydro-electric station of 10 000 kW capacity at Dolgarrog, which came into service in 1925. The North Wales Power Co. constructed a double circuit 33 kV overhead transmission line between Percival Lane, Runcorn, and their Crewe substation, in order to supply the requirements of the London Midland and Scottish Railway Co. for their engineering works at Crewe, until such time as the supply from the new station at Maentwrog was available.

The Maentwrog works are situated in the valley of the Afon Prysor which joins the Afon Dwyryd near the village of Maentwrog, in the county of Merioneth, North Wales.



**A view of the new power house at Maentwrog, showing the 6-ft. high pressure pipe line. The reservoir is 630 ft. above the power house.**

An artificial reservoir has been formed near the village of Trawsfynydd by the construction of four concrete dams. The main dam across the Afon Prysor is of the arch type, constructed of concrete, and is designed for a present spillway level of 650 O.D., although this level may be ultimately increased. The maximum static head at present is 630 ft. The other three dams are of mass construction of gravity type without spillways and are intended to serve as "cut off" dams.

### The Catchment Area.

The water for the present development is derived from a catchment area varying in altitude from 650 to 2 800 O.D. extending to 23 square miles. The run-off drains naturally into the lake by the Afon Prysor, but in the future leets may be constructed which will enable the drainage from other catchment areas to be diverted into the lake. The catchment area is for the most part steeply sloping and rocky, and in view of the heavy rainfall and its practically continuous distribution throughout the year a high percentage run-off is obtained, the whole catchment area feeding by direct and natural channels to the reservoir. The catchment area is extremely well placed geographically, as from the rainfall records available the precipitation is from 70 in. to 110 in. per annum, equivalent to an output of 35 to 40 million kWh per annum. The capacity of the reservoir is 1 200 million cu. ft., which is sufficient for continuous operation in years of minimum rainfall. The impounding of this quantity of water has necessitated the purchase of land and buildings which are now submerged, and also the diversion of the Dolgelly-Festiniog main road and various footpaths.

Water is taken under pressure from the main dam to the power house, entering at the dam intake through a screening chamber, thence to a 30 ft. length of 10 ft. diameter steel pipe between the outlet and No. 1 tunnel. At the point of entry to the tunnel is fitted an 8 ft. 6 in. butterfly valve with automatic trip gear as a protection against a burst on the low pressure pipe line. The tunnel is 10 ft. internal diameter, 1 920 ft. in length, and, driven through rock, is lined with concrete. An air shaft is provided which is situated near the entrance to the tunnel and is carried to a level above the main dam.

The low pressure conduit between the No. 1 and No. 2 tunnels comprises a length of 5 700 ft. of 9 ft. 6 in. diameter riveted steel pipe with manholes, scour valves and air valves in suitable positions. No. 2 tunnel is situated between the low

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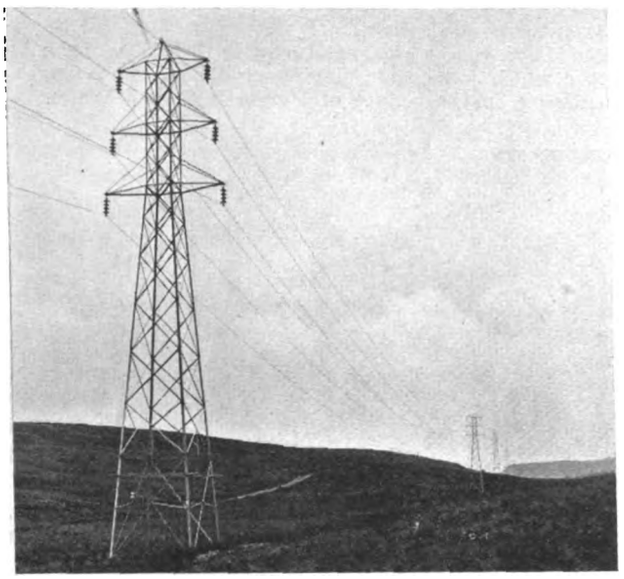
pressure conduit and the high pressure pipe line, and is 10 ft. diameter, similar in construction to the No. 1 tunnel, but having a length of 1 500 ft.

A surge tank 20 ft. in diameter is constructed at the highest point of the tunnel, and has been formed by excavating a vertical shaft. The ground level over the tunnel is such that only about 13 ft. of the surge tank is above ground.



**A section of the 66 000 V steel-cored aluminium transmission line from the North Wales Power Co.'s Maentwrog hydro-electric station, which supplies the towns and industries of North Wales and South Cheshire.**

The high pressure pipe line is constructed of lap welded steel pipes of 73½ in. outside diameter having parallel bump joints, single or double riveted. Concrete anchor blocks are placed at each position where the slope changes, and intermediate concrete piers are provided at intervals, an expansion joint being provided immediately down stream of each anchor block, and at the outlet from No. 2 tunnel.

The No. 2 tunnel outlet is bifurcated so that an additional high pressure pipe line may be laid in the future, and at each outlet a sluice valve is provided to enable examination or repairs to be effected to the high pressure pipe line without emptying the tunnels and the low pressure pipe conduit. One high pressure pipe is sufficient for operating the three units at present installed in the power house.

Down stream of the sluice valve an automatic self-closing butterfly valve is installed which will operate in the event of excess velocity through the pipe from any cause.

The power house building is of steel frame construction with brick filling and rough cast outside. Particular care has been taken in the design of the buildings to preserve so far as possible the amenities of the district. The floor level is at 22 O.D.

## Initial Plant.

The plant for the initial development comprises three hydraulic turbines each direct coupled to a 6 000 kW 6 600 V 50 cycle, three-phase alternator. The turbines are of the horizontal impulse type designed to develop 9 000 B.H.P. at 333 revs. per min. at a maximum static head of 650 ft.

Each turbo alternator set is arranged across the power house and connected to the 72-in. diameter high pressure pipe line by a 36-in. diameter hydraulically-operated cast steel sluice valve fixed adjacent to each machine. Each unit is fitted with three pedestal type bearings having bushes of cast iron lined with babbitt metal. They are spherically seated and self aligning. A belt driven pump mounted on the bed plate provides a continuous supply of oil to the bearings, the pump with vertical water tube type oil cooler, sump tank and filter, forming an integral part of the lubrication system.

The turbines are designed with two runners operated in a single casing and keyed to the same shaft. Each runner carries 22 cast steel buckets bolted to the rim by fitted taper bolts and nuts with locking plates, the buckets being finely ground on the inside surfaces. Each runner was balanced statically before mounting on the shaft, and after mounting, each pair was again statically balanced. Finally the complete rotor was tested to an overspeed of 100 per cent.

There are four nozzles per turbine so arranged that two jets impinge on the buckets of each runner. The needles are of the solid cylindrical type, and both needle tips and nozzles are of stainless steel.

Speed control is obtained, by means of deflectors and needle valves. On rejection of load taking place the deflectors instantly come into operation, diverting the jets from the runners, this being followed by a diminution of the jets due to the gradual closing of the needles. In the case of a 100 per cent. rejection of load the momentary increase in speed is 10 per. cent.

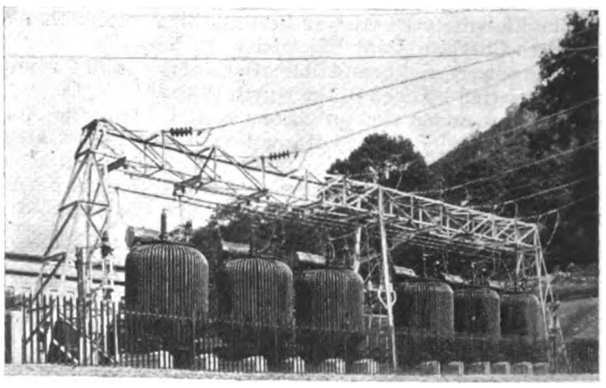
## Automatic Overspeed Device.

To provide against a runaway, an automatic centrifugal overspeed device is incorporated in the governor pump pulley. On a predetermined overspeed being reached a spring loaded piston valve trips, which opens a discharge from the top of the regulating valve of the governor allowing this valve to rise, so closing the turbine. The same device operates when the speed falls below a predetermined minimum. The spring loaded valve is fitted with contacts which are connected to the tripping mechanism of the circuit breaker.

The governor is of the evolvent type with centrifugal pendulum, and the position of the pendulum at any instant determines (except in the case of overspeed or underspeed) the position of the regulating valve. Through this valve oil is admitted under pressure to a differential servo motor, the oil supply coming from the pressure tank fed by a rotary pump driven by belt from the turbine main shaft. The piston of the servo motor, the position of which is controlled by the pendulum, controls the needles and deflectors through rods and levers. A hand controlled electrically operated speed adjusting device is also provided ; in addition, each alternator control panel is fitted with a push button, for use in case of emergency, which closes down the turbine and trips the machine circuit breaker.

The alternators are of the standard slow speed salient pole type designed for a maximum output of 6 000 kW, 0.8 p.f. 50 cycles, three-phase, 333 revs. per min. Each machine has its own direct coupled exciter with overhung armature.

Forced ventilation is adopted, the air being led into a pit below the machine by air tunnels, the inlet to which is controlled by hand-operated dampers. From the pit air is led to the fan inlet at either end of the machine by intake shields



**The outdoor transformers at Maentwrog stepping the pressure up to 66 000 V at the beginning of the 45-mile transmission line to Wrexham and Crewe.**

The combined pressure of the fan and pole forces most of the air through the radial ducts in the core, from which it is discharged to the chamber formed by the solid back of the frame. Part of the air is bye-passed through cored holes in the ends of the frame, which serves to cover the overhanging parts of the stator end windings. Alternative means of exhausting the heated air are supplied in the form of top and bottom chimneys in the frame casting. The bottom chimney is arranged to discharge through the pit to the hot air duct traversing the whole length of the station. Six thermo-couples per machine embedded in the slots are provided, these being taken to a pyrometer controlled by a 12-way selector switch.

The whole of the switchgear controlling the 35 kV and 6.6 kV three-phase power supply is of the metal-clad draw-out type. The main 10-panel 6600 V switch board consists of three oil-immersed circuit breakers of the horizontal draw-out type for controlling the three 6 000 kW alternators, two circuit-breakers for the two 10 000 kVA banks of transformers stepping up to the 66 kV transmission lines, two circuit-breakers for the two 3 500 kVA banks of transformers stepping up to 35 kV, one circuit-breaker for the transformer supply in

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current to the power station auxiliaries and for lighting, one circuit-breaker for an outgoing high tension feeder and one circuit-breaker for service as a busbar coupler. The oil circuit-breakers on this switchboard have a breaking capacity of 350 000 kVA, and the panels are of the duplicate bus-bar type. Merz-Price circulating current protection is provided for the generators and works transformer, and plain overload protection on the outgoing feeder circuits.

The 5-panel 35 kV switchboard is also of the duplicate bus-bar type, and consists of two three-phase circuit-breakers for controlling the two 3 500 kVA transformer banks previously referred to, and three circuit-breakers for the outgoing transmission lines to Llanfrothen, Dolgarrog and Oakeley substations respectively. The circuit-breakers for this board have a breaking capacity of 500 000 kVA.

The circuit-breakers are electrically-operated by means of solenoids energised from a separate control board fitted with all the switches necessary for remote operation.

The control boards consist of desk type cubicles of sheet-steel construction, fitted with dust-tight doors at the back, and lift-up desk lids at the front. Each cubicle is surmounted with a mimic diagram of the circuit, with automatic discs and lamps for the visual indication of the position of the circuit-breakers. By this means, the operator in the control room may ascertain at a glance whether the circuit-breakers are open or closed, and to which set of bus-bars they are connected. Indication is also given in a similar manner when any of the feeder lines are earthed.

A neutral earthing resistance is provided for the three alternators and also a further resistance for the 3 500 kVA transformers. In each case they are coupled to the neutrals through single-phase draw-out solenoid operated metal-clad circuit-breakers, mounted in the basement and operated from the main control board.

The transformers for stepping up the generated voltage to feeder pressure are of outdoor pattern, and are located in a special compound adjoining the station building. There are two 3 500 kVA three-phase units of ratio 6 600/20 000/35 000 V for use on the inter-connector feeders to Dolgarrog and Cwm Dyli, and the Western Area feeders.

Six single-phase transformers arranged in two banks of 10000 kVA capacity with ratio 6 600/66 000 V are provided to transmit the bulk of the power from Maentwrog to the Wrexham and Crewe areas.

The transformers are outdoor type, oil immersed and self-cooled, an interesting feature of the three-phase units being the special cable boxes which permit removal of the transformers without the cable joints. The foundations for the transformers have been so designed that any unit can be readily brought under the power house crane by means of a special truck running on standard gauge track laid between the transformer compound and the loading bay.

All transformers are controlled from the 6.6 kV switchboard, to which they are coupled up by single core cables. The 35 kV sides of the three-phase units are coupled up by single core cables to the 35 kV switchboard, which is in turn connected to the 35 kV transmission lines by means of three-core cables of the belted type. The e.h.t. side of the 10 000 kVA banks is directly coupled to the feeder ends, there being no 66 kV switchgear.

## The Transmission System.

The 66 kV double circuit transmission line between Maentwrog and Legacy is of lattice steel tower construction with normal spans of 650 ft., specially designed towers being used at road crossing angle and section points. The conductors used are of steel cored aluminium of 0.125 sq. in. equivalent copper, and consist of steel core of 7/0·0785 in. dia. surrounded by 26/0·10 in. dia. aluminium strand.

Insulators are of the suspension type, comprising four sheds in series on straight line towers and five sheds in series at road crossings and other points requiring special provision. To facilitate maintenance an outdoor switching station has been erected midway, near Corwen, and provides for the complete control of both circuits in either direction. With the exception of the line between Maentwrog and Legacy substation near Wrexham, which is the distribution centre of the system, copper conductors are used, 19/0·083 in. strand of 0·1 sq. in. section.

An interesting pictorial record of the overhead transmission line between Maentwrog power station and the Legacy substation, a distance of about 45 miles, has been prepared by Siemens Brothers and Co., Ltd., the contractors for this portion of the work. Although, in the illustrations, the details of the towers are emphasised, the pictures suggest what is borne out by actual inspection on site, that this form of construction blends remarkably well with the landscape. On a recent inspection tour of the entire system we were particularly impressed with the appearance of the line, which in many places gave far less offence to the eye than the General Post Office telegraph and telephone lines.

The output to the system during the last ten years has risen from 4 to 34 million kWh, and it is fully anticipated that the same rate of expansion will continue for some years.

The principal industries in North Wales and South Cheshire are the slate, granite and limestone quarries in the west, and collieries and engineering works in the east. The former group of industries absorbed 29·8 per cent., and the latter group 30·85 per cent. of the total energy sold on the company's system during the past year. The highest simultaneous maximum demand so far recorded on the system is 13 300 kW.

## Areas Supplied.

The company is now supplying power in bulk to authorised undertakers in the following towns and villages :—Abergele, Acrefair, Alsager, Bangor, Bethesda, Buckley, Carnarvon, Cefn, Chirk, Cœdpoth, Colwyn Bay, Connahs Quay, Conway, Crewe, Criccieth, Denbigh, Dyserth, Elworth, Flint, Grange Park, Gresford, Hawarden R.D., Holywell, Llanberis, Llandudno, Llanfairfechan, Llanrwst, Meliden, Minffordd, Mold, Mynydd Isa, Nantwich, Northop, Oswestry, Penmaenmawr, Penrhyndeudraeth, Portmadoc, Prestatyn, Pwllheli, Rhosllanerchrugog, Rhostyllen, Rhyl, Ruabon, Sandbach, St. Asaph, Trefnant, Trefriw, Willaston, Wrexham.

Substantial progress has been made in providing supplies to towns and villages in North Wales and South Cheshire through the activities of Electricity Distribution of North Wales and District, Ltd., an associated company formed for the purpose of carrying out and operating electricity distribution schemes in districts not already provided for. Supplies are taken from the power company's system in bulk for the various developments, and at the present time 32 such points of supply are in operation.

The main contractors for the hydraulic works were Sir Robert McAlpine and Sons with, as sub-contractors for low-pressure pipe line, the Cleveland Bridge Co. ; valves, Glenfield and Kennedy, Ltd., and high pressure pipe line, South Durham Steel and Iron Co., Ltd. ; the contractors for the power house equipment were :—turbines and alternators, Boving and Co., Ltd., and the English Electric Co., Ltd. ; switchgear, Reyrolle and Co., Ltd. ; transformers, Ferranti, Ltd., and the English Electric Co., Ltd. ; crane, S. H. Heywood and Co., Ltd. ; cables, Pirelli-General Cable Works, Ltd. ; lighting, West Wales Electric Co., Ltd.

# WORK OF THE B.E.S.A.

## Appeal for Wider Financial Support at Annual Meeting.

MR. LL. B. ATKINSON, the Chairman of the Finance Committee of the British Engineering Standards Association, at the annual meeting of the Association held at the Institution of Mechanical Engineers, on Tuesday, said that he felt sure that the enormous amount of time and energy put into this work by the 2 700 honorary members, technical experts and business people up and down the country, who gave their time and experience to the preparation of British Standard Specifications, was not in the least realised by the industry as a whole. If it was, the B.E.S.A. would not every year have to record a large deficit in their funds. This year they were £1 800 down, and it was hoped that that sum would soon be made up.

Mr. Maurice Wilson, the new Chairman of the Association, said that if industry realised that in their midst there was this independent, impartial organisation, ready to carry out their behests, they would make much more use of it than they did at present. In fact, could any firm connected with the engineering and allied industry of the country afford not to be in the closest touch with the work when it meant so much, not only to the home but to the export trade of the country ?

On Saturday, August 18th, a unique incident occurred on the Timperley Golf Links. A match was being played by Messrs. Bailey and Pierson, against Messrs. Peck and Whitmoyer, all of the Metropolitan-Vickers Electrical Co., Ltd., when *all four players did the tenth hole in three*. The hole is 285 yards long and is a bogey four. Mr. Baumann calculated the chances against such a coincidence and finds them to be one in two and a half million.

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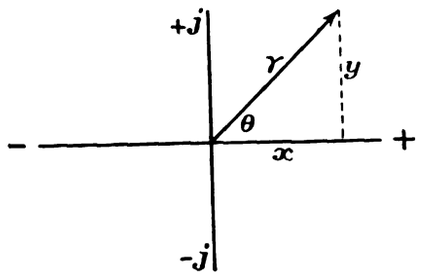
# VECTOR NOTATION.

## Some Possibilities of the System.

By W. FORDHAM COOPER, B.Sc., A.M.I.E.E., A.M.I.Mech.E.

THE notation put forward by Mr. C. Turnbull in his letter to THE ELECTRICIAN on October 5th is not altogether new, something very similar having been put forward by several American writers, if not by Europeans; though quite possibly




it was new when Mr. Turnbull suggested it twenty years ago. It is surprising that his "mathematical" friends were uninterested in what they cannot find in a textbook, since the method follows very simply from the theory of equations. The possibilities, however, are very interesting, and since they do not appear to be well known, the following short theory is given.

The position of a point or the value of a vector is usually stated in complex algebra by one of two methods, thus:—

$R = x + jy$ in cartesian co-ordinates or
$R = r\underline{|\theta}$ in polar co-ordinates,

and, of course, $x = r\cos\theta$
$y = r\sin\theta$.

In investigating the properties of these quantities it is easiest to put $r = 1$—*i.e.*, to deal with unit vectors. (Some writers distinguish between vectors and operators, but this refinement is not attempted here.)

$(\cos m + j\sin m)(\cos n + j\sin x)$
$= (\cos m.\cos n - \sin m.\sin n) + j(\cos m.\sin n + \sin m.\cos n)$
$= (\cos(m+n) + j\sin(m+n))$

In polar co-ordinates this may be represented by

$$\underline{|n} \times \underline{|m} = \underline{|n+m}.$$

Extending this

$$\underline{|x1} \times \underline{|x2} \times \underline{|x3}, \text{ etc.} = \underline{|\Sigma x} = (\cos \Sigma x + j \sin \Sigma x).$$

In particular

(1) $(\cos x + j\sin x)^n = (\cos nx + j\sin nx)$.

From which

$$(2)\quad \left[\cos\left(\frac{2m-1}{n}\right) + j\sin\left(\frac{2m-1}{n}\right)\pi\right]^n$$
$$= (\cos(2m-1) + j\sin(2m-1))$$
$$= -1 \text{ when } m \text{ is any integer.}$$

$(-1)^{\frac{1}{n}}$ has, of course, $n$ roots which are derived from the above by substituting the integers 1 to $n$ successively in the above expression, after which the values recur. Thus, for example, in $n = 3$.

$$\sqrt[3]{-1} = \left[\cos\left(\frac{2m-1}{3}\right) + j\sin\left(\frac{2m-1}{3}\right)\right]$$
$$= (\cos 60 + j\sin 60) = \left(\tfrac{1}{2} + j\frac{\sqrt{3}}{2}\right) \text{ when } m = 1$$
$$= (\cos 180 + j\sin 180) = -1 \quad \text{when } m = 2$$
$$= (\cos 300 + j\sin 300) = \left(\tfrac{1}{2} - j\frac{\sqrt{3}}{2}\right) \text{ when } m = 3.$$

This result may be obtained algebraically, thus—

if $x^3 + 1 = 0$
$(x+1)(x^2 - x + 1) = 0$

*i.e.*, $x = -1$ or $\tfrac{1}{2} \pm \dfrac{\sqrt{1-4}}{2}$

From this we see that the fractional powers of $(-1)$ are represented by complex numbers or vectors, and if we select for use the value when $m = 1$ we have the identity

(3) $(-1)^n = [\cos(n\pi) + j\sin(n\pi)] = \underline{|n\pi}$.

(4) or $(-1)^{\frac{n}{\pi}} = (\cos n + j\sin n) = \underline{|n}$, which is more convenent.

We have thus from (3) or (4) a complete specification of any vector in terms of $(-1)$—*e.g.*, $R = r[-1]^{\frac{\theta}{\pi}}$. It is interesting to note that (3) gives an expression for an angle in terms of complete half rotations instead of radians, since $(-1)$ is equivalent to 180 deg.

* * *

Periodic functions are easily rendered in this notation, since $(-1)^{2ft.} = (\cos 2\pi ft. + j\sin 2\pi ft.)$, which is the fundamental expression for alternating currents, etc.

* * *

It is important to study the derivatives of any such function, and the results are seen to be quite satisfactory.

$$\frac{d}{dt}(-1)^{\frac{t}{\pi}} = \frac{d}{dt}(\cos t + j\sin t)$$
$$= (j\cos t - \sin t)$$
$$= j(-1)^{\frac{t}{\pi}}$$

which is equivalent to rotation through 90 deg.; and the general formula is

$$D^n(-1)^{\frac{\omega t}{\pi}} = (j\omega)^n(-1)^{\frac{\omega t}{\pi}}$$

Applying this to the solution of differential equations we obtain, for example

$$D^2y + aDy + by = 0,$$

putting $y = (-1)^{\frac{\omega t}{\pi}}$ and cancelling out, we obtain

$$-\omega^2 + ja\omega + b = 0$$
$$\omega = \frac{-1 \pm ja\sqrt{4b - a^2}}{2}$$

The result will be real or complex according to whether $a^2$ is $>$ or $<$ than $4b$, thus giving an oscillating or exponential variation of $y$ with $t$, the necessary connection between the two being given by the identities $\sin(jx) = j\sin h(x)$ and $\cos h(jx) = \cos(x)$. These results can be obtained from the expansion of sin, sin $h$, cos and cos $h$ obtained by Maclaurin's theorem.

All the above results could have been deduced from the usual methods of analysis by means of the identity $e^{m\pi} = -1$, but the interest of the development given lies in the derivation of a complete method of analysis independent of any reference to the exponential theorem.

* * *

The final test of any notation is convenience and accuracy, that is to say, the object of the symbols is to compress into the smallest space the greatest possible amount of information without the fear of ambiguity, and, further, the notation should not confuse the eye by its elaboration, but, on the contrary, be suggestive by its simplicity.

A new notation, having only a small margin of advantage, is not likely to survive, and it is most likely to succeed by suggesting solutions to new problems rather than by repeating the known results of current problems.

## RATING RELIEF.

"Rating Relief Simply Explained" is the title given to a book by Mr. J. Scott Henderson, which forms a comprehensive explanation of the provision of the Rating and Valuation (Apportionment) Act, 1928, and should prove valuable to anyone interested in the application of the Act. The book deals with the application of the Act both in England and Scotland. Sir Kingsley Wood in a Foreword says that what Mr. Henderson's book claims to do "is to give, in language which every layman can understand, a description of the sort of premises which are on the face of it entitled to relief, and the process by which the relief is to be obtained. It should be invaluable to those who are in doubt whether or how, to go to the trouble of making claims; and even the expert will not disdain the convenience of having an admirable summary of an extremely difficult subject." The book is published by "Rating and Income Tax," 1, Dr. Johnson's Buildings, Temple, London, E.C., and by the Argus Press, Ltd., Temple Avenue, London, E.C.

Swansea Electricity Committee has asked the Electrical Engineer to report as to the system of hire and purchase of electrical apparatus being extended to houses other than those occupied by Corporation tenants.—The Committee has arranged for the extension of facilities for the installation of electric cookers on the Maesteg housing estate.

Wigan T.C. has applied for a loan of £6 000 for the erection and equipment of an electricity showroom and offices.

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# OVERHEAD LINES.

## Electrical Properties and Behaviour in High Winds.

OVERHEAD transmission problems are dealt with in two papers in the October issue of the " Journal " of the Institution of Electrical Engineers.

The first, by Mr. E. C. Walton, deals with " The Electrical Properties of Galvanised Steel Conductors for Overhead Transmission Lines," and in it are given the results of some work which was carried out with a view to obtaining definite information as to the electrical properties of steel conductors when carrying alternating currents. The most important values measured in the tests were the " effective a.c. resistance " and " internal inductive reactance," and it is shown that it would be impossible to calculate these in the case of iron or steel conductors.

Full particulars with regard to the selected range of test samples are given, including their mechanical properties, chemical analyses and magnetic qualities.

The test methods are briefly described, the method of power-factor measurement employed in the " internal inductive reactance " tests being more fully referred to in an appendix.

The effect of spacing on the values of " effective a.c. resistance " and " internal inductive reactance " is then considered. The test results show that these values do not vary with the spacing until the conductors are brought very close together, and, in fact, are separated only by a thickness of paper.

Some observations on the test results are given, and it is shown that the most suitable of the four grades of material tested is the " 45-ton quality, hard-drawn " grade.

In the other paper on " The Behaviour of Overhead Transmission Lines in High Winds," Prof. E. H. Lamb attempts to formulate a theory of the swaying of one span of a single overhead transmission line due to the action of a transverse wind, on the assumption that the " loop " of wire swings as a rigid whole, freely suspended at its extremities.

The results comprise formulæ for calculating (*a*) the equilibrium position of the loop in a steady wind, (*b*) the maximum swing of the loop due to a short gust of known intensity, as well as the rate of decay of the disturbance, and (*c*) the amount of continuous movement likely to be imparted to the loop by wind gusts of regular periodicity.

Diagrams are given to facilitate the estimation of these quantities, and a few numerical examples are worked out by way of illustration.

Some suggestions for experimental investigation of swaying are made as a consequence of the form of the dynamical equations which occur in the theory.

# BOOK REVIEW.

**Vorlesungen über die wissenschaftlichen Grundlagen der Elektrotechnik.** By M. VIDMAR. (Berlin: Julius Springer.) Pp. x+451. Bound, 16·5 marks.

Prof. Vidmar is already known to many readers of German technical literature through his excellent treatise on transformers—probably the best book of its kind at the present time, and an invaluable aid to the designer. The book before us comprises lectures on the underlying principles of electrotechnics, and can best be described as a comprehensive textbook on electrical technology. The book is written in Dr. Vidmar's characteristic style, and a technical reader will find it both refreshing and absorbing. This is just the kind of book we should recommend to an electrical engineer desirous of learning technical German—a conscientious student who plods carefully through this present book with the aid of a grammar and dictionary ought to acquire sufficient knowledge of German to enable him to read technical articles without difficulty. The beginner will find the task by no means disagreeable because the literary side will serve as a recreative stimulus.

The arrangement of the lectures is logical. Starting with electricity at rest—electrostatics—the reader learns about capacity and insulators. Electricity in motion—current electricity—follows with the laws governing the flow of electricity. This leads up to inductance, magnetic fields and alternating currents. Transformation and transmission are the natural sequence. Electric machines are then discussed in fair detail. This brings us to lecture 21, and halfway through the book.

Interest increases as we reach the transmission circuit, distributed capacity, resonance, and switching phenomena, which occupy several lectures. A study of wave shapes, by aid of Fourier's series, introduces many problems in a.c. working. With the thirtieth lecture we reach travelling waves, and so come to electromagnetic waves and high-frequency phenomena, radio transmission and valves. The last lecture, number 34, is devoted to the passage of electricity through gases and liquids, which introduces the mercury-vapour rectifier and the storage battery.

From the foregoing synopsis it will be seen that the author has covered practically the whole field of electrical engineering, while the inclusion of such subjects as transients, distributed capacity and the like, shows that no attempt has been made to keep the treatment elementary. Completeness appears to have been the author's aim, and where advanced mathematics are called for, they are used. Many parts of the book go far beyond what would be required in an ordinary degree course. At the same time, the reader must not be discouraged. As much care is taken with the interpretation as with the obtaining of results—indeed the discussions of the results are particularly good, and make it hard to stop reading. The reviewer has felt this frequently, for many earlier attempts at writing this review have been frustrated by the attractiveness of the reading. For those desirous of obtaining a clear insight into the scientific side of electrical engineering, the book is just what is wanted. S. P. S.

# LOOKING BACKWARD.

## Playing Football By Electric Light in Sheffield Fifty Years Ago.

FIFTY years ago, according to THE ELECTRICIAN dated October 19th, 1878 :—

A Paris theatre which formerly paid 30 francs a night for gas was electrically illuminated at a nightly cost of 14 francs.

The Jablochkoff light was introduced into England by Messrs. Wells and Co., of the Commercial Ironworks, Shoreditch.

Already electricity was being used in the U.S.A. for the operation of sewing machines, coffee grinders and dental appliances.

No less than three electric light companies, with a total capital of over £200 000, were registered within a few days. Of these it was said that " the British Electric Light Co., promoted by Mr. E. J. Reed, takes up Rapieff's patent, and is patronised by " The Times." The Electric Lighting Co., promoted by Mr. Hollingshead, is to work the Lontin system. These two have a nominal capital of £100 000 each. The Sun Electric Light Co. is the third and last, with a capital of £5 000 only. Mr. Strickland is the promoter, and the company is formed for the development of the Harrison system.

Football by electric light, now regarded as a novel departure, was played in Sheffield, when nearly 30 000 people gathered at Bramall Lane grounds to see a match between two teams belonging to the Sheffield Football Association. It appears that " the electric light was thrown from four lamps 30 ft. from the ground, and the rays, which were of great brilliancy, lighted nearly the whole of the ground, the players being seen almost as clearly as at noonday. The brilliancy of the light, however, dazzled the players, and sometimes caused strange blunders. The illuminating power was equal to 8 000 standard candles."

* * *

Twenty five-years ago, as recorded in THE ELECTRICIAN of October 16th, 1903 :—

Wolverhampton Corporation decided to extend its " free " wiring scheme.

W. T. Henley's Telegraph Works Co. removed to new premises at Blomfield Street, London Wall.

Lamp prices to wholesale customers were raised from 3·12d. to 6d. per lamp by the new continental lamp ring.

A bronze shield subscribed for by students of the I.E.E. was placed on the tomb of Volta at Camnago, near Como.

Following dissensions among members of Manchester Corporation, Mr. Metzger, the chief electrical engineer, handed in his resignation, which was accepted.

Sir Oliver Lodge and Dr. Muirhead were developing their system of wireless telegraphy, an interesting application of which was in the portable apparatus for military purposes; two sets were used in the 1903 army manœuvres.

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# ELECTRICALLY-DRIVEN SPINDLES FOR ARTIFICIAL SILK.

## Spinning Pots Fitted with Individual High-Speed Motors—High Speeds and Periodicities—Rapid Starting and Stopping an Important Feature.

By THEODORE RICH.

THE extraordinary rise of the artificial silk industry in the chief manufacturing countries of the world has been one of the most remarkable movements since the War, and as is usual in such cases, each new process of manufacture involves new problems to be solved, and ingenuity to be exercised. Messrs. Constructions Electriques Patay, of Lyons, showed at the Paris Fair in the early summer a frame containing a series of spinning pots, each of which has its own high speed motor.

### The Process.

The process of making artificial silk resembles in some ways that developed by Swan in the 'eighties for the making of the filaments of carbon lamps; the viscous liquid from which the silk is made is squirted through a small orifice through an acid bath, and then passes over a driven pulley, and then down into a spinning pot running at about 6 000 revolutions and upwards; the filament winding itself round the interior of the spinning pot in vertical layers with the aid of an up and down motion communicated to an internal guide tube by means of a rocker.

The individual driving of spindles for artificial silk manufacture has the advantages of complete regularity of revolution with facilities (through the variation of the motor generator current supply) of easy adjustment of the speed; the upkeep and wear are reduced to a minimum; any one pot can be attended to separately; noise and vibration are reduced to a minimum, and it is easier to keep enclosed motors tight against the effect of acids than when gear drive is used. A high-speed spindle can also be started and stopped rapidly with the aid of an electrically driven controller.

Fig. 3 shows the section of a frame fitted with Patay system motors and pots. The drive is on the principle shown in Fig. 1; the pot P is supported by a spindle B with a spherical seat O, the connection to the motor being with the aid of a spiral-spring R in slight tension. By this means the pot can oscillate and turn freely, and the spring acts against the vibration and pressure of the pot; by this means very steady smooth running is secured.

Fig. 2 shows a section of the motor and pot. The spindle is supported on spherical seated double ball-bearings O. In order to reduce the height over all, the motor is built up on a hollow shaft, supported also on ball bearings with spherical seats. The pot spindle is placed inside the hollow shaft, clear of it, with a certain amount of side play, the two being connected by the spiral spring R. The motor is completely enclosed, the windings are impregnated with a special varnish under pressure, and no external lubricators are used, the bearings only requiring to be greased at long intervals.

The incoming electrical connections, which are protected by a rubber tube, pass through a stuffing box; the spindle can be taken out without dismantling the motor. The motor is of the three-phase induction type with a squirrel cage rotor. The speeds used range from 5 800 revs. with 100 periods at 60 V, to 7 500 revs. with 130 periods, and 80 V. The power factor is about 81 to 83 per cent., the absorbed power being from 55 to about 62 W, depending upon the state and balance of the pot to be driven, the motor itself only taking about 15 W to drive.

### Advantages of Electric Drive.

One of the advantages of the electric drive is the speed with which the spindle can be started and stopped by the operator. It takes 30 seconds to run up, and a filled pot can be stopped by electric counter-current braking in approximately 20 seconds. The controller handle is thrown over for the braking position, and in order to prevent the spindle reversing under these conditions, the lever comes back automatically to the stopping position.

For the supply of current at the high periodicity required, motor generators are usually employed; in cases where a speed variation is not required, plain induction motor generators are satisfactorily used. When speed variation is demanded, some form of special drive is utilised, for example, a three-phase commutator motor, a direct-current drive, or, alternatively, by means of resistances in an induction motor rotor circuit.

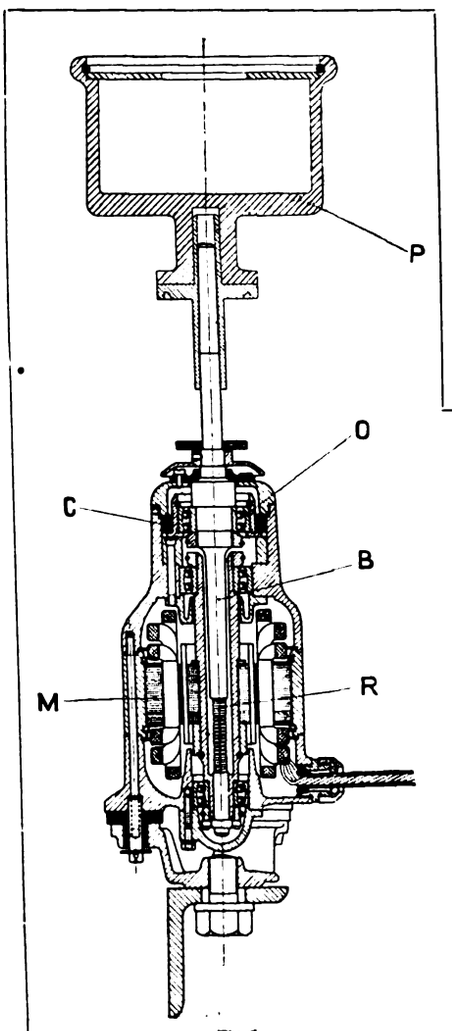


Fig. 1.

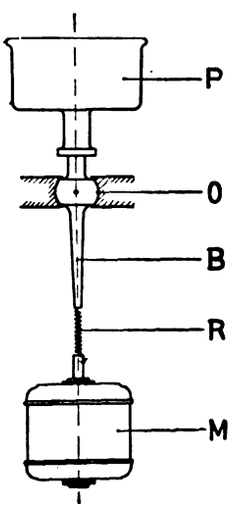


Fig. 2.

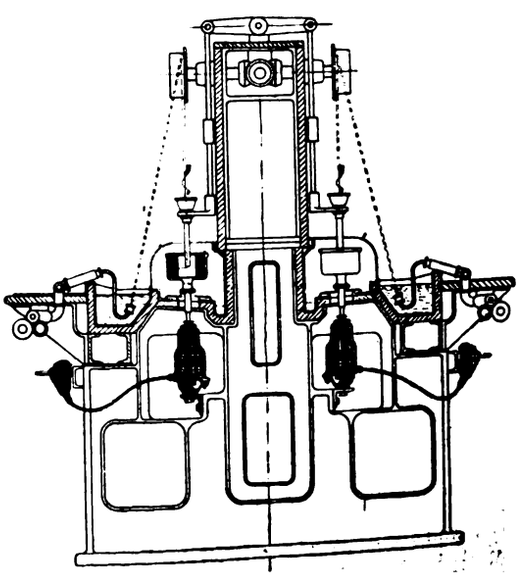

Fig. 3.

These diagrams, illustrating the construction and operation of the electrically-driven spindles for artificial silk manufacture, show (Fig. 1) the principle of the drive; (Fig. 2) a section of the motor and pot; (Fig. 3) section of a frame with motors and pots.

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# CABLE CONDUIT CONSTRUCTION.

## Employment of Longer Duct Sections—How Operating Disadvantages are Met—Allowing for Expansions and Contractions—Duct Edge Troubles.

IN view of the attention that has been drawn to methods of conduit construction following the recent serious fires in the London cable subways on the Victoria Embankment, considerable interest attaches to the report on "Conduit and Manhole Construction," which has just been issued by the Underground Systems Committee of the National Electric Light Association of New York.

The report states that the gradual extension of underground transmission systems to the outlying sections of large communities has made itself felt in several ways affecting underground construction. Perhaps the most outstanding effect is seen in the increase in voltage of underground cables, as exemplified in the recent installations of 132 000 V underground cable. Associated with this tendency is the possibility and also the desirability, from an economic standpoint, of installing such cable in longer sections than has been standard practice. Such a demand for longer duct sections has brought with it the development of dynomometers, which have facilitated the taking of large numbers of tension readings to determine the effectiveness of various methods of lubrication and the actual tension on long pulls. These tests have indicated that it is practicable to build duct lines up to 1 000 ft. long, or even 1 200 ft., provided the duct is carefully built and the cable does not too nearly approach the size of the duct.

The cost of installing one section of cable 1 000 ft. long is usually much less than the cost of pulling in two sections of 500 ft. each, and the investment in reels, cost of carting cables to the job, and of handling the empty reels is much less per cable foot for the long sections than for the short ones.

The use of extra long duct sections introduces certain operating disadvantages which must be met. Chief among these are that somewhat longer time is required to replace a section which has failed, and that a larger stock of cable must be kept on hand for emergency use. It also brings to the fore the desirability of having available splicing equipment and men trained in making duct splices so that short pieces may be spliced together to make full length sections.

The installation of these longer cable sections has also emphasised the necessity of taking into consideration, in the design of the manholes, the expansion and contraction of the cable during its cycles of operation. Experience in providing for this expansion in the case of shorter lengths of low tension feeder cables has for many years been reflected in the design of manholes used by operating companies in the largest American cities. The expansion and contraction evidenced in relatively short lengths of high tension feeders has not been of such magnitude that it has been essential to build manholes for these cables that will give the fullest and freest possibility for unrestricted cable expansion. With the advent, however, of duct sections 1 000 ft. long, for high tension feeders, it is manifest that the manholes must be suitably designed to take care of the inevitable expansion. Some reliance may be placed in the use of extra duct size which will permit the cable to assume a wavy line during expansion, but this should not be considered necessary, since provision for free and full expansion can be provided in the manholes without appreciable extra expense.

### Manhole Design.

Some 1 000 ft. duct sections have recently been completed and tested in a new conduit line adjacent to New York. These ducts are 5 in. in diameter and will contain three single-conductor 45 000 V, 200 000 c.m. cables, three in a duct, with a total weight of cable per duct foot of approximately 17 lb. A series of trial tests has indicated that it will be practicable to make this installation.

The increasing use of long duct sections has not only pointed out the importance of proper manhole design, to provide for the cable expansion, but it has also emphasised the importance of great care in building conduits.

Improvements in the art of making cable, increases of voltage hitherto considered applicable only to overhead lines, and cumulative increases in load to be served, have all combined within the last few years to make it desirable to build increasing numbers of ducts as large as 5 in. in diameter. It seems worth while at this time to enumerate some of the advantages of large ducts which have only in the last few years been manifest. Apart from the obvious necessity of large ducts for large cables, and the ease in pulling which comes from having ample leeway between the diameter of the cable and the diameter of the duct, considerable economic advantage and saving of space in the street are being found in the use of large ducts for the installation of three large single-conductor cables per duct.

When individual conductors become very large, either on account of the large copper section, or by reason of thick insulation required for high voltage, it finally becomes impracticable to build and instal a triplex cable on account of its magnitude and stiffness. Three alternatives are then offered: First, the installation of two or more smaller triplex feeders, which has been standard American practice in the past; secondly, the installation of three single-conductor cables, one per duct, a solution which would be used if the single-conductor cables are too large to be installed three in one duct. The third alternative is the use of three single-conductor cables per duct. This arrangement can obviously be used up to a cable diameter where it becomes impracticable to instal three cables per duct.

A further advantage in the use of extra large ducts may lie in the fact that opportunity is thus given for the cable to assume a wavy line during expansion, but if freedom for complete expansion is provided in the manhole design, it hardly seems necessary to use the larger duct size for this particular reason.

### Sheath Abrasion.

Probably one of the most common sources of trouble in the operation of underground cables is the abrasion of the lead sheath of the cables at the point where the cables emerge from the conduit into the manhole. The daily change in loads carried by most underground cables conforms to the variation in requirement for electric current which is common to all electric distribution systems, and this change in load results in heating and subsequent cooling of the conductor of the cable, which in turn is accompanied by expansion and contraction of the entire feeder cable. It is this expansion and contraction that tends to produce an abrasion at the duct edge, usually at both ends of every cable section.

Partially successful attempts to overcome this difficulty have been made along two general lines; in one, by the installation of special pre-formed duct entrances, and in the other by the use of duct shields or protectors placed under or around the cables at the duct edge. In some installations also there is evident reliance in the weaving of the cable in the duct to reduce the expansion into the manhole. To secure this action reliably requires, first, a duct that is to a considerable degree larger than the cable, and, secondly, as shown by recent tests, the development of considerable resistive force in the manhole by the cable, the splice, and by the fireproofing, if this is present. This method of attacking the problem is obviously a compromise, and while it may have proved successful in the case of high tension cables undergoing relatively slight expansion, it is questionable whether it should be relied upon to eliminate expansion and duct edge troubles where relatively greater expansion is expected.

In existing systems where adequate provision has not been made for taking care of the expansion of the feeder cable, it is a difficult matter to eliminate the duct edge cable troubles, particularly for cables which undergo cycles of relatively great expansion and contraction. Obviously, unless the faulty manholes are redesigned and reconstructed to provide suitably for the expansion of the cable, the duct shield applied under or around the cable at the duct edge is the natural remedy, even though in such cases it is at best a poor one.

On a new duct and manhole system the prevention of duct edge trouble should be sought in the proper design of the manhole rather than in the use of special protective duct entrances to overcome the effect of improper manhole design. If the manholes are constructed with such a shape, and the cables are so arranged that in their expansion cycle they do not press hard against any edge of the duct, there should be little or no cause for worry as to the condition of the cable at the duct edge.

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From the consumer's point of view, instalment purchase ensures a higher standard of living, while for the manufacturer it is essential to mass production.—*Mr. J. Gibson Jarvie.*

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# A NATIONAL ELECTRICAL APPRENTICESHIP SCHEME.

## Details of Plan Devised by the Association of Supervising Electrical Engineers—A Central Apprenticeship Board—Elasticity in Training Period—Employment on Completion of Apprenticeship.

WE reproduce below a suggested scheme of apprenticeship for the electrical industry which has been drawn up by the Association of Supervising Electrical Engineers :—

The intention of the scheme is to provide a steady supply of skilled men, and to place the scheme on an industry basis. The initial scope of the scheme is intended to apply to boys who are expected to contribute to their own maintenance.

The scheme is to apply to the electrical industry as such, and not to individual employers, and the indentures will be between a Central Apprenticeship Board and the parent or guardian.

### Government of Scheme.

It is suggested that the government of the scheme shall be in the hands of a Central Apprenticeship Board composed of representatives of the various interests affected, and local committees be appointed for the purpose of dealing with local matters.

The principles of the scheme are outlined below, and the clauses suggested are submitted with a view to consideration by the parties concerned, and not necessarily as a final detailed scheme.

Applications for entry are to made to any of the bodies included in the scheme or their members, either locally or nationally.

1. INDENTURE.—An indenture of apprenticeship for a period as hereinafter provided in employers' workshops, or on jobs, shall be entered into in all cases for boys to learn the craft under the agreed working conditions, and shall be made between the Central Apprenticeship Board and the boy's parent or guardian.

2. CONDITIONS TO BE FULFILLED BY ENTRANTS.—(*a*) *Age at entry*. Boys desiring apprenticeship under this scheme shall be not less than 15 years and not more than 17 years of age. (*b*) *Education*. Entrance examinations are not deemed essential, but a leaving certificate from the headmaster as to "position in the school and personal character" shall be furnished, and an agreed standard of education enforced. (*c*) *Health*. A medical certificate as to physical fitness shall be provided by each applicant for apprenticeship.

3. APPROVED EMPLOYERS.—An employer under this scheme shall be one who is a member of a recognised body of employers, such as in the electrical contracting section, the National Register of Electrical Installation Contractors.

4. TERM OF INDENTURE.—The period of indenture shall be five years.

5. PROBATIONARY PERIOD.—Before the indenture is entered into, the prospective apprentice shall be employed on trial for a period of not less than four weeks at the recognised indenture rate of pay, which period shall be included in the indentured time.

6. RESPONSIBILITIES.—(*a*) The apprentice shall be bound to serve the employer faithfully, honestly and diligently, and obey all the employer's lawful and reasonable commands and requirements, and keep the secrets of his trade and do no damage or injury to the employer or his goods. (*b*) He shall not waste the employer's goods nor shall he execute electrical work for gain otherwise than for the employer, save with the consent of the employer. He shall work in the employer's business such hours as are customary in the electrical industry in the district, and shall not absent himself unlawfully, but shall in all things conduct himself as an honest and faithful apprentice ought to do. The apprentice shall observe such regulations as are in force in the trade or business, and shall provide such tools as are usual and necessary. (*c*) The employer shall undertake that every opportunity shall be given the apprentice to learn the craft to which he is apprenticed. He shall allow the apprentice holidays without deduction of wages on all Bank and public holidays, and in addition shall grant one week's holiday with full pay each year between the months of May and October. (*d*) The employer shall provide facilities of an adequate nature for the apprentice to obtain or partake of wholesome food and drink. (*e*) During the apprenticeship, the employer shall allow the apprentice leave of absence for one whole day or two half-days during the employer's time in each week, or for such time as will permit of six hours' attendance at classes in each week for the purpose of instruction, both technical and general, and the apprentice shall not suffer any diminution of wages on that account.

7. TRAINING.—The apprentice shall have facilities for one of the following schedules—whichever is applicable :—

(*a*) *Contracting Section* :—1. Installation work, one year; 2. Manufacturing or works experience, one year; 3. Installation work, one and half years; 4. Generation, three months; 5. Distribution, three months; 6. Drawing office, three months; 7. Commercial and estimating, nine months.

(*b*) *Manufacturing Section*.—(1) Manufacturing or works experience, one year; (2) Generation, three months; (3) Distribution, three months; (4) Installation, one year; (5) Manufacturing or works experience, one and half years; (6) Drawing office, three months; (6) Commercial and estimating, nine months.

(*c*) *Supply Section*.—(1) Manufacturing or works experience, one and half years; (2) Installation, six months; (3) Generation and distribution, two years; (4) Drawing office, three months; (5) Commercial and estimating, nine months.

8. EDUCATIONAL FACILITIES.—Adequate technical education of the apprentice shall be provided during the indentured time to the satisfaction of the Central Apprenticeship Board to be decided. The costs of such technical training shal not be borne by the apprentice.*

The apprentice shall be bound during the first three years of his apprenticeship to attend during the employer's time a day technical school for one whole day or two half-days every week (or a minimum of six school hours) without deduction from wages, and shall attend evening schools for two evenings each week during the remaining period of his indentured time while the schools are open; school attendances to be certified from time to time. If the apprentice stays away without proper cause from the day technical school he shall lose his wages for the period of such absence from the school.

If the apprentice during the term of his attendance at a day technical school should fail to reach a standard of efficiency of 25 per cent. of the maximum, the Central Apprenticeship Board shall call the apprentice before them, and if a satisfactory explanation is not given, may cancel the indenture.

The apprentice shall be encouraged to qualify for medals and awards given by institutions or authorities connected with the electrical industry.

### Payment to Include Bonus.

9. REMUNERATION.—The apprentice shall receive the following weekly rates of remuneration :—1st year, 10s. 9d.; 2nd year, 15s. 8d.; 3rd year, £1 3s. 6d.; 4th year, £1 11s. 4d.; and 5th year, £1 19s. 2d. per week, and in addition the following bonus, subject to conditions referred to later :—2nd year, 1s. 6d.; 3rd year, 2s. 6d.; 4th year, 5s.; and 5th year, 10s. per week.

The foregoing bonus will be paid to the apprentice on his attendances and progress at work and school, the allocation of marks being as follows :—Attendance at work, 20 per cent.; progress at work, 30 per cent.; attendance at school, 20 per cent.; progress at school, 30 per cent. The apprentice shall secure not less than 85 per cent. of the total marks each year to qualify for the bonus.

10. OVERTIME.—Should the apprentice be required to work before or after the customary hours such work shall be counted as overtime. The apprentice shall not be required to work overtime during the first three years of his apprenticeship, and subsequently if overtime be worked the apprentice shall be paid proportionate additional wages as applies to workmen.

11. TRAVELLING TIME AND EXPENSES.—The actual expenses incurred by an apprentice travelling between the shop and work and incurred through being compelled to live away from home shall be paid by the employer.

* NOTE.—It is hoped that costs of such technical training will be borne by the Government, but pending such arrangement the costs to be borne by the Central Apprenticeship Board.

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When an apprentice is compelled to live away from home, he shall be allowed, once per quarter, a week-end leave of 48 hours and week-end fares.

When attending technical schools, the actual travelling expenses shall be paid.

12. ABSENCE.—An apprentice desiring leave of absence must apply to a responsible official. Absence with leave and absence covered by a medical certificate will be counted as apprenticeship hours up to a maximum equivalent of two weeks in any one year.

In all cases of prolonged illness, the question of counting any part of the absence as apprenticeship hours shall depend on the progress of the apprentice, which shall be determined on a report of the Central Apprenticeship Board.

In all cases of illness the Central Apprenticeship Board reserve the right to have their medical officer certify the fitness of the apprentice before he resumes work.

Leave granted for attending duties in the Territorial Forces shall be counted as special leave, and allowed in addition to the two weeks aforementioned.

13. PROPORTION OF APPRENTICES.—The proportion of indentured apprentices employed in any one department or section of a firm or business must not exceed 20 per cent. of the average number of male employees working in such department or section. The proportion of apprentices on any one job shall not exceed 15 per cent. of the number of employees on the job, and this shall only apply when the number of employees exceeds six. The term employees does not in this case include apprentices.

14. EMPLOYMENT AT TERMINATION OF APPRENTICESHIP—The Central Apprenticeship Board shall use their best endeavours to find suitable employment for every apprentice at the satisfactory termination of his apprenticeship. An apprentice on the termination of his apprenticeship may be engaged as an improver with full use of tools for a period not exceeding one year, during which time he shall be paid not less than 90 per cent. of the recognised journeyman's rate of pay in the branch of the industry in which he is employed. At the termination of such improvership (or such period) he shall be paid full journeyman's rate of pay.

15. COST OF INDENTURES.—Expenses incurred in connection with indentures shall be borne by the Central Apprenticeship Board.

16. GOVERNMENT OF THE SCHEME.—The Central Apprenticeship Board, composed of representatives of the various interests affected, such as:—British Electrical and Allied Manufacturers' Association; British Electrical Development Association; Electrical Contractors' Association; Electrical Contractors' Association of Scotland; Electrical Power Engineers' Association; Electrical Trades Union; Incorporated Association of Electric Power Companies; Institution of Electrical Engineers; Incorporated Municipal Electrical Association, and Association of Supervising Electrical Engineers, shall be responsible for the general management of the scheme. The country to be divided into districts and local committees elected from the organisations concerned.

The local committees to have certain powers, to be defined, but the decision of the Central Apprenticeship Board shall be final.

The Central Apprenticeship Board shall include among its duties the regulation of the supply of apprentices, collection of the necessary data and reports, etc., to ensure the efficient working of the scheme.

17. FINANCE OF THE CENTRAL APPRENTICESHIP BOARD.—The finance of the Central Apprenticeship Board shall be provided by the organisations and other bodies represented, by the payment of a sum to be decided and/or by grants from State funds.

18. DISPUTES, CANCELLATION, ETC.—A clause to be inserted in the indentures to deal with disputes, cancellation, etc.

# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## "Shoddy Wiring in Churches."

[TO THE EDITOR.]

SIR,—With reference to your note on "Shoddy Wiring in Churches," appearing in the current issue of THE ELECTRICIAN, you may be interested to know that the National Register of Electrical Installation Contractors is taking steps to prevent, as far as possible, the recurrence of cases such as you mention.

For instance, in the case of the London church referred to, the Register has sent letters to the local Press and to the vicar of the church concerned, explaining how this risk and other troubles can be avoided in the future by having the installation put in by a Registered Contractor. A copy of the latest list of Registered Contractors was also enclosed for guidance.

It is proposed to follow up where practicable all cases of shoddy wiring which receive publicity in the newspapers, and it would be appreciated if Registered Contractors who see this letter would send me cuttings of such references when they appear in their local newspapers. I am, etc.,

For the National Register of Electrical Installation Contractors,
T. TRIMNELL,
Secretary.

1, Lincolns Inn Fields,
London, W.C.2.
October 13th.

## "A New Description of 'j.'"

[TO THE EDITOR.]

SIR,—With reference to the letter of Mr. C. Turnbull appearing in your issue of October 5th, if the methods proposed are reliable and would really save time in operation against other methods, surely it would be practicable to get them introduced into such a book as "Exponentials Made Easy," by Mr. Gheury de Bray, together with several practical examples illustrating their application, and their advantages over other methods.

I believe, if their advantages were thus demonstrated, there would be quite a number of engineers, including myself, who would be very pleased to make use of them, but we cannot be expected to undertake the pioneer work ourselves.

I suggest the above book, because I believe it is destined to have a great sale among those who wish to keep intelligently in touch with the simpler forms of mathematics which are necessary to an engineeer's equipment.—I am, etc.,

A. M. TAYLOR.

Slade Lodge,
Erdington, Birmingham.
October 9th.

[TO THE EDITOR.]

SIR,—May I call attention to an error in my letter in your issue of October 5th under the above heading. In this I dealt with the curve plotted from the expression $\frac{(1+1)^n}{n}$. This should have been written $\frac{1=1^n(1+1)}{n}$. Treating 1 as a rotating vector we note that it rotates one revolution when $n=1$, two revolutions when $n=2$, and so forth. When $n$ approaches zero, the length of the vector $\frac{(1+1)}{n}$ becomes infinite, and it coincides with the initial line. When $n$ becomes infinite, the vector rotates an infinite number of times and its length approaches 1. I have not worked out what happens when $n$ is negative, but there does not appear to be much difficulty in obtaining the result.

The relation between $(\sqrt{-1})^n$ and $1^n$ treated as rotating vectors appears to be worthy of investigation and may lead to interesting results.—I am, etc.,

C. TURNBULL.

Electricity Works,
North Shields.
October 12th.

[TO THE EDITOR.]

SIR,—In connection with Mr. Turnbull's remarks under the above heading in your issue of October 5th, I would like to point out that his proposal is by no means a new one.

It is fully set out in Vol. I of the admirable "Treatise on Infinitesimal Calculus" by Bartholomew Price (published at Oxford in 1852), and in view of the fact that the first two volumes of this work are out of print, I venture to quote the following from pp. 270–271 (Art. 163): "So again $+\sqrt{\ }$ symbolises that operation which, being performed twice, one on the back of the other, is equivalent to $+1$, i.e. to $(-)$, and, being performed four times successively, one on the back of the other, is equivalent to $+$:

$$\therefore +\sqrt{\ }=(-)^{\frac{1}{2}};$$

and therefore, as $-$ indicates that a line is to be turned through 180 deg., so $(-)^{\frac{1}{2}}$ means that a line is to be turned through

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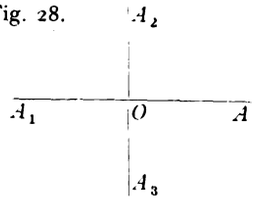
90 deg. Whenever, then, a line is affected with $(-)\frac{1}{4}$, which is equivalent to $+\frac{1}{4}$, as its symbol of direction, that line is to be drawn at right angles to the original direction of origination, viz., in the direction $OA_2$ (see Fig. 28); and, whenever the symbol of direction is $+\frac{1}{4}$, which $= +\frac{1}{4}+\frac{1}{4} = -(-)\frac{1}{4}$, the line which is affected with it is to be drawn in the direction $OA_3$. Similarly $+\frac{4n+1}{4}$ indicates a line drawn in the direction $OA_2$, and $+\frac{4n+3}{4}$ a line drawn in the direction $OA_3$. So also $+\frac{1}{n}$ means that that line with which it is affected is to be drawn at an angle of $\frac{360}{n}$ deg. to the originating direction $OA$."

Fig. 28.




Mr. Turnbull's concluding remarks seem rather to leave the impression that the purely analytical side of complex representation stands in need of development. Assurance to the contrary may be readily obtained from a perusal of J. L. S. Hatton's book "The Theory of the Imaginary in Geometry," Cambridge, 1919, or J. L. Coolidge's "The Geometry of the Complex Domain," Oxford, 1924. Both these volumes contain a very comprehensive statement of the elements of the theory, and an extension of these principles to advanced pure mathematics, and higher co-ordinate geometry. The theory has greatly progressed since the publication of Prof. Price's Vol. I in 1852.—I am, etc.,

G. WINDRED.

Bedford.

NOTE.—The following typographical errors occurred in Mr. Turnbull's letter on p. 377 of our issue of October 5th, 1928. In column 1, fourth line from bottom, for $(-1)^{.25}$ read $(-1)^{\cdot 25}$. In column 2, line 13, for $\sqrt{\frac{3}{2}}$ read $\sqrt{\frac{3}{2}}$, and in line 30, for $1\frac{1}{4}$ read $1\frac{1}{4}$.—ED.]

## The Human Touch in Advertising.

[TO THE EDITOR.]

SIR,—With reference to your issue of September 28th I was greatly impressed by the pleasing appearance of the photograph illustrating an electric washer on page 362. One has become so used to seeing pictures of domestic electrical appliances in the usual uninteresting form adopted by manufacturers in this country, that the unexpected glimpse of an American picture in an English paper converted my casual glance into an interested look, which finally caused me to actually read the paragraph concerning it. On those occasions when I spot an illustration of a new cooker, cleaner, etc., I think to myself how much more effective would the picture be were the "human touch" introduced into the scheme.

The human mind is such that it is quicker to appreciate action than the inanimate, and though an illustration of a domestic appliance may convey all that the photograph is intended to portray, a picture of the same appliance *plus* someone working it is far more pleasing to look upon, and, better still, will claim attention more quickly. To give examples of this point I enclose two photographs introducing the human element; the smaller shows a well-known make of portable typewriter and the other a portable wireless set.

In the first, one's attention is immediately attracted by the fact that two people are shown doing something, which upon further scrutiny appears to be typewriting. One's mind at once becomes associated with the object of the picture.

In the second picture one is attracted by the group of young people aboard a yacht, and, upon studying the good looks of the party, one's eyes fall upon the wireless set.

In the ordinary way both the typewriter and the wireless set would have been shown alone, and much, if not all, of the attracting powers of these pictures would have been lost. I take it that photographing commercial articles for editorial reproduction is a form of advertising which, according to the temperament of the editor to whom it is submitted, is one of the few forms of "mention" which is less likely to be rejected than any other. For that reason the manner of illustrating the article should be such as to please the eye of the editor before all else, working on the assumption that if it pleases him it will please others.

It may be said, of course, that such pictures do not show the appliance in any appreciable size, but since the purpose of the picture is mainly to attract attention, the question of size is a secondary consideration. Having claimed the reader's attention—the hardest of all things to do—the rest will follow.—I am, etc.,

AN AMERICAN.

London.

## Effects of Earth Currents.

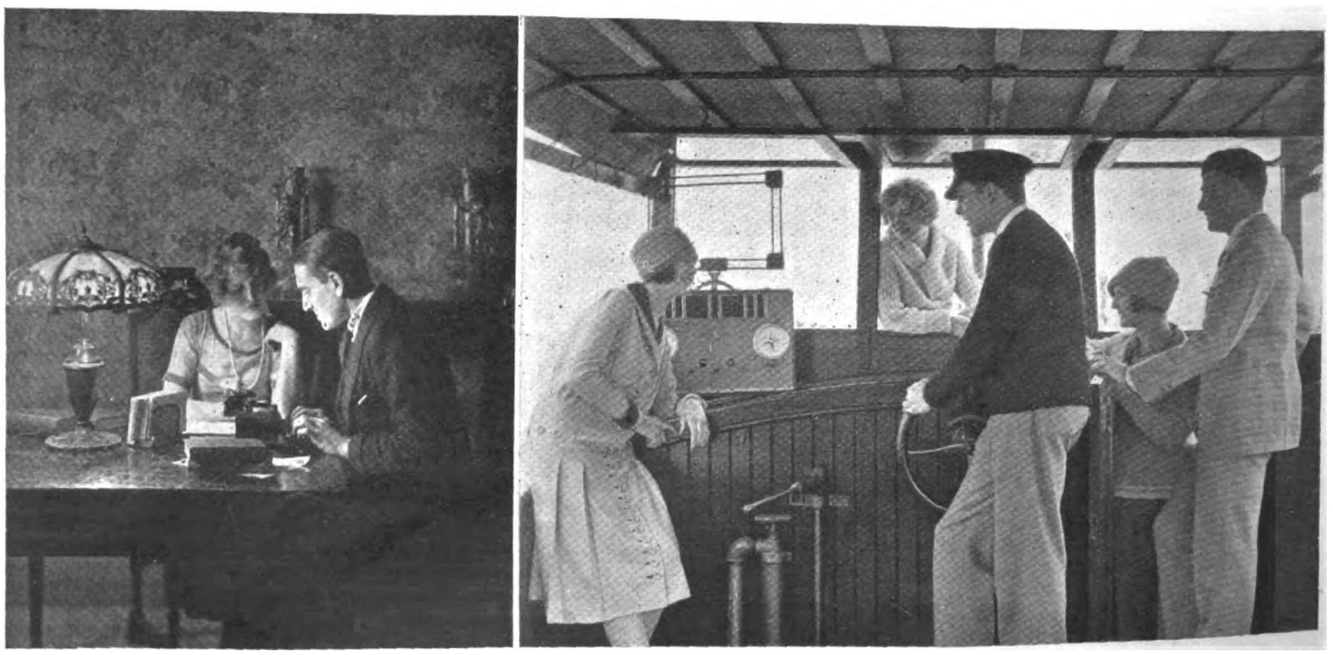
[TO THE EDITOR.]

SIR,—In order to counteract the effects of earth currents on a cable working bridge duplex, it is suggested that an adjustable E.M.F., preferably by potentiometer method, be applied to the end of the artificial line, either automatically or by hand; any balance disturbance due to the variation of the applied E.M.F. being compensated for simultaneously by means of a variable resistance.

In order to confirm my own experiments, I should be very glad to know whether any of your readers have already tried such a scheme, and if so, with what success.—I am, etc.,

E. C. W.

Natal.



**The two illustrations referred to in the letter from "An American" relative to the "human element" in photographing domestic electrical and other appliances. The first is an advertisement for a well-known portable typewriter (to say nothing of the lamp standard) and the second shows a portable wireless receiver.**

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# NEWS IN BRIEF.

## New Submarine Telegraph and Telephone Cable—Fulham's New Showrooms—Faraday House Dinner—Plant for a Westminster Hospital—Prepayment Meters for Hotels—Illuminating Engineering Society's Arrangements.

LURGAN U.D.C. held an exhibition of electrical appliances in the town hall, Lurgan, last week.

There are 561 043 telephones in use in Ontario, amounting to over 17 per 100 of the population.

The Amsterdam telephone system, with 28 000 subscribers' telephones, is now worked automatically.

The number of telephones in use in Brussels now exceeds 50 000, an increase of over 30 000 in the last seven years.

The Belgian Cabinet has decided to reconstitute the telegraph and telephone services as a separate department.

A hydro-electrical engineer is required for the Irrigation Branch, Public Works Department, United Provinces, India.

Ilkley U.D.C. held an electrical exhibition last week, at which many of the leading British manufacturers were represented.

York Electricity Committee has approved a design for the alteration and extension of the electricity showroom in Clifford Street.

The number of hired cookers connected to Manchester Corporation's mains in August was 67, making the total connected 4 731.

The borough electrical engineer of Ilford is making further inquiries regarding showroom premises in the vicinity of Cranbrook Road.

Rotherham Electricity Committee has authorised the electrical engineer to purchase all necessary materials required in connection with the assisted wiring scheme to March 31st next year.

An interesting feature of the "Western Mail" Brighter Homes Exhibition, which is being held in the Pavilion, Stow Hill, Newport, until to-morrow (Saturday), is an all-electric bungalow exhibited by Newport Electricity Department.

The Bell Telephone Co. announces that its engineers have perfected a cable which can be used for long-distance and under-sea telephony, and also for telegraphing at a much higher speed than that now permitted even by permalloy cables.

At the request of the Institution of Electrical Engineers, Torquay Town Council has given its sanction for the placing in the Marble Hall of the Municipal Buildings a brass memorial tablet to the memory of the late Mr. Oliver Heaviside, who was a native of the town.

Birmingham Electricity Committee has accepted tenders for the construction of foundations for rotary converters at Bordesley Green, Bournville and Dale End sub-stations and Summer Lane generating station and extensions of the Water Street and Chester Street sub-stations.

The 25th anniversary of the foundation of the Faraday Society will be celebrated on November 9th, when at 3.30 p.m. there will be delivered, at the Royal Institution, the first Spiers Memorial Lecture. Sir Oliver Lodge will give an address on "Some Debatable Problems in Physics." The chair will be taken by Sir Robert Hadfield.

The working of the automatic telephone equipment which was put into operation in the Manchester Town Hall last week has given complete satisfaction. Nearly 200 instruments are in use at the Town Hall, and direct communication can now be established between the different departments without reference to the central switchboard.

The Transport and General Workers' Union have made application to the Scottish Tramways and Transport Association with a view to the formation of a Joint Industrial Council for the regulation of wages and conditions of tramway employees. It is stated that the Association has approved the principle of the proposal. Wages and conditions of employees of tramway undertakings in Scotland have hitherto been settled in each area.

The Industrial Court, sitting at Westminster last week, heard, in private, a claim by the four railway groups for a reduction of 6s. a week in the wages of staffs employed in railway generating stations and sub-stations. The companies suggested that the electrical workers should voluntarily accept the reduction of 2½ per cent., which was agreed upon by the unions covering all other classes of railway workers. The Electrical Trades Union opposed the companies' claim, in conjunction with the National Union of Railwaymen. The Court having heard evidence, reserved its decision.

A station superintendent is wanted in the Nuneaton Electricity Department.

An experimental automatic street traffic control equipment is to be erected in Birkenhead.

A manager and engineer is required for the Kirkwall and district municipal electricity supply undertaking.

An assistant lecturer in physics and electrical engineering is required at the Municipal College of Technology, Belfast.

The Metropolitan Asylums Board is about to instal electricity at the Southwark casual ward and the Hostel, at a cost of £680.

A modern internal telephone system is to be installed at the Metropolitan Asylums Board's South Western Hospital, at a cost of £600.

The first meeting of the session of the North-Eastern Centre Students' Section of the I.E.E., will be held to-day (Friday) at the Armstrong College.

Members of the South Wales branch of the Association of Mining Electrical Engineers recently visited the Lydbrook cable works of Edison Swan Cables, Ltd.

Fulham (London) Electricity Committee has arranged for the opening of the new electricity showrooms and offices in Fulham Road on Wednesday, October 24th.

Barnsley Electricity Committee is to seek sanction for a loan of £10 000 for hired wiring, and has decided to put into operation a scheme of hire purchase of domestic apparatus.

Wakefield Electricity Committee has arranged to provide the Education Committee with an up-to-date electric cooker, free of charge, for demonstration purposes, at the cookery centre.

Carlisle Electricity Committee has considered the question of student apprentices being permitted to attend the power station during vacation, but has decided to take no action at present.

The twentieth annual dinner of the Faraday House Old Students' Association will be held on October 26th at the Savoy Hotel. Mr. F. E. Berry, President, will be in the chair. A musical entertainment will, as usual, follow the dinner.

Taunton Electricity Committee has decided to present each member of the Corporation and the employees of the Electrical Department, with a copy of "The Past and Future Developments of Electricity," by H. G. Massingham, just published by Hutchinson and Co., London.

The Minister of Health has approved the proposal of the Westminster Board of Guardians to instal new generating plant at St. Stephen's Hospital. The Minister has asked to be furnished with a detailed estimate of cost, based on a provisionally accepted tender.

Brighton Lighting Committee has adopted a recommendation by the engineer for making arrangements with proprietors of hotels, boarding houses, etc., to hire prepayment meters for installation in bedrooms, to provide a means of use by visitors of radiators, irons, kettles and other heating apparatus.

On Friday, October 12th, Mr. Harry Moss, Hon. Sec. of the Bradford Circle of E.D.A., gave a lantern lecture to members of the Foremen's Mutual Benefit Society, Engineering and Allied Trades Section, at the Empress Hotel, Bradford, on the "History of Electricity and Its Application to Industrial Uses."

Mr. William G. Gass, in his presidential address to the Manchester Association of Engineers, said financial problems did not enter sufficiently into engineering training. There was a tendency for engineers to forget that machines had to be sold at a price which would show a profit. The commercial side should be part of the training in technical schools and colleges.

A new departure is being made this autumn by the Illuminating Engineering Society, which is arranging a series of meetings at provincial centres at which the subject of "Industrial Lighting" will be discussed, Mr. J. C. H. Cooper opening the proceedings. The dates arranged are Birmingham, October 22nd; Manchester, October 29th; Newcastle, October 31st; and Glasgow, November 1st. The opening meeting of the season will be held at the E.L.M.A. Lighting Service Bureau, Savoy Street, at 6.30 p.m., on November 6th, when Mr. C. C. Paterson will deliver an address dealing with the recent International Illumination Congress.

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# PERSONAL.

MR. N. J. Young, tramways manager, Newport, was 57 on Tuesday.

Mr. John H. Sandiford has joined the Switchgear Sales Department of the English Electric Co., Ltd.

Mr. N. F. Wilson, who has accepted the Mayoralty of Kendal, is chairman of the Corporation Electricity Committee.

Mr. A. T. Snell has been re-appointed to represent the City of London Corporation on the London and Home Counties Joint Electricity Authority.

Mr. J. N. Waite, deputy electrical engineer, Bradford, was appointed electrical engineer, Hull, on October 11th, at a commencing salary of £1 300, rising to £1 500 per annum.

The directors of the Ever-Ready Co. (Great Britain) Ltd., have appointed the managing director, Mr. Magnus Goodfellow, to be chairman, and appointed Mr. F. S. Johnson (who has served the company for many years in various executive positions) a director to fill the vacancy on the board created by the death of the chairman, Mr. C. H. C. Moller.

Among the members of the committee appointed by the President of the Board of Education to consider the problem of education for salesmanship and to make any recommendations that may appear desirable for the promotion, by means of education, of greater efficiency in the marketing of British goods and services at home and overseas, are Sir Ernest Benn, Sir Edward Manville, and Mr. P. J. Pybus.

The prize winners in this year's W. E. Highfield Shield Competition of the Association of Supervising Electrical Engineers are: MEMBERS' SECTION: 1st prize and winner of the Shield, Mr. B. C. Garman (London); 2nd prize, Mr. G. H. Conway (Acharacle); 3rd prize, Mr. R. W. Whitley (London). ASSOCIATES' SECTION: 1st prize, Mr. F. Anderson (Glasgow); 2nd prize, Mr. A. Simpson (Sunderland). See page 445.

An interesting presentation was made on Tuesday by Sir George Sutton, chairman of W. T. Henley's Telegraph Works Co., Ltd., at that company's works at North Woolwich, when about 250 employees received certificates in recognition of their having served the company for periods of from twenty to fifty years. Similar presentations are also about to be made to employees at the Gravesend works and also at the head office and branches.

Mr. and Mrs. C. F. Venndt celebrated their diamond wedding on Thursday, October 11th. Mr. Venndt, who is 85, has had over sixty years' service in the telegraphic world. He served as a war telegraphist in the German-Danish War of 1864, and was subsequently stationed in the Government telegraph office at Fredericia. When the Great Northern Telegraph Company was formed in 1869 to operate the cables between Denmark, Norway, England, and Russia, Mr. Venndt was selected to improve signal speed between England and Denmark, and, going to Newcastle for that purpose, remained as head of the original operating staff. In 1870 he introduced the then newly developed Wheatstone automatic instruments at the company's station at Libau, Russia.

## Obituary.

MR. HAROLD JOHN HALL, on October 4th, aged 32 years. He was technical manager to Biggleston and Son, of Canterbury.

MR. FRANK RICHARDSON, on October 6th, as a result of a motor accident. He was in the service of the Enfield Cable Works, Ltd., for a number of years as chief electrician, and was latterly assisting in general works management.

MR. HUGH INNES ROGERS, on October 16th. He was head of the firm of Brecknell, Munro and Rogers, engineers, of Bristol. His first appointment was with Robert W. Blackwell and Co., who carried out the installations of some of the earliest overhead electric tramway systems erected in the United Kingdom, and as assistant engineer with them he superintended the equipment of the Dublin United Tramways Company's and Bristol Tramway's systems during the period 1895 to 1898. Upon the completion of his engagement with Messrs. Blackwell, he entered into partnership with H. Brecknell, Sons and Munro, Bristol, whereupon the style of the firm was altered to Brecknell, Munro and Rogers. In 1904, the firm was converted into a limited liability company under the style of Brecknell, Munro and Rogers, Ltd., and at its inception he was appointed chairman, which office he occupied to his decease. The company manufactured overhead electric tramway fittings and supplied a considerable portion of corporations and private companies in the United Kingdom and Colonies during the transition from horse-haulage to electric traction.

# OVERSEAS TRADE.

## Electrical Exports Show Balance Over Imports of £9 197 155.

DURING September, 1928, exports of electrical machinery, apparatus and materials shipped from the United Kingdom amounted to £1 478 578, representing a decrease of £106 045 when compared with the figures for the corresponding month of last year. The total value of exports of British electrical goods for the nine months of 1928 amounted to £13 703 466, compared with £13 870 917 for the corresponding period of 1927, representing a decline of £167 451. Imports of electrical apparatus, machinery and material during September, 1928, amounted to £479 318 as compared with £525 001 for September 1927, the decline being £45 683. For the nine months of this year the total electrical imports amounted to £4 506 311, or £455 649 higher than for the same period of last year.

These figures show that the electrical exports for September, 1928, exceed imports for the same month by £999 260, while for the nine months of the year the excess is £9 197 155.

Export items which show increases during September 1928, when compared with last year's figures for the same month, include submarine telegraph and telephone cables, increase £362 646; and electric glow lamps, increase £9 775. On the import side, items which have fallen off by comparison with last year's returns include electrical machinery, decline £30 924; and cables other than rubber insulated and not telegraph or telephone cables, decrease, £22 176.

We give below detailed figures for September, 1928, and for the nine months of the year, contrasted with those for the corresponding month and period of last year.

| | Month of September | | Nine Months | |
|---|---|---|---|---|
| IMPORTS. | 1927. | 1928. | 1927. | 1928. |
| | £ | £ | £ | £ |
| Electrical Machinery | 128 573 | 97 649 | 1 179 653 | 1 283 737 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 9 541 | 12 944 | 88 060 | 121 899 |
| Insulation other than rubber (not being Telegraph or Telephone Wires or Cables) | 61 499 | 38 323 | 445 389 | 427 399 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 6 742 | 6 777 | 67 341 | 62 258 |
| Submarine Telegraph and Telephone Cables | 73 | — | 73 | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 39 328 | 55 899 | 307 724 | 447 432 |
| Carbons, Electric | 4 807 | 9 636 | 68 663 | 92 990 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 46 697 | 34 282 | 276 776 | 353 032 |
| Arc Lamps and Electric Searchlights | 385 | 316 | 6 739 | 5 206 |
| Parts thereof (except Carbon Rods) | 1 895 | 2 308 | 19 313 | 22 030 |
| Batteries and Accumulators (including parts) | 94 429 | 78 477 | 468 475 | 436 224 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 24 480 | 19 863 | 205 656 | 205 795 |
| Switchboards, other than Telegraph and Telephone | — | 12 | 1 069 | 792 |
| Electrical Goods and Apparatus, all other Sorts | 106 552 | 122 832 | 915 731 | 1 047 517 |
| Total of Electrical Goods and Apparatus | 525 001 | 479 318 | 4 050 662 | 4 506 311 |
| EXPORTS. | £ | £ | £ | £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 32 716 | 28 150 | 404 543 | 377 277 |
| Other Motors and Generators | 205 274 | 135 423 | 1 745 914 | 1 817 184 |
| All other Sorts | 342 250 | 235 451 | 2 913 574 | 2 783 275 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 110 352 | 101 835 | 1 065 370 | 1 028 841 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 178 843 | 105 568 | 1 207 309 | 1 089 921 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 92 723 | 51 161 | 680 526 | 664 064 |
| Submarine Telegraph and Telephone Cables | 10 412 | 373 058 | 444 309 | 530 205 |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 223 874 | 128 481 | 1 896 316 | 2 002 513 |
| Carbons, Electric | 4 471 | 2 699 | 17 347 | 12 218 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 32 406 | 42 181 | 441 590 | 376 737 |
| Arc Lamps and Electric Searchlights | 1 285 | 463 | 11 360 | 9 773 |
| Parts thereof (except Carbon Rods) | 89 | 39 | 2 813 | 5 598 |
| Batteries and Accumulators (including parts) | 125 007 | 68 435 | 960 109 | 814 666 |
| Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 27 362 | 17 787 | 273 286 | 282 642 |
| Switchboards, other than Telegraph and Telephone | 5 579 | 2 876 | 53 376 | 58 387 |
| Electrical Goods and Apparatus, all other Sorts | 191 980 | 184 971 | 1 753 175 | 1 850 165 |
| Total of Electrical Goods and Apparatus | 1 584 623 | 1 478 578 | 13 870 917 | 13 703 466 |

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# ELECTRICAL WOMEN.

## Domestic Science Teachers Visit the E.A.W. Kitchen.

ON October 6th over thirty members of the Surrey branch of the Association of Teachers of Domestic Subjects visited the E.A.W. Club Room and Kitchen at 46, Kensington Court. In the absence of Miss Haslett, a lecture on "Electrical Housecraft," was given by Miss Norvick, who spoke of the various applications of electricity in the home and the need for domestic electrical apparatus in the domestic subjects centres and schools. At the special request of the teachers, Miss Norvick gave a brief description of a simple electrical installation, with special reference to the purposes of fuses and some of the causes of fuse blowing. The lecture was followed by a visit to the kitchen where a cooking demonstration was given by Mrs. McNiell Thomson (member), who came down specially from Northampton.

A very pleasant and informative meeting was held in the drawing room of the home of the Mayoress of Kensington, Mrs. R. Dudley Baxter, on October 8th. In welcoming those present, the Mayoress stated that Kensington had appointed the first woman sanitary inspector. They were pleased to feel that they now had the headquarters of so progressive a women's organisation as the E.A.W. in Kensington. Mrs. Wilfrid Ashley, who was present, spoke of the need for the women of the country to learn all they could of electricity in the home. Ald. Mrs. Hammer referred to the work which women had done and could do as members of local electricity committees.

The inaugural meeting of the Rugby branch of the Association was held in the Benn Buildings, Rugby, on Thursday, October 11th. The chair was taken by Lady Feilding, the President of the branch.

# THE NATIONAL REGISTER.

## Twenty More Applications Accepted at October Meeting of Executive Committee.

STEADY progress continues in the addition of further names to the roll of the National Register of Electrical Installation Contractors. Growing recognition of the value of the National Register is reflected in the number of applications for registration which come before the Executive Committee at each of its monthly meetings, and, in view of the fact that the number of unregistered contractors who are eligible for registration is continually decreasing, the present rate of growth is, on the whole, satisfactory. In certain cities and towns the active interest of the electricity supply undertaking has led to a big increase in the number of local electrical contractors seeking registration. In one town recently, the interest of the municipal electrical engineer caused no fewer than fifteen local contractors to apply for registration at one time. The result is that practically every electrical contractor in that town is now a registered installation contractor.

At the October meeting of the Executive Committee of the National Register, 30 applications for registration were considered. Of these 20 were accepted, one application being withdrawn, and the remaining nine declined. The names and addresses of the newly-registered contractors are as given below:—

Atkinson and Beanland, 19, Slater Street, Liverpool; Beabey, O. and Co., 13/15, Carlton Street, Liverpool; Bloomfield, Edward E., 32, Coggeshall Road, Braintree, Essex; Coolmore Electrical Works, Donegall Road, Belfast; Daly, Thomas and Son, Skinnergate, Darlington; Driver and Peterson, 398, Stanhope Road, Tyne Dock, South Shields; Fishbourne, W. J., 7, Tynewydd Road, Newbridge, Mon.; Fletcher and Jones, 8, Whitchurch Road, Cardiff; Glamorgan Electrical Co., 11, Moira Buildings, Cardiff; Glenville, Samuel J., Back Westoe Parade, South Shields; Griffey, Edgar L., 19, Livingstone Road, Bath; Linzell Dickinson and Co., 3, Cazenove Road, Stoke Newington, London, N.16; Locke and Soares, 83–87, New Cavendish Street, London, W.1.; McBride and Nuttall, 7, Sheil Road, Fairfield, Liverpool; Nutter, Edgar, 183, Leeds Road, Nelson, Lancs.; Pearn and Carson, 27, Tavistock Road, Plymouth; Ribton, C. P., Ltd., 44, South Castle Street, Liverpool; Wardley, Reginald, 891A, Manchester Road, Castleton, Manchester; Wills, A. and Sons, Ltd., 15, Argyle Street, Bath; Woolliscroft, J. H. and Co., King Edward Street, Liverpool.

# FARADAY MEMORIAL.

## Unveiling of Bust of Michael Faraday in Southwark (London) Library.

ABOUT a year ago Southwark (London) Borough Council commenced the formation of a Faraday Memorial Collection at their Central Library in Walworth Road, London, and, to mark the new departure, Sir Oliver Lodge, on October 28th of last year, unveiled, at the Library, a memorial tablet referring to Faraday's life and work. A further ceremony in Faraday's honour was performed at the same place on Wednesday last, when Lieut.-Col. Kenelm Edgcumbe, President of the Institution of Electrical Engineers, unveiled a bust of Faraday, which was presented by the Institution of Electrical Engineers and is a replica of the marble bust which is in the Institution's building on the Victoria Embankment.

The bust of Michael Faraday which was unveiled at the Central Public Library, Walworth Rd., London, on Wednesday.

Lieut.-Col. Edgcumbe, having unveiled the bust, said he did so with a great sense of what we owed to the great man whom it represented. There were probably many there to whom the name of Michael Faraday was not much more than the name of one of a number of illustrious men who had been born in the borough, but to electrical engineers Faraday was their hero—he might almost say they looked upon him as their patron saint. It might be imagined, therefore, how pleased they were to hear of the starting of this memorial, and with what alacrity they presented the bust, which he might mention was the original model made by the sculptor, Mr. Macdougall, and from which he made the marble bust.

Lieut.-Col. Edgcumbe, in the course of a brief survey of Faraday's life, said his earliest job was taking newspapers from house to house. His master, a bookseller, however, was also a bookbinder, and that enabled Faraday to read a great deal, which gave him an insatiable thirst for knowledge —especially scientific knowledge. It was difficult for us, in these days of easily acquired technical and scientific literature, to realise how difficult it was for a man in Faraday's position to embark upon a scientific career. At last his opportunity came, and he was appointed assistant to Sir Humphrey Davy at the Royal Institution, where he practically passed the whole of his scientific life and where he was a professor until his death. It was now nearly a hundred years ago since he started on a series of experiments which formed the basis of the whole of modern electrical engineering. Without those discoveries we should not have had any transmission of electricity, and therefore we should have had no electric light, tube railways or wireless, and he doubted whether we should have had the telephone. These discoveries he made in four or five years. He thought there was something almost supernatural about Faraday's genius. He seemed to follow the trail without pausing. He had a marvellous intuitive gift of knowing which of his results were worth following up and which he could just lay aside as no good. He was no mathematician. Perhaps if he had been it might have delayed him.

Mr. Sydney Evershed, who gave a great deal of attention to the life of Faraday, said these words not long ago:

"Faraday, in his researches, never seemed to lose his way. It was almost as though nature herself was leading him by the hand." Could one wonder then when he said this was a man whom they looked upon as their patron saint? There was a good deal of the saint about him. The more he unravelled nature's secrets the more he felt that there was, somewhere beyond and above it all, a directing force which was inscrutable, even to his great mind. He was one of the greatest of those who made the name of England great.

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# EVER-READY WEEK.

## List of Prize Winning Windows of Battery Displays.

IN connection with the special Ever-Ready battery window display competition, particulars of which were given in THE ELECTRICIAN of September 14th, and which was held from October 1st to 6th, the Ever-Ready Co. (Great Britain) Ltd., announces that the displays were magnificent, both as to quality and number, and must have entailed considerable thought and hard work. In judging the windows the managing director of the company experienced great difficulty in making his selection, but finally decided upon five of outstanding merit.

### Value of Prizes Increased.

The company has increased the prize money from the £600 originally offered to £810, which has been allocated as follows :

FIRST PRIZES, £75 EACH :—George Brown and Co., 14/16, Devonshire Street, Carlisle ; E. V. Lomas-Smith, 29, High Street, Camberley ; W. R. Rose, 3, Promenade, Cheltenham ; Sympers, 26, Greenhill Parade, Harrow ; and Walker Bros., Quality House, Temple Row, Birmingham. SECOND PRIZES, £50 EACH :—J. H. Harper, St. Helier, Jersey, C.I. T. M. Kingdon and Co., 97, High Street, Winchester ; R. J. Sloan, Hill Street, Newry ; A. A. Turney, 7 York Buildings, Bridgwater. THIRD PRIZES £25 EACH :—J. E. Beale (Eastbourne) Ltd., Victoria Place, Eastbourne ; Andrew McRobb, 27, Adelphi, Aberdeen ; Pollock and Co., 36, Bridge Street, Glasgow ; Seal and Ball, 25, London Street, Southport. FOURTH PRIZES, £5 EACH :—Arcade Cycle and Sports Co., the Cycle Shop, Okehampton ; A. E. Ball and Co., Ltd., 10, Woodhouse Parade, North Finchley, N. ; Bentall's, Kingston-on-Thames ; H. J. Bell, Hamlet Court Road, Westcliff-on-Sea ; Bowerman Bros., Osborne Road, Southsea ; W. T. Canning, 47, Goldhawk Road, Shepherds Bush, W.12 ; Coates and Co., 17, Princes Street, Harrogate ; W. S. Cowell, Butter Market, Ipswich ; Denniss Paine and Co., 61, High Street, Maidstone ; A. H. Dykes, 8 Bury Street, Stowmarket, Suffolk ; Haynes Bros., Ltd., 1 King Street, Maidstone ; Harding Bros., Ltd., Hereford ; B. J. Hockaday, Loughborough Junction, S.W.9 ; L. James, 10, Alexandra Road, Newport, Mon. ; Percy Kiln, 2 and 3, New Buildings, Elm Grove, Southsea ; G. Laurie, Selkirk ; Herbert G. Leake, Radlett, Herts ; Pavilion Service Depot, Stow Hill, Newport, Mon. ; Radio Sports Co., 274 High Street, Acton, W.3 ; Read Bros., 4 and 6, Goods Station Road, Tunbridge Wells ; Row and Son, 2, Finkle Street, Thirsk ; Shipley and Co., Gainsborough, Lincs ; Swan and Jarvis, 50 London Road, St. Albans ; Robert Tait, Westport, Selkirk ; F. Westrup Coomber, Radio House, The Tything, Worcester ; H. R. Williams and Co., Barnstaple ; and A. R. Wilson, 737, Christchurch Road, Bournemouth.

A large number of excellent displays were made by retailers with small windows, which could not compete on equal terms with the large windows. The company have therefore decided to award 27 consolation prizes of £5 each to the best of these smaller displays, and in future competitions will arrange prizes in two classes, large and small to specified dimensions. It is the intention of the company to organise similar displays annually with a view to stimulating public interest.

In addition to the prizes mentioned above, representatives of the company distributed to purchasers of " Ever-Ready " goods during the selling week, 50 £5 notes in the following towns :—Bath, Bedford, Birmingham, Bournemouth, Bradford, Brighton, Bristol, Cambridge, Cardiff, Cheltenham, Derby, Doncaster, Eastbourne, Edinburgh, Glasgow, Hull, Ipswich, Liverpool, London and Suburbs, Manchester, Newcastle, Norwich, Oxford, Salisbury, Taunton, Winchester, York. A list of the names and addresses will be supplied upon application to the company. We reproduce both on this page and on page 443 photographs of some of the windows.

# WIRELESS NOTES.

## Dublin Wireless Exhibition—Television and the B.B.C. Demonstration.

THE Dublin Wireless Exhibition was opened in the Mansion House on October 8th, by Mr. M. R. Hefferman, Parliamentary Secretary to the Free State Minister for Posts and Telegraphs. The exhibition was organised by the Irish Radio Traders' Association, and excited wide public interest. The goods shown were almost exclusively of British manufacture.

Mr. Hefferman said their ambition was to bring reception within crystal set range of the greatest possible part of the Free State population. Two possible forms of extension were involved—the setting up of a number of short-range stations, or the setting up of a high-power station to serve the whole country. The latter would be the more satisfactory, but they were faced with technical difficulties. He believed that the recent conference in Berlin of the International Union of Radiophony had approved the allocation of a wavelength that would suit the high-power requirements. They hoped soon to lay a scheme before Dail Eireann for the future development of broadcasting in the Free State.

According to the " Financial Times " the British Broadcasting Corporation engineers, on the night of October 9th, witnessed a demonstration of Mr. J. L. Baird's television apparatus, but no decision was arrived at regarding broadcasting with this invention. It is expected that private experiments of the broadcasting of television will be made from one of the B.B.C. transmitting stations in the near future.

### MERCHANDISE MARKS.

The Standing Committee (General Merchandise) appointed by the Board of Trade will hold inquiries on November 5th and 6th, and, if necessary, November 12th and 13th, at 11.30 a.m. and 10.30 a.m. respectively, as to whether various imported rubber manufactures including vulcanite, ebonite and manufactures thereof should bear an indication of origin.

Inquiries will be held later as to whether imported vacuum cleaners, wireless receivers, components and accessories, should also be marked.

The inquiries will be held at the Board of Trade Offices, Great George Street, London, S.W.1. Communications should be addressed to the Secretary, Mr. E. W. Reardon, at that address.

*THE window of Walker Brothers, Quality House, Temple Row, Birmingham, which was awarded one of the first prizes in the Ever-Ready Battery Window Competition. The names of the other prize winners are given above, while on page 443 are shown further pictures of winning windows.*

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# BUSINESS ITEMS.

MR. W. V. Fairhurst, electrician, has opened new electrical showrooms at 205, Duckworth Street, Darwen.

Metro-Vick Supplies, Ltd., announces that the price of the full-wave rectifying valve, S.P. 42/U, has been reduced.

H. S. Phillips and Co., electrical engineers, of 30, The Boulevard, Weston-super-Mare, have taken over the business of Mr. G. Pope, of Prospect Place, Boulevard, Weston.

The Wellington, N.Z., branch of the British General Electric Co., Ltd., has been moved from Empire Buildings, Willeston Street, to the N.Z. Automobile Chambers, Taranki Street.

The British Thomson-Houston Co., Ltd., has opened a new Mazda Lamp stores and trade counter at 130, George Street, Edinburgh, to which all orders for lamps from the Edinburgh district should henceforth be sent.

Philips' Lamps, Ltd., have prepared a special radio window display for the present season. The size of the screen is 4 ft. 6 in. wide, by 3 ft. 6 in. high, and the display may be obtained upon application to either the local branches of the company or to the Publicity Department in London. The display is reproduced on page 442.

We are asked to point out that it has come to the knowledge of the Electric Heating Co. of George Street, Croydon, that statements are being made to the effect that it is unable to deliver "Elect" irons against customers' orders. The company requests customers to note that there is no foundation for the statements.

The Alton Battery Co., Ltd., announces the recent receipt of orders for batteries, ranging in capacity up to 6 450 Ah, for Avenue, Amherst, St. Albans, Malden, Paddington, Portsmouth, Ashton, Leicester (repeater station), Primrose Hill, Aldershot, and Leith telephone exchanges. We are informed that during the last month orders were received for four batteries for Foochow, China; four for Harbin, Manchuria; two for Changchow, China; three for Ceylon and one each for India and Malay States.

We are informed by Howden Ljungstrom Preheaters (Land), Ltd., that they have recently secured the third repeat order from the Shanghai Municipal Council for air preheaters for the Riverside power station in that city. The contract calls for four preheaters of the rotary regenerative type. Each preheater is to be installed on a 100 000 lb. boiler, and brings the total of preheaters of this type up to 11 in the Shanghai power station. The company have also secured a contract for the supply of a preheater to the Neasden station of the Metropolitan Railway.

John Shaw and Sons, Wolverhampton, Ltd., have added to their domestic electrical appliances departments, a section devoted to lighting fittings. In connection with this new business, large showrooms have been opened at 29/30, Shoe Lane, London, E.C.4., where the trade may inspect practically the whole range of the company's products. We are informed by Mr. A. G. Jones, manager of the electrical department, that John Shaw and Sons have published a special window display in connection with vacuum cleaners, and this, together with numerous sales aids, may be seen in Shoe Lane. A Photograph of the new premises is reproduced on this page.

Metro-Vick Supplies, Ltd., points out that the Company's exhibit at the Manchester Radio Exhibition must necessarily be on much the same lines as Olympia, with the exception, possibly, of some more recent development in Cosmos valves. As before, the leading exhibits will consist of mains-operated sets, d.c. or a.c., 3, 4, and 5 valve; portable sets; Cosmos valves; elastic aerial units; eliminators of all kinds, including model "B" arranged for l.t. h.t., and g.b. for operation off a.c. mains; new moulded resistance coupling units, and other components. The stand will be carried out in blue and silver, with illuminated coloured glass panels to the counters, and will be brilliantly flood-lighted.

In connection with the Lincoln Electricity Exhibition which will be open from to-morrow until October 27th, the British Thomson-Houston Co., Ltd., points out that stand No. 17 represents a shop window equipped with apparatus for demonstrating window lighting. A feature of the demonstration will be the use of automatic colour changing. The equipment consists of twenty-four 200 W gasfilled lamps in X-ray reflectors fitted with blue, red and amber colour screens. The colours are arranged on three different circuits, each circuit being connected to a separate disc of the colour mixer. This colour mixer, driven by an electric motor, continually changes the colour of the lighting, producing an almost infinite variety of colour combinations. The X-ray reflectors control the distribution of the light given by the lamps and direct it on to the goods.

The General Electric Co., Ltd., draws attention to the enterprise of the Ironbridge Petrol Depot, Uxbridge Road, Southall, on the main London-Oxford Road. The approaches

The interior of the fittings showrooms of John Shaw & Sons, Wolverhampton, Ltd., which have recently been opened in London.

to the station are illuminated by floodlight projectors, mounted on columns, some 27 in. above the level of the road, and are fitted with hoods to direct the light to the runways. The side walls of the building are white rough-cast, and are illuminated by 100 W gasfilled lamps in inconspicuous floodlights, set in the flower beds. "Geco" vitreous enamelled steel dispersive reflectors, fitted with 200 W sprayed lamps, are recessed into the false ceiling over the covered portion of the roadway, into which cars are driven. Two "Wonlite" signs, with 18-in. letters, duplicate the word "Petrol," back to back, on top of the roof of the covered roadway. Messrs. A. J. Perkins, 225, Boston Road, Hanwell, W.7, were responsible for the installation, which is regarded as quite a new departure n petrol station lay-out.

## WILLESDEN'S NEW TARIFF.

### Encouraging the Public in Off-Peak Load.

WILLESDEN U.D.C. Electricity Department has adopted, as from the September meter readings, certain new charges which should prove attractive to domestic consumers. All current consumed is to be charged at ¾d. per kWh, but there is a service charge based upon the number of lamps included in the installation. These range from a minimum of 3s. per quarter in summer, and 4s. per quarter in winter for 4 lamps, and each additional lamp installed involves an addition to the service charge, the highest number of lamps referred to in the printed tariff being 22, for which the summer and winter quarterly service charges are £1 5s. and £1 15s., respectively, but particulars of larger installations will be supplied. The general tendency is to make a greater increase in the charge per additional lamp in the case of larger installations than in the case of smaller installations; for instance, an increase in the number of lamps from 4 to 5 involves, under the summer tariff, an increase of 9d. in the service charge, whereas an increase from 20 to 21 lamps entails an increase of 3s. Consumers have the option of continuing on the old m.d. rates, viz., 4d. and 1d., with a minimum charge. The Council also offers to provide an electric water heating tank of not less than 10 gallons capacity, and to supply an agreed quantity of energy for an agreed charge for lighting and water heating; without a meter, any additional supply for heating or cooking, etc., to be supplied through a meter at ¾d. per kWh. The following are examples of the application of this system: (1) Energy required for lighting 160 W, maximum load on water heater (10 gallon) 240 W, charge per week, 2s. 10d.; (2) energy required for lighting, 280 W, max. load on water heater (25 gallon) 420 W, charge per week, 4s. 6d. The heating energy is reduced by automatic apparatus as the lighting is increased, and increased as the lighting is reduced. Hot water tanks can also be hired upon inclusive terms covering cost of units, the smallest being a 10-gallon tank, with 200 W loading, at 2s. 6d. per week.

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# WESTERN CENTRE I.E.E.

## The Question of Unemployment and the National Electricity Scheme.

THE first meeting of the session was held on October 8th, at the Merchant Venturer's Technical Cottage, Bristol, when Mr. W. J. Bache, borough engineer, Cheltenham, was installed as chairman, and gave his inaugural address. Supporting him were Ald. C. H. Margerett (Mayor of Cheltenham) and Mrs. Margerett.

In his address, Mr. Bache said that the Centre looked forward to a useful period of work. The national re-organisation of electricity supply was now well afoot, and it would continue to occupy the attention of the supply industry for some time. One result would be the closing of a large number of the present generating stations, and this would prove beneficial to consumers, as all the labour, skill, and capital now expended on generation would then be devoted to distribution, salesmanship, and service. Distribution was already receiving a greater measure of attention and consideration, which would result in an increase of knowledge, and experience, leading to greater efficiency and economy.

An important effect of the closing of generating stations was the displacement of the staffs employed in them, and, while it might not be possible for electricity supply undertakings as a whole to make any substantial response to the Prime Minister's recent appeal to employers to provide additional employment, they could play their part by abstaining from adding to the amount of unemployment when their stations were closed through a scheme of re-absorption of the displaced labour.

In this connection a scheme of transference from one undertaking to another would be helpful, and the report of the Industrial Transference Board, who had recently studied the transfer of unemployed miners, contained many suggestions which might be of assistance to the electricity supply industry. But if the employers did their part, the staffs must assist by qualifying themselves for the new duties, for while the general principles and theory of electricity and physics were common to all branches of electricity supply, the specialised knowledge and experience of each branch differed, and they must qualify themselves to undertake new duties and different work. Facilities might be afforded for generation engineers to obtain experience with cable work, sub-stations and on the commercial side. This had been done in his own undertaking with useful results.

It was, however, important to commence this educational work now in anticipation of the change, and he gave statistics showing that with goodwill and reasonableness on both sides, it should be possible to re-absorb a considerable proportion of the displaced engineers.

It was, however, necessary to warn students and others who proposed to enter on electricity supply work that for some years the available number of vacancies would be small, and he advised them to turn their attention to other branches of electrical work, where the new openings would be more numerous and the chances of promotion greater.

# ILLUMINATION COURSES.

## Opening of Eighteenth E.L.M.A. Illumination Design Course.

THE first lecture of the eighteenth Illumination Design Course conducted by the E.L.M.A. Lighting Service Bureau was given at 7.30 p.m. on Wednesday, October 10th, at 15, Savoy Street, W.C.2. An audience of some 170 representatives of all branches of the electrical industry had assembled by the time the proceedings were opened with a brief address by Mr. C. A. Hughes, vice-chairman of the E.L.M.A. Sales Committee, who presided. After extending a welcome to all present he pointed out how past experience had proved the value of these courses in assisting the industry as a whole to keep pace with the advancement of modern lighting progress and in bringing its service before the public. Mr. W. J. Jones then delivered his lecture entitled "Light and Visibility."

On Wednesday the subject of "Illumination Design Data" was dealt with by Mr. W. Imrie-Smith.

The annual dinner of the South Midland Centre of the I.E.E. will be held on November 30th, at the Grand Hotel, Birmingham.

# REDUCTIONS OF CHARGES.

## Many Concessions to Encourage Heating, Cooking and Power Loads.

THE following reduced charges for electricity are announced: *Bethesda*, power 2d., instead of 4d. *Cardiff*, lighting, flat rate, 3¾d., m.d. system, 3¾d. and 1⅛d., prepayment system, 4½d., late shop window lighting, 1⅞d., public lighting, all night, £30 17s. 6d. per kW, till midnight, £20 17s. 6d.; heating, winter quarters, 1d., summer quarters, ⅞d., or ⅞d. all the year round where cookers are installed; power, flat rate 1⅛d., m.d. system, 1⅛d. for first 350 kWh per quarter per kW demanded and 7/16d. per kW for all over (applicable to consumers taking between 2 500 and 25 000 kWh per quarter); bulk, with coal at 10s. per ton, l.t., £3 17s. 6d. per kW, or £3 2s. per kVA, plus 0·29d. per kWh; l.h.t., £3 10s. 6d. per kW., or £2 16s. 6d. per kVA, plus 0·28d. per kWh; vehicle charging (private charging stations), ⅜½d.; domestic supplies, all-in tariff, 12½ per cent. of rateable value, plus ⅝d.; bakers' ovens, off peak, 11/16d. *Warrington*, lighting, 4½d. per kWh for first 1 000 per quarter, instead of 5d.; 4d. per kWh for all in excess of this quantity; small power, 2½d. per kWh for first 1 000 per quarter; and 1½d. per kWh for all in excess; rateable value system (domestic), 12½ per cent. of rateable value, plus ½d. per kWh; motor rents reduced from the pre-war charge, plus 20 per cent. to pre-war charge; discount of 5 per cent. for prompt payment to apply to all accounts.

### Further Reductions.

*Wimbledon*, cinemas, all kWh supplied in excess of 40 000, at 2d. per kWh. *Ilford*, lighting, flat rate, 4d.; m.d. rate, 6d. and 1d.; power, first 1 500 kWh per quarter, 2d. per kWh, with sliding scale to 1·2d. per kWh for over 100 000 per quarter; heating and cooking, 1d. *Wrexham*, lighting, up to 250 kWh per quarter, 6d. per kWh; 250 to 1 000, 5½d.; 1 000 to 2 000, 4½d., beyond, 2½d., with discount of 5 per cent., for prompt payment; lighting, heating and other domestic purposes, 20 per cent. of rateable value, plus ⅜d. per kWh, less 5 per cent.; shops and business premises using over 250 kWh per summer quarter, and over 500 per winter quarter, a rental of 2s. 6d. per summer quarter and 6s. per winter quarter for each 100 W lamp, or equivalent, plus 2½d. per kWh, less 5 per cent; after-hours shop window lighting, 2d., slot meters, 7d., heating and cooking 1½d., less 5 per cent.; power, 2½d. per kWh up to 500 kWh per quarter, 1 000 kWh 2d. per kWh, up to 10 000 kWh per quarter 1½d. per kWh, discount 5 per cent. *Weald Electricity Supply Co., Ltd.*, flat rates, 11d. for lighting; 4d. for heating and power; 3d. for cooking and water heating, and shop window lighting between 6 and 9.30 p.m.; alternative tariff for lighting, heating, cooking and domestic supplies, 2d., with the following standing charges: on cottage property, of net rateable value not exceeding £15, 1s. per week; dwelling houses, 1s. 6d. per quarter each £1 of net rateable value; business premises, quarterly standing charge of 1s. 6d. for each £2 of gross rateable value; commercial power users, quarterly standing charge of 12s. 6d. per H.P.; domestic power users, quarterly standing charge of 12s. 6d. per H.P.; cinematograph projectors, etc., quarterly standing charge of £2 10s. per kVA of maximum demand. *Beckenham*, lighting, flat rate, 5d. per kWh, instead of 6d.; all-in system, annual charge on rateable value, 10 per cent. instead of 12½ per cent.; shops, factories and business premises, flat rate 4½d., instead of 6d.; heating, 1½d., instead of 2d. per unit; outside and inside ship window lighting, 3½d., instead of 4d.; new tariff for window lighting after closing hours, 2d.; hospitals, charitable institutions, clubs, and public buildings, 4½d., instead of 5d., with 1½d. per kWh for heating, electric water heaters and refrigerators included in the cooking rate of 1d.; fixed price light (limiter) consumers are offered alternative scale of 1s. per week, plus 1½d. per kWh. *Grays*, power, first 500 kWh per quarter, 2½d., instead of 3d. per kWh, heating, 1½d., instead of 3d.; alternative tariff to private houses, for lighting, heating, cooking, etc., 10 per cent. of rateable value, plus 1½d. per kWh. *Crewe*, lighting 4d., instead of 4½d., less 2½ per cent. for prompt payment. *Sutton Coldfield T.C.*, where electricity is used for lighting and heating or cooking, fixed charge based on rateable value (payable in each quarter), 15 or 12½ per cent., plus 1½d. per kWh in winter quarters, and 1d. per kWh in summer; lighting, under 750 kWh per quarter, 5½d. per kWh, 751 to 2 000 kWh, 5½d.; over 2 000 kWh, 4d. *Torquay T.C.*, heating places of worship and schools, ⅞d., less 5 per cent. instead of 1d., less 5 per cent., through separate meter.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

GLASGOW PARISH COUNCIL, October 20th.—Twelve months' supply of electric fittings (item 62) and electric lamps (item 62A). Forms of tender, etc., from Mr. M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

TEMPERANCE INSTITUTE, LISBURN, October 20th.—Electric light installation, including fittings, etc. Further particulars from Hon. Secretary.

DARTFORD URBAN DISTRICT COUNCIL, October 23rd.—Renewal of permanent way on portions of light railways. Specification, etc., from Mr. A. J. Abraham, Tramways Manager, Broadway, Bexley Heath.

LONDON COUNTY COUNCIL, October 23rd.—Electric wiring and fitting of two blocks of dwellings, comprising some 32 tenements, on East Hill estate, Wandsworth (229 points). Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1 ; deposit £1 1s.

SOUTHWARK (LONDON) BOROUGH COUNCIL, October 23rd.—Supply of electric cables during 12 months ending November 30th, 1929. Further particulars from the Electrical Engineer, Electricity Works, Penrose Street, Walworth Road, S.E.17.

OLDBURY EDUCATION COMMITTEE, October 27th.—Electrical installation at Bristnall Hall Lane Public Elementary School. Specifications, etc., can be seen at Engineer's Department, Council Offices, Oldbury.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, October 29th.—Overhead distribution scheme (Contract No. 43). Specification, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire ; deposit 10s. 6d.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., October 29th.—Insulation and refrigeration of approximately 100 000 cu. ft., with compressors, electric motors, etc., at the Fruit Storage Testing Station, East Malling, Maidstone. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1 ; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, October 31st.—Automatic telephone system, at High Wood Hospital for Children, Brentwood. Specification from the office of the Board, Victoria Embankment, E.C.4 ; deposit £1.

ROCHDALE CORPORATION, October 31st.—Wiring installation work for 12 months, by registered electrical installation contractors. Tenders to the Engineer and Manager, Electricity Works, Rochdale.

BRADFORD CORPORATION, November 10th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, porcelain insulators, controller contacts, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

LONDON COUNTY COUNCIL, November 12th.—Four electrically-driven sewage-pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc. ; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1 ; deposit £5.

ROCHDALE CORPORATION, November 13th.—Supply of single-phase prepayment meters for twelve months. Specifications from Mr. F. H. Rudd, Electricity Works, Dane Street, Rochdale.

STOKE-ON-TRENT CORPORATION, November 14th.—Overhead wiring and services to 64 new houses on Sutton estate, Trent Vale. Specification, etc. (£2), from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent.

ROCHDALE CORPORATION, November 17th.—Supply and installation of 12 000 kVA, three-phase, 32 000/6 400 V transformer, with boosting transformers and necessary switchgear, at the power house, Dane Street, Rochdale. Specification, etc., from Mr. F. H. Rudd, engineer and manager, Electricity Department.

LONDON COUNTY COUNCIL, November 19th.—Supply of (1) about 5 590 tons of tramway track rails, guard rails and fishplates (Section A) ; about 150 tons of bolts and nuts (Section B) ; and about 450 tons of slot rails (Section C) ; and (2) about 1 025 tons of conductor tee rails. Specifications, etc., from General Manager, L.C.C. Tramways, Victoria Embankment, W.C.2 ; deposit £2 in each case (Nos. 1 and 2).

WEST RIDING EDUCATION COMMITTEE, November 20th.—Electric lighting installation at Bentley New Middle School. Specifications, etc., from the Education Department, County Hall, Wakefield.

### Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

RANGOON MUNICIPALITY, October 19th.—Supply of instruments and apparatus for installation of street fire alarms on closed circuit principle. Specification, etc. (10s. per set), from Messrs. Ogilvy, Gillanders and Co., 67, Sun Court, Cornhill, London, E.C.3.

WATERFORD HARBOUR COMMISSIONERS, October 19th.—Supply of 20-ton electrically operated hoisting and slewing travelling crane. Specification (21s.) from the Harbour Engineer.

*AS part of the ceremony, on October 6th, at the Festival Service at Newchurch Kenyon Parish Church, which has recently been wired for electric light, was the presentation by Mr. John Bowyer, the manager of Callender's Cable and Construction Co., Ltd., of a silver gilt replica of a mediæval chalice to Lord Derby as a memento of the occasion. Lord Derby, thanking the donors for the gift, handed it to the rector to be kept as a memorial. The cup is a copy of one in the possession of the Dean and Chapter of Rochester Cathedral, made in 1528. As seen in the photograph, the chalice or tazza is a very fine reproduction of mediæval art. Note the cable sections inlaid in the lid.* *See page* 445.

VICTORIAN ELECTRICITY COMMISSION, October 22nd.—Transformers and spares, for Yallourn power station and Richmond terminal station (specification 28/44). (Reference B.X. 4 637.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 23rd.—Insulated wire. (Reference B.X. 4 674.)

INDIAN STORES DEPARTMENT, October 24th.—Motor generator and switchgear for Delhi Fort (Order No. N. 8979). (Reference B.X. 4 792).

PORT ELIZABETH MUNICIPALITY, October 25th.—Steel cross arms for transmission line. (Reference A.X. 6 892.)

PORT ELIZABETH'S MUNICIPALITY, October 25th.—Transformers. (Reference B.X. 4 760.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, October 25th.—Supply of two 6½ kW crude oil driven generating sets.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., October 26th.—Supply of gasfilled and vacuum lamps. Specification, etc. (10s., not returnable) from the company's offices, The White Mansion, 91, Petty France, Westminster, S.W.1.

DURBAN MUNICIPALITY, October 26th.—Supply of single-phase transformer. (Reference B.X. 4 762.)

DURBAN MUNICIPALITY, October 26th.—Supply of 10 single-phase and two three-phase transformers. (Reference B.X. 4 761.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

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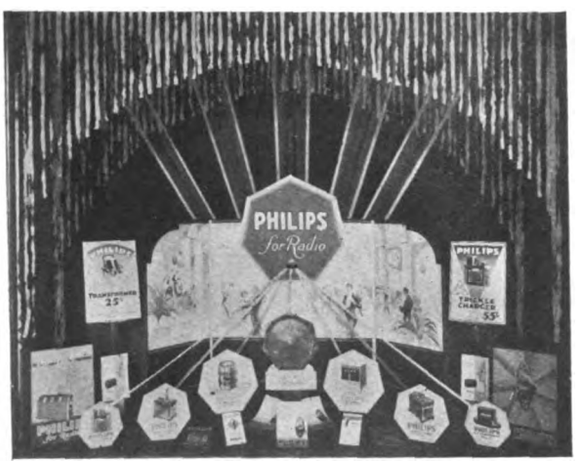
MELBOURNE CITY COUNCIL, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944). (Reference B.X. 4 698.)

SOUTH AFRICAN ELECTRICITY SUPPLY COMMISSION, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)




*THE special radio window display which has been prepared by Philips' Lamps, Ltd. Details are given on page 439.*

ANGORA RAILWAYS AND PORTS DEPARTMENT, October 30th.—Supply of overhead electric travelling crane. (Reference A.X. 6 954.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

BANKS PENINSULA (N.Z.) ELECTRIC POWER BOARD, October 31st.—Supply of transformers. (Reference B.X. 4 801.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water-tube boilers with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of six induction voltage regulators. (Contract No. 55.) (Reference B.X. 4 768.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of truck type switchboard cubicles (contract No. 54). (Reference B.X. 4 782.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of transformers (contract No. 53). (Reference B.X. 4 783.)

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

DUBLIN CORPORATION, November 3rd.—Supply of (1) electric cookers; and (2) meter boards, house service fuses and automatic cut-outs. Specifications (5s. for each) from City Electrical Engineer, Fleet Street, Dublin.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, November 5th.—Supply and erection of switchgear and two transformers, each 5 000 kVA (38 000/10 000 V) for the Shannon transformer station at Milltown, Co. Dublin. Specification, etc., from Mr. P. J. Dempsey, secretary, Electricity Supply Board, 60–62, Upper Mount Street, Dublin; deposit £5.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Supply of 22 000 V armoured type switchgear. (Reference B.X. 4 763.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Steel lattice towers, with cross arms, insulators, etc. (Reference A.X. 6 897.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically-driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step grates and accessories, for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 13th.—Supply of transformers. (Reference B.X. 4 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362). (Reference B.X. 4 396.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Supply of switchboard keys and parts (schedule C. 362). (Reference B.X. 4 752.)

MELBOURNE CITY COUNCIL, November 14th.—Supply of totally enclosed, metal clad type switchgear and spares (specification 952). (Reference B.X. 4 748.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

INDIAN STORES DEPARTMENT, November 15th.—Motor alternator, testing transformer, and induction regulator controller, for Government Test House, Calcutta (Order No. N. 5 217/1). (Reference B.X. 4 790).

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of galvanised wire and aerial cable (tender No. 132). (Reference A.X. 6 950.)

WINNIPEG MUNICIPALITY, November 19th.—Supply of two 10 000 kVA and two 450 kVA generators, for Slave Falls, Manitoba. (Reference B.X. 4 791).

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 749.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737.)

JOHANNESBURG MUNICIPALITY, November 22nd.—Supply of tramcar axles and gear wheels (Contract No. 67). (Reference A.X. 6 985).

JOHANNESBURG MUNICIPALITY, November 22nd.—Supply of electric lamps (Contract No. 65). (Reference B.X. 4 794).

EGYPTIAN MINISTRY OF THE INTERIOR, November 24th.—Electric light installation, for Sohag. (Reference B.X. 4 777).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of indicators (schedule C. 371). (Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). (Reference B.X. 4 753.)

VICTORIAN RAILWAY COMMISSION, November 28th.—Supply of 10-ton overhead electric crane. (Contract No. 42 090.) (Reference A.X. 6 951.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

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SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of 7-ton electrical overhead travelling crane (tender No. 1 347). (Reference A.X. 6 989.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

## Tenders Accepted.

EARBY URBAN DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., supply of electric cables, £444 per 1 000 yards.

MANCHESTER CORPORATION.—British Thomson-Houston Co., Ltd., tramcar motors; General Electric Co., Ltd., tramcar motors and controllers.

BATTERSEA (LONDON) BOROUGH COUNCIL.—British American Laundry Machinery Co., Ltd., supply of one 30 in. and four 26 in. electric hydro extractors, £797. (Recommended.)

LEEDS CORPORATION.—Supply of cables: W. T. Henley's Telegraph Works Co., Ltd., £4 371 12s.; Enfield Cable Works, Ltd., £5 460; and Macintosh Cable Co., Ltd., £7 308.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Supply of cable, Pirelli-General Cable Works, Ltd., £1 563 14s.; Hackbridge Cable Co., Ltd., £56 15s.; Greenwich Cable Works, Ltd., £294 10s.

STOKE-ON-TRENT CORPORATION.—English Electric Co., Ltd.—Switchgear for control of electricity supply to Stone, £15 000; District Transmission Lines, supply and erection of e.h.t. cable.

COLCHESTER CORPORATION.—English Electric Co., Ltd., 300 kVA transformer, £280; Electric Construction Co., Ltd., three feeder panels and one three-phase draw-out truck type cubicle, £827.

LLANDUDNO URBAN DISTRICT COUNCIL.—Bruce Peebles and Co., Ltd., supply of motor converter, £2 190; W. T. Henley's Telegraph Works Co., Ltd., cables, transformer kiosks and feeder pillars, in connection with extension scheme, £9 852 7s. (Both recommended.)

PORTLAND URBAN DISTRICT COUNCIL.—Yorkshire Electric Transformer Co., Ltd., supply of transformers, £1 206; Measurement, Ltd., supply of meters, at schedule prices; Pirelli General Cable Works, Ltd., laying underground cable and erecting overhead lines, £6 191 17s. 9d. (All recommended.)

# WORK IN PROSPECT.

ARUNDEL.—Houses (10), for the Town Council. Particulars from the contractor, Mr. H. J. Jenkins, Littlehampton.

CANNOCK.—Housing scheme (22), for the Urban Council. Particulars from the architect, Mr. S. Harrison.

CASTLEFORD.—Conversion of premises into maternity hospital for the Urban Council. Particulars from the architect, Mr. Fred Scatchard, Midland Bank Chambers.

DAVENTRY.—Housing scheme (10), for the Rural Council. Particulars from the Surveyor.

EAST PRESTON.—Housing scheme (16), for the Rural Council. Particulars from the surveyor, Mr. H. R. Judd, 72, South Terrace, Littlehampton.

GRANTHAM.—Housing scheme and police station, etc., for the Town Council. Particulars from the Borough Surveyor.

LUDLOW.—Housing scheme (20), Craven Arms, for the Rural Council. Particulars from the Surveyor.

NEWPORT (SALOP).—Houses (12), for the Urban Council. Particulars from the contractors, Purshouse and Gregory, Wednesfield.

READING.—Cinema Theatre, Russel Street and Oxford Road, for Mr. R. Fort.

RYE.—Houses (12), Udimore Road, for Mr. J. Ashenden.

SALFORD.—Church, Langworthy Road, Pendleton, for the Welsh Wesley Trustees. Particulars from Rev. Rhys Jones.

STAFFORD.—Housing scheme (62), for the Town Council. Particulars from the borough engineer, Mr. W. Plant.

SWANAGE.—Houses (54), for the Urban Council. Particulars from the contractors, John Parsons and Sons.

TORQUAY.—Extensions, Isolation Hospital, to cost £11 700, for the Town Council. Particulars from the Borough Surveyor.—Additional housing scheme for the Town Council. Particulars from the Borough Surveyor.

TROWBRIDGE.—Creamery, Wyke Road, for the Mid Wilts Creameries.

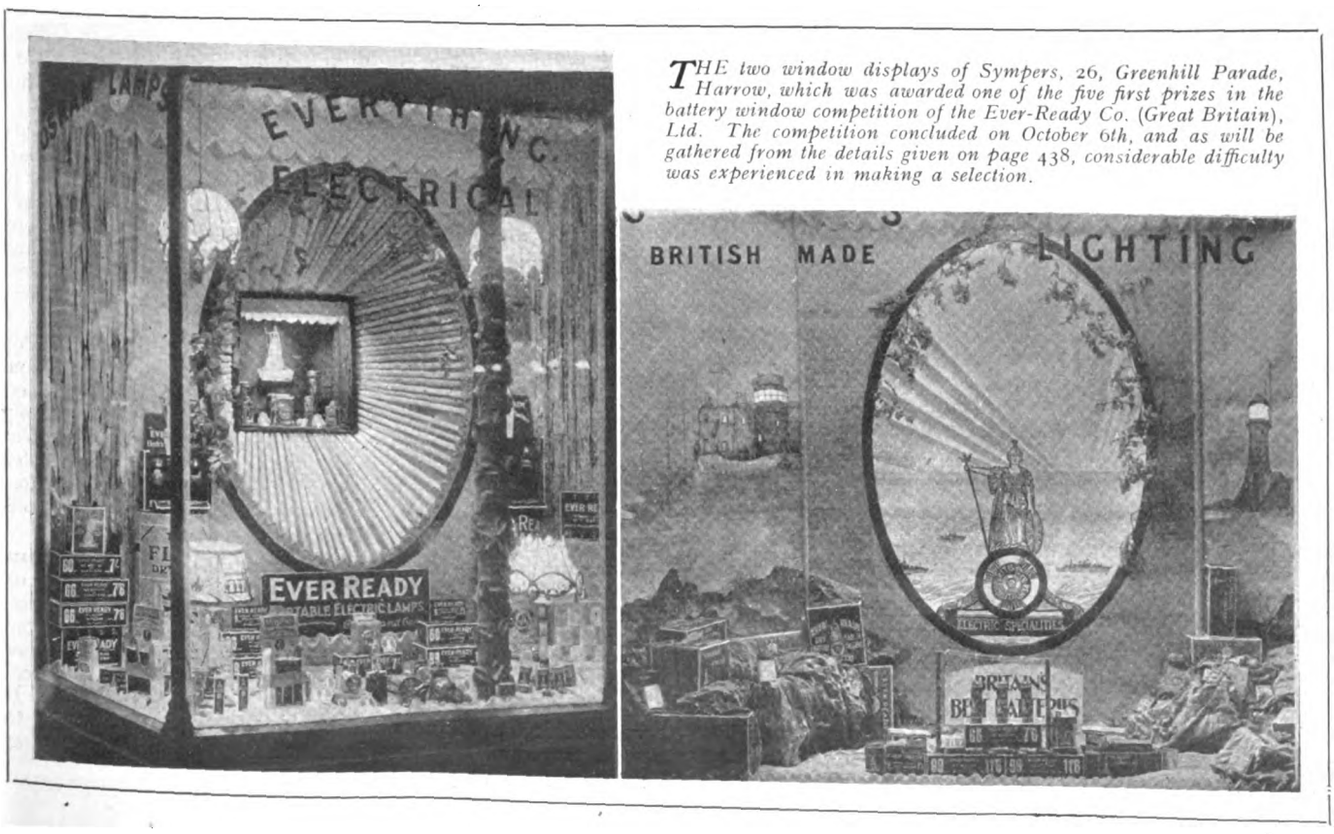
WELLINGTON (SOMERSET).—Housing scheme (16), for the Urban Council. Particulars from the Surveyor.—Housing scheme (26), for the Rural Council. Particulars from the surveyor, Mr. A. H. Richards.

WESTBURY (WILTS).—Extensions, Laverton Institute, to cost £1 586, for the Urban Council. Particulars from the contractors, Holdoway and Sons.

WIGAN.—Showrooms, offices, etc., to cost £6 000, for the Town Council. Particulars from the Borough Surveyor.

WOLVERHAMPTON.—Gramophone works, for the Symphony Gramophone and Radio, Ltd.

YEOVIL.—Additional 120 houses, for the Rural Council. Particulars from the Surveyor.




*THE two window displays of Sympers, 26, Greenhill Parade, Harrow, which was awarded one of the five first prizes in the battery window competition of the Ever-Ready Co. (Great Britain), Ltd. The competition concluded on October 6th, and as will be gathered from the details given on page 438, considerable difficulty was experienced in making a selection.*

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# ELECTRICITY SUPPLY.

## Proposed New Power Station at Eastbourne—Barnes and the J.E.A.—Stamford Corporation to Acquire Electricity Undertaking—New Turbo-Generator for Halifax—Hull Power Station Extensions.

HORNSEY Electricity Committee has authorised mains extensions to cost £1 000.

Sheffield Electricity Committee has authorised mains extensions at a cost of £8 000.

Thakeham R.D.C. will oppose an electric light scheme submitted by the Steyning Electric Light Co.

Cannock U.D.C. has applied for a loan of £7 500 for the extension of the overhead mains to Penkridge.

Warrington Electricity Committee seeks sanction to borrow £20 000 for mains and services.

Leeds Electricity Committee has authorised the purchase of a further 5 000 prepayment meters.

Brighton Lighting Committee has voted £5 000 for lighting improvements in London Road and Dyke Road.

Hastings Electricity Committee has agreed to extend the overhead line to the Pelsham estate, at a cost of £1 000.

The Central Electricity Board is negotiating with Eastbourne Corporation regarding a site for a new power station.

Turton U.D.C. has obtained an Order to supply electricity to its sewage works at Eagley, in the area of Bolton Corporation.

Preliminary steps have been taken to secure a Ministry of Transport inquiry into the charges for electricity at Leamington.

Grimsby Electricity Committee seeks sanction for a loan of £1 400 for the supply of electricity to the Yarborough Road district.

Barnes U.D.C. at its last meeting, decided against the transfer of the electricity station to the Joint Electricity Authority.

East Ham Corporation has decided that in future all streets now lighted by gas shall be converted to electricity when the cable is laid.

Rhyl U.D.C. on Monday affixed its seal to agreements for loans, including £30 380 for the extension of the electricity undertaking.

A company has offered to fix smoke prevention apparatus on the chimney at Bradford Corporation's Valley Road power station, on approval.

Antrim R.D.C. has given its assent to the Antrim Electric Light and Power Co.'s application for an Order to supply electricity in the town.

The Canadian Federal Cabinet has granted a thirty-year lease of the Seven Sisters power site on the Winnipeg river to the Winnipeg Electric Co.

East Grinstead U.D.C. has applied for an Order to supply electricity to premises at Felbridge and Baldwins Hill, in the area of Godstone R.D.C.

Brechin T.C. has decided to persist in its opposition to the route proposed by the Grampian Electricity Supply Co. for its cables through the town.

Darlington T.C. has applied for a loan of £9 200 for reconstructing the boiler house and extending the coal and ash conveyors at the electricity works.

Stamford T.C. has decided, subject to the Electricity Commissioners' approval, to purchase the Urban Electric Supply Co.'s electricity undertaking in the town.

Norwich U.D.C. has agreed to support the application of the Bolton Electricity Committee for an Order to supply electricity in the Smithhills Dean district.

Canterbury Corporation has received the Commissioners' consent to the expenditure on works of a capital nature of a sum of £12 599, part of the surplus revenue for the past two years.

The Scottish Southern Electricity Supply Co., which is taking over the Jedburgh electricity undertaking, has promised to reduce all the charges for electricity, with the exception of street lighting.

Walton-on-Thames U.D.C. is to carry out extensions of mains in Molesey Road in connection with 50 houses being erected by the Council.—The Electricity Commissioners have sanctioned the borrowing of £6 500.

Batley T.C. has received sanction to a loan of £3 000 for extensions of mains and services.—The Commissioners have been asked for permission to change over from d.c. to a.c. in the Mount Pleasant and Taylor Street districts.

Stoke-on-Trent Electricity Committee is to lodge an objection to the application of the Power Development Co. for a Special Order for Cheadle and district.—The Committee has approved terms for the bulk supply to Leek U.D.C.

Specifications are practically completed for a new 6 500 kW turbo-generator, with auxiliaries and equipment, for the Halifax electricity works. Tenders are to be invited shortly, and the scheme provides for an expenditure of £150 000.

Westminster C.C. Lighting Committee recommends a renewal for one year of the contract with the Charing Cross Electricity Supply Co. for lighting the St. Martin's district and part of the Strand, at the existing rate of £42 per unit per annum; total £5 208.

Carlisle Corporation has asked the Electrical Engineer to obtain tenders for his scheme for the provision of electric lighting at the covered markets.—The Electricity Committee is to apply for a loan of £967 for mains extensions and the provision of two sub-stations.

Battersea (London) Electricity Committee has authorised electricity services to 127 premises at a cost of £1 172; mains extensions for private services, £433; extensions for lighting and conversion of gas lamps, £95; and replacement of old v.b. distributors by armoured cable, £1 120.—The Committee is seeking sanction for a loan of £24 500 for laying electricity mains.

The Electricity Commissioners have asked for further information regarding the application of Hull Electricity Committee for sanction for a loan of £481 500 for power stations extensions, but have sanctioned a loan of £250 000 so that the scheme may be proceeded with. The Committee has also received sanction to borrow £25 000 in connection with the assisted wiring scheme.

On Monday the Brompton and Kensington Electric Electricity Supply Co.'s Richmond Road generating station ceased to function as a generating station, and the reception of current from the London Electric Power Co. was commenced. The ceremony of stopping the last generator was performed by Mr. H. R. Beeton, chairman of the company, who inaugurated the station 30 years ago.

St. Pancras (London) Electricity Committee seeks sanction for a loan of £1 200 for the installation of a kiosk with distributing switchgear, transformers, etc., for the supply of current to L.C.C. dwellings in the Ossulston Street area.—The Committee has obtained sanction for loans of £4 833 for switchgear at King's Road station and Regent's Park sub-station and £1 440 for a new l.t. main from Tavistock Place sub-station to Upper Bedford Place.

The London and Home Counties Joint Electricity Authority has issued its first Electricity Supply Return. Particulars are given relating to electricity generation and supply in the district, including the undertakers authorised to supply electricity, and an analysis of the accounts of each undertaking. The area of the district is approximately 1 797 sq. miles, and includes the whole of the counties of London and Middlesex, and parts of the counties of Herts, Essex, Kent, Surrey, Buckingham, and Berks.

With regard to the proposed bulk supply by Croydon Corporation to Beckenham U.D.C. through the London and Home Counties Joint Electricity Authority, the Commissioners have not been able to satisfy themselves that the supply can be given more cheaply and economically by the Joint Authority than by the West Kent Co., and they have decided to refuse consent to the proposed supply by the Corporation.—The Electricity Committee is to change over more streets from gas lighting to electricity, at a cost of £1 180.

At last week's meeting of Preesall U.D.C., the chairman, Mr. D. Schofield, drew attention to the deficit on the electricity undertaking. He remarked that the Council had an expert adviser, but members of the Council had, in the past, put their judgment against his experience. The point had now been reached when, unless the price of current was raised, they would have to levy a rate on the whole township. It was decided to advance the public lighting rate from 8d. to 10d., prepayment meters from 10d. to 1s., and small power rates from 2d. to 4d.

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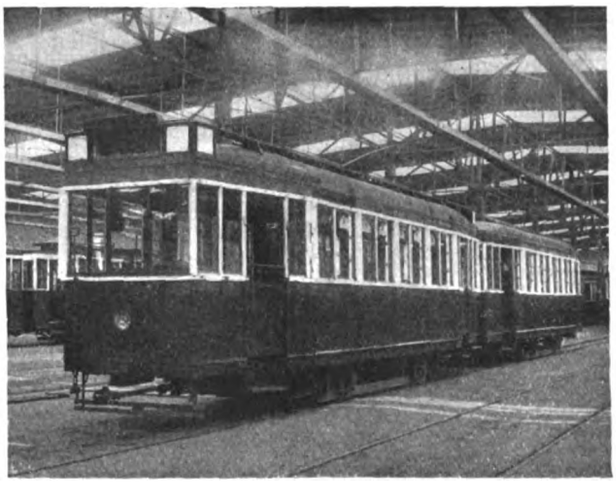
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

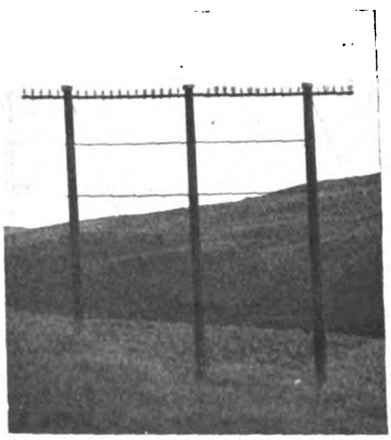
The names of the winners in the W. E. Highfield Shield Competition of 1928 are given on page 436, and above may be seen, in the centre, Mr. B. C. Garman, with Mr. G. H. Conway on the left, winners of the first and second prizes respectively in the Members' Section of the Association of Supervising Electrical Engineers. On the right is shown Mr. A. Simpson, the winner of the second prize in the Associates' Section.

Mr. J. Bowyer, of Callender's Cable and Construction Co., presenting a silver gilt chalice to Lord Derby on the occasion of the Festival Service at Newchurch Kenyon Parish Church, which has recently been wired for electric light. A larger picture of the cup, together with more details, is given on page 441.



A novel form of lighting which has been adopted for illuminating tramcars in Berlin during the special illumination period. The illuminations are intended to serve as an additional attraction to continental and other visitors, and are being supported by decorated window lighting and similar commercial displays.

An example of what can be done with floodlights. The scene is one in a park near Berlin, and represents a type of the night effects in that city.



A new type of telegraph post on a Scottish moor, built to withstand heavy weather. It is used wherever the lines cross exposed places.

The all-electric kitchen on board the airship "Graf Zeppelin." In appearance it resembles many of the kitchens associated with model electric houses.

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# CONTRACTORS' YEAR BOOK.

## Progress of the Electrical Contractors' Association of Scotland During the Past Year.

THE Electrical Contractors' Association of Scotland has just published the 1928/29 year book (price 3s. 6d. post free). This book contains in addition to details of the Scottish E.C.A., information concerning the Central Scotland Electricity scheme, specimens of various contracts and forms of tender applying in Scotland, together with details relating to various insurances. A list of architects in Scotland is given, together with the memberships of many of the various electrical associations. A page is devoted to details of the approximate power required to drive various machinery, while an extensive diary is also included. The book is a large and well-bound volume, and the diary section alone is of such ample space as to justify the price asked for. An alphabetical list of members, together with maps of the Central Scotland Scheme, the supply areas of Edinburgh and Lothians, Clyde Valley, and Glasgow, are given, while snapshots of the social activities of the Association, together with portraits of the officers are also included. The book also contains a list of the Scottish supply undertakings, a description of the technical side of the Association, regulations for contracts for building work, preliminary rules applicable to all trades, British standard specifications, etc.

*TO celebrate the opening of their new electricity and wireless department, James Howell and Co., Ltd., Cardiff, recently held a fourteen days' exhibition in the new demonstration showroom, a section of which is seen above.*

## CABLE SUBWAY FIRES.

### Jury's Finding in Inquiry into Recent Subway Fires.

THE jury which, under the provisions of the City of London Fire Inquests Act, had inquired in the cable subway fire at Victoria Embankment, London, on September 8th, expressed the opinion on October 10th in their verdict that the L.C.C. electric lighting system was obsolete and dangerous. They found that the fire was due to an accident—a defective London County Council cut-out or switch-box—and stated that they were not satisfied with the inspection-system of the London County Council. The jury added the following rider:—

"We are of the opinion that the London County Council electric lighting system is obsolete and dangerous. It should be replaced by an up-to-date system, thereby eliminating the danger of fire.

"The London County Council cable should have been overhauled more frequently by an expert after the flooding in January last, as the water affected the cables."

The fire occurred in the cable tunnel between Blackfriars and the Temple, and the results reported the next day were:

Eighty-five telephone junction groups out of use.

One thousand Central exchange and 400 City exchange subscribers' lines affected.

Telegraphic services temporarily disconnected.

The jury had also inquired into a cable tunnel fire on September 30th. Their verdict was that this outbreak was caused by defective insulation of the cable.

# ELECTRIC TRACTION.

## Proposed Extensions to the Electric Tramway on Southend Pier.

SOUTHEND T.C. is to apply for a loan of £22 500 for extending the loops to the central passing place on the Pier electric tramway.

Rotherham Corporation has decided to establish a parcel delivery department in connection with their tramway and railless 'bus services.

More than 20 tramway companies of the leading German cities are represented at the exhibition of electric railways now being held at Essen.

The income of Halifax tramways department for the past year was £195 662, and the net result of the year's working was a deficit of £513, compared with £23 434 for the previous year.

Pontypridd U.D.C. has decided to promote a Bill in Parliament authorising the substitution of motor 'buses or trolley vehicles for portions of the existing tramways as and when necessary.

Southgate U.D.C. has granted a request by the Underground Railways Co. for permission to sink a trial hole at Chase Side, Southgate, in connection with the proposed extension of the Tube railway from Finsbury Park to Southgate.

The revenue of George Town, Penang, electric tramway and trolley omnibus undertaking in 1927 was £34 989. Balance to net revenue account, £8 406, and balance to revenue surplus and appropriation account, after provision for sinking fund, redemption and interest, £1 482.

The total income of Bradford tramways department during the year ended March last was £715 487, an increase of £65 917. The gross surplus was £143 256, and the net profit £28 745. Car miles run were 9 411148 and passengers carried 112 367 506. The parcel department carried 701 145 parcels and the income was £12 152.

Ministry of Transport inspectors held an inquiry last week into Liverpool Corporation's proposal to construct an electric tramway, consisting of about 700 yards of double track, from the present Warbreck Moor terminus, through Sefton rural district, to the works of the British Enka Artificial Silk Co., where about 3 000 people are employed. The Automobile Association were the only opponents of the scheme.

## SWISS RAILWAYS.

### Interesting Details Given at Opening Meeting of the Junior Institution of Engineers.

AT the opening meeting of the winter session on October 5th, Mr. A. J. Simpson gave some interesting details of the equipment of three of the Swiss Alpine Railways, viz., the St. Gothard—Basle to Chiasso; the Engelberg Mountain Railway—Stanstead to Engelberg; and the Wengeralp and Jungfraujoch Railway, illustrating his remarks with a number of slides. The majority of the main line electric locomotives on the Swiss Federal Railways are driven by single-phase motors through transformers on a line voltage of 15 000. The transformers carried on the engines are oil-cooled, the circulating pipes being carried horizontally outside the engine cab. Details of the weights, speed and method of transmitting the motion of the motor armatures to the running wheels were given, the author stating that in his opinion the individual drive to the driving wheels would eventually supersede the gearing and connecting rod drive now fitted to the larger portion of the engines. It was noted that the average passenger locomotive of 1 350 H.P. weighing 91 tons was capable of drawing a passenger train of 300 tons at an average speed of 30 miles per hour, or a goods train of equal weight at a speed of 22 miles per hour on a maximum gradient of 26 per cent. The maximum speed of these engines being 75 miles per hour.

The latest type of Brown Boveri locomotive has individual driving by separate motors to each of the four pairs of driving wheels, the diameter of which is 5 ft. 6 in., the gear ratio being 2·5 to 1. The total weight of these engines is 117½ tons, of which 80 tons is available for adhesion. The transformer on the engine is of 2 500 kVA capacity oil-cooled, the oil being circulated through pipes carried under the running board on one side of the engine. An auxiliary transformer supplies current at 220 V for the train heating circuit and for lighting and for operating the speed control mechanism. The engine cab is warmed by 600 W heaters, four in all, and electrically-heated foot warmers are also provided.

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# COMPANY NEWS.

## County of London Shares Improve—Wireless Descriptions Weaken—Cable Manufacturing Holdings Less Firm—Electricity Supply Shares Mainly Steady—Company Meeting and Report News.

THE County of London Electric Supply ordinary shares have provided the chief feature in the electrical share market during the past week. As the result of the demand for the shares, the price has not only recovered the fall recorded a week ago but has improved to a like extent, being now quoted 42s. 6d. In the manufacturing group English Electrics have improved to 7s. 6d., but British Insulated and Electric Construction have weakened. Marconi's Wireless have fallen 3s. 9d.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*c*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 42/6 | 38/6 | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/- | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 46/10½ | 46/10½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10⅝ | 10⅝ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B. Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 38/- | 38/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | •79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. .. | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 90½• | 92½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 66 | 67 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 78½ | 79½ | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 115½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/- | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 85/- | 86/3 | 20/6 |
| 6 | ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 85/- | 85/- | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 26/3 | 26/3 | 27/6 | 16/6 |
| 6 | Crompton Parkinson Pref. Ord. .. | 19/- | 19/- | 18/- | 8/- |
| 8 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 26/3 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 6/10½ | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 28/- | 28/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 41/6 | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 37/6 | 37/6 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 34/4½ | 34/4½ | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 30/- | 30/- | 30/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 24½ | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½• | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 257½• | 264½ | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. | 69½• | 70½ | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 80½• | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25⅝• | 26 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 38 | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 73/9 | 77/6 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 54/-• | 55/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25⅛ | 26 | 23 | 11/3/6 |

(*a*) 1s. 7½d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus. • Ex. dividend.

QUEBEC POWER CO.—A div. on common shs. of no par value is now payable.

RHINE WESTPHALIA ELECTRIC POWER CORPORATIONS.—A div. of 10 p.c., less tax, has been declared.

NORTH METROPOLITAN ELECTRIC POWER SUPPLY CO.—Intm. div. of 4 p.c. has been declared on ord. shs., payable Nov. 15.

ISLE OF WIGHT ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. at rate of 8 p.c. p.a. on ord. shs. for past half year has been declared.

INDO-EUROPEAN TELEGRAPH CO., LTD.—Intm. div. for half-year ended June 30, 1928, at rate of 5 p.c. p.a., tax free, will be payable on Nov. 1.

MERSEY POWER CO., LTD.—During the present week subscriptns. have been invited for an issue of 400 000 6 p.c. cum. pref. shs. of £1 each, at par.

CALLENDER'S CABLE AND CONSTRUCTION CO., LTD.—Intm. div. of 5 p.c., less tax, on ord. shs. (same rate as last year) will be payable on November 2nd.

PARA ELECTRIC RAILWAYS AND LIGHTING CO., LTD.—Div. on 6 p.c. cum. pref. shs. at rate of 3 p.c., less tax at 4s. in £, on acct. of year endg. Nov. 30, 1928, will be payable on Nov. 1.

EASTERN TELEGRAPH CO., LTD.—Int. for half-year ending Oct. 31 on 4 p.c. mtge. deb. stk. will be paid by warrants on Nov. 1. Transfer books of deb. stk. will be closed fm. Oct. 26 to 31, inclusive.

NATIONAL TELEWRITER CO., LTD.—Pft. for year ended June 30th, 1928, after paying int. on debs., £1 254, agst. £1 379 for previous year; makg. total available £7 052. Div. 1 p.c. on pfd. ord. shs.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Intm. div. of 4 p.c. actual tax free has been declared on ord. cap. Ord. shhlders., on Jan. 1 next, will be given the right to subscribe at par for one new ord. sh. for every three then held.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION CO., LTD.—Net earngs. for August, 1928, after deductg. London exes, $17 600, increase over August, 1927, $2 900. Total net earngs. from Jan. 1st, 1928, $157 800, increase $108 600.

STOTHERT AND PITT, LTD.—Net pft. for year ended June 30, 1928, £30 364, compared with loss of £5 814 for previous year, plus £250 brt. in. After provisn. for pref. div. and placing £7 500 to res., div. of 6 p.c. is proposed on orb. shs. Fwd. £4 726.

FERRANTI, LTD.—Net pft. for year ended June 30, 1928, £56 798, less premium on redemptn. of 1st mtge. deb. stk., £2 182, leavg. £54 515, plus £36 020 brt. in. To gen. res., £35 000, makg. total £270 000. Div. on ord. shs., 20 p.c., tax free (same rate as last year).

MEXICAN LIGHT AND POWER CO., LTD.—A div. at rate of 7 p.c., p.a., for half-year endg. Oct. 31st, 1928 ($3·50 p. $100 sh.) on 7 p.c. cum. pref. shs. and a div. at rate of 4 p.c. p.a. for half-year endg. Oct. 31st, 1928 (10 cts. p. $5 sh.) on 4 p.c. cum. red. 2nd pref. shs.) will be payable on Nov. 1.

BRAZILIAN TRACTION, LIGHT AND POWER CO. LTD.,—Qrtrly. div. of 44 cts. p. sh. on ord. shs. of no par value will be payable on Dec. 1. This does not apply to the ord. shs. recently subscribed for, which do not rank for div. until after Dec. 1. London agents: Canadian and General Finance Co., Ltd., 3, London Wall Buildings, E.C.2.

AUTO-ELECTRIC DEVICES, LTD.—Statutory rpt. states that 700 000 1s. shs. have been allotted, of which 100 000 1s. ord. shs. have been allotted in full satisfactn. of purchase price of business and assets of J. and C. Manufacturing Co. Cash received in respect of shs., £29 000. Paymts. on cap. acct. are: Purchase of machinery, £27 10s.; purchase of office furniture and equipmt., £63; leaving blce., £28 908.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—In regard to the div. of 7½ p.c., less tax, now payable, hldrs. of sh. warrants to bearer are notified that coupons may be lodged at the Head Offices, Marconi House, Strand, London, W.C., four clear days before paymt., and that coupons will also be payable at the Banca di Roma, Rome, and branches, and at the Succursale de la Société Générale de Belgique, 48, Rue de Namur, Brussels. Forms for lodging coupons may be obtained from any of the above addresses or the co's office, Via dei Condotti, 11, Rome.

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SHAWINIGAN WATER AND POWER CO.—The directors have declared a bonus, payable in fully-paid shs. of no par value, in the proportn. of one new sh. for every ten shs. held. Fractional rights will be covered by warrants exchangeable for definite certificates on or before Dec. 1, and the new issue will rank for any div. that may be declared for the last qtr. of this year.

NEW YORK TELEPHONE CO.—Sealed proposals will be received at the office of the Farmers' Loan and Trust Co., 22, William Street, New York, for the sale to the trustee at not exceeding par and interest, of a sufficient number of 1st and gen. mtge. sinkg. fd. bds., to invest the sum of $750 000 of the sinkg. fd. Proposals must be presented before noon on Thursday, Nov. 1, 1928.

WURTEMBURGISCHE ELEKTRIZITATS A.G., STUTTGART.—It is announced that the majority of the hldrs. of bonds of the co.'s £120 000 7 p.c. sterling loan of 1923 have exercised their right to exchange their holdgs. for bonds of the City of Salzburg 7½ p.c. loan. The co. has the right to redeem the whole amt. outstandg., and has given notice that all bds. are repayable at 102 p.c.

RADIO CORPORATION.—The corporation has purchased an interest in the Keith Albee Orpheum, Inc., a theatre organisation. The combined capital of the two cos. is about £65 000 000. It is stated that the Radio Corporatn. is seeking an outlet for a photophone, or talking picture device, which it has developed at considerable expense.

SOCIÉTÉ INTERNATIONALE D'ENERGIE HYDRO-ELECTRIQUE, SOC. ANON.—The followg. divs. for 1927-8 are payable: 47 francs (9·40 Belgas) on pref. shs.; 47 francs (9·40 Belgas) on ord. shs., and 171·83 francs (34·366 Belgas) on founders' shs. Coupons may be presented at the offices of Baring Bros and Co., Ltd., 8, Bishopsgate, London, E.C.2., or J. H. Schroder and Co., 145, Leadenhall Street, London, E.C.3.

COMPAGNIED' EXPLOITATIONS HYDRO-ELECTRIQUES.—This co. has been formed in Brussels, with a cap. of 150 million francs, to exploit electrical undertakings in Roumania and elsewhere. Amongst those interested in the co. are the Société Generale de Belgique; Brown, Boveri; Compagnie d' Enpreprises Electro-mecaniques; Banque d'Anvers; Banque de l'Union Parisienne, and Banque de Paris et des Pays Bas.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—A committee (with power to co-opt), consisting of Sir Richard Davies, Mr. F. P. Robjent, Mr. Herbert Guedalla and Mr. Alfred Kohnstamm, has been formed to safeguard the interests of Marconi pref. shhdrs. This committee will work in close associatn. with the committee already appointed on behalf of the £1 ord. shhdrs. The secretary will be Mr. Bernard Wicks, 27, Abingdon Street, Westminster, S.W.1.

BRITISH COLUMBIA TELEPHONE CO.—Operatg. rev. for year ended March 31st, 1928, $4 317 212; maintenance operatn. taxes, etc., required $2 462 273, employees' benefit fd. $38,470, and depreciatn. $882,588, leavg. $933 881. Deb. int. absorbs $90 046, employees' saving plan int. $5 302, pensn. fd. $27 077, sinkg. fd. $27 077, div. on ord shs. $315 000, div. on pref. shs. (6 p.c.) $60 000, div. on pfd. shs. (6 p.c.), $247 500, fire loss res., $60 000, and accident res., $20 000; blce. to surplus acct., $88 956.

COMPANIES STRUCK OFF THE REGISTER.—The following companies have been struck off the Register of Joint Stock Companies:—Electric Refrigeration Co.; Fleet Electric Co.; New British Electric Supply Co.; A. and A. Electrical Co.; Grosvenor Clark Electrical; International Electric Railways and Water Powers Syndicate; Magnus Electrical Appliances; Swan Radio Co.; Taylors Radio Electric; Universal Wireless Supply Co.; Wireless (Southampton); Associated Battery Co.; Coventry Electric Clock Co.; Electric Gyroscope Kinematograph Camera Co.

GEORGIA LIGHT, POWER AND RAILWAYS.—The trustees have entered into an agreement providg. for the transfer of the property and assets to Georgia Light, Power and Railways, Incorporated, in consideration, among other things, of the issue to each of the holders of common stk. of the railways of shs. of the cap. stk. without par value of Georgia Light, Power and Railways, Inc., equal in number to the number of common shs. of the railways held by him. The necessary action has been taken to terminate the railways, and the issue and delivery of the certificates for shs. of the cap. stk. of Georgia Light, Power and Railways, Inc., may now be made to the hldrs. of common shs. of the railways. Certificates for the common shs. of the railways are to be sent to the New York Trust Co., 100, Broadway, New York.

J. H. HOLMES AND CO., LTD.—It is announced that the business of J. H. Holmes and Co., has been acquired by J. H. Holmes and Co., Ltd., and has been reconstructed with a cap. of £100 000. It is the policy of the co. to continue the productions of sound design and excellent workmanship in which the late firm specialised during the period of 45 years. The firm established in 1883, had a wide reputatn. for good workmanship and design, and many of the electrical devices now in common use owe their origin to the pioneer work of this firm. Among the productions of the new co. will be: motor-generators for electro-plating; Holmes-Clatworthy duplex motor equipments, used mainly for driving large newspaper printing presses; sine-wave testing sets for a.c. meter testing; searchlights of various types and sizes; special transformers for pressure and current testing, etc.; motor-generators up to 500 kW and rotary converters up to 125 kW; a.c. and d.c. generating sets; a.c. and d.c. motors and instruments. The new co. will have increased facilities for research and development, a large staff and a very complete laboratory equipmt. being now at its disposal. The directors are: Mr. Wilfred Hall (chairman), Mr. Norman D. Newall and Sir A. N. Lindsay Wood, Bart.

## Company Meeting.

HURST, NELSON AND CO., LTD.—Mr. R. F. W. R. Nelson, presiding at the meeting last week, said last year they were well placed in the early part of the year, but almost within three or four months work fell off, and they had a difficult time. Despite that, they had had increased profits. They depended to a certain extent on private owners' work, but also to a certain extent on the railways. They hoped for a recovery in the coal trade, and a consequent recovery in the railways, which would ensure their firm more work. There were many rumours of amalgamation in the papers. The director sent an intimation to the papers that these rumours were not quite unfounded. Because of present and future competition, they felt that if they were to carry on as an industrially efficient body, and continue to give good results, it would be a wise thing for them and others to come together. In the first place, however, they had to prove—and Hurst, Nelson and Co. were jealous of their position—that a saving would take place. The negotiations were in hand, progress had been made, and they had a bit yet to go. If all went on well it would be, he thought, for the benefit of the company, and, failing all going well, the company was as sound as ever. The report and accounts were adopted. At an extraordinary meeting, which followed, it was resolved to increase the company's borrowing powers from £200 000 to £500 000.

## New Companies.

W. E. HAMPSON AND CO., LTD.—Cap., £2 000. Manufacturers of field tape, insulating tape, etc. Reg. Office: 27, Bridge Street, Manchester.

LONDON AND MIDLAND CONSTRUCTION CO., LTD.—Cap., £2 000. Engineers, electricians, etc. Reg. Office: 64, Victoria Street, London, S.W.1.

WOODWORKERS SUPPLY CO., LTD.—Cap., £500. Manufacturers of and dealers in tools, materials, etc., used by electricians, etc. Reg. Office: 7, Bradford Road, Huddersfield.

M. W. WOODS, LTD.—Cap., £5 500. To acquire business of electrical and general engineer now carried on by W. Woods at Denmark Street, Colchester, as "M. W. Woods."

E. R. MORTON, LTD.—Cap., £1 000. Manufacturers of and dealers in electrical and radio goods and appliances, etc. Solicitors: Roche, Son and Neale, 1, Church Court, Old Jewry, London, E.C.

MATCHLESS RADIO MANUFACTURING CO., LTD.—Cap., £500. To carry on business of electrical and radio engineers formerly carried on by R. Davidson at 341, Goswell Road, London, E.C., etc.

COOPER, BEARD AND CO., LTD.—Cap., £1 000. Manufacturers of, agents for and dealers in magnetos, wireless receiving and transmitting sets, etc. Reg. Office: 23, Coleman Street, London, E.C.2.

EAST SUSSEX WIRING CO., LTD.—Cap., £1 000. Electric wiring contractors, suppliers and vendors of electric light, heat and power installations and fittings, electricians, etc. Reg. Office: The Hill, Cranbrook, Kent.

NEETRAM, LTD.—Cap., £500. Manufacturers of, agents for and dealers in materials, apparatus, etc., used in connection with electricity: electrical engineers, electricians, etc. Reg. Office: 29, Theobalds Road, London, W.C.1.

INSULATED WIRES, LTD.—Cap., £100. Manufacturers, importers and exporters of and dealers in insulated and bare wires, cables, flexibles, mechanical, galvanic and optical appliances, etc. Solicitor: F. C. H. Jones, Bank Chambers, 329, High Holborn, London, W.C.1.

BRITISH PUBLICITY TALKING FILMS, LTD.—Cap., £25 000. To advertise and arrange for advertising by means of films or motion pictures, either with or without sound effects, etc. Solicitors: Last, Riches and Fitton, 18, Bolton Street, London, W.1. (Public co.)

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BOYNTON, Mr. A., 6, Silver Street, Thorne, near Doncaster wireless agent. £17 15s. 2d. September 5th.

BERRY AND HAYWARD, LTD., Pearson's Buildings, St. James' Street, Nottingham, manufacturing electrical and mechanical engineers. £34 12s. 8d. September 6th.

CREST MANUFACTURING CO., 50, Grooms Hill, Greenwich, electrical engineers. £24 10s. September 13th.

ELECTRADIO CO., LTD., 25, Westbourne Grove, Bayswater, W. £15 15s. 2d. May 10th.

ELLISTON, EVANS AND JACKSON, LTD., 93, Old Street, E.C., electrical engineers. £22 5s. 6d. September 6th.

GARBUTT, Mr. A. A., Vital Elite Electric Stores, Measham, Burton-on-Trent, electrical engineer. £10 15s. 9d. July 11th.

HEWSON AND LOWN, 68, Victoria Street, Westminster, electrical engineers. £15 14s. 8d. September 8th.

JENNENS (J. R.), LTD., Jennens Row, Birmingham, wireless factors. £22 18s. 8d. August 7th.

JONES, E. T., 37, Hendrecafn Road, Penygraig, electrical supplier. £12 11s. 5d. August 30th.

NEWSOME (F. B.) AND CO., 138, Fitzwilliam Street, Huddersfield, radio factors. £17 12s. 1d. August 9th.

PREMIER ELECTRICAL STORES, 184, Railway Approach, Shepherds Bush, electricians. £18 9s. 6d. September 7th.

PRYTHERCH, Thomas, 3, Dingat View, Llandovery, radio dealer, etc. £20 0s. 5d. August 24th.

RUNNYMEDE ENGINEERING AND ELECTRICAL CO., Dacre House, Victoria Street, Westminster, S.W., wireless dealers, £18 8s. July 11th, £15 10s. 5d. September 5th.

WARBURTON, Mr. S. G., Cycle Depot, Yatton, wireless dealer. £10 9s. August 7th.

ZONE WIRELESS CO., LTD., Oxford Street, W., electrical engineers. £23 3s. 1d. September 7th.

## Deed of Arrangement.

PORTER, Frank, Deanhouse, Thongsbridge, and Ratcliffe Street, Skelmanthorpe, near Huddersfield, electrical engineer. Dated October 12th, filed October 15th. Trustee, T. N. Steel, Market Place, Huddersfield, I.A. Liabilities unsecured, £2 025; assets, less secured claims, £861.

## Receiverships.

BURGOYNE MANUFACTURING CO., LTD.—E. D. Hine, of Abbey House, Victoria Street, Westminster, was appointed receiver and manager on October 1st under powers contained in debenture dated August 28th, 1928.

W. O. AND E. FLINT, LTD.—G. H. Branson, of Walsall, was appointed receiver on September 29th, 1928, under powers contained in a debenture dated October 11th, 1927.

SHORT WAVE COMMUNICATIONS DEVELOPMENT CO. LTD.—H. T. Woodard, of 19, Valetta Road, Acton, W.3, was appointed receiver and manager on September 29th, under powers contained in debentures dated February 2, 1928.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

KAY (T. L.) AND CO., LTD., 6, Blake Street, York, wireless engineers, etc. At the statutory meeting of the creditors in this voluntary winding up, the statement of affairs showed liabilities of £4 031, due to unsecured creditors. There was a contingent liability in respect of hire purchase contracts which were not expected to rank. The assets were estimated to realise £1 205, less £300 preferential claims, leaving net assets of £989. The assets included stock at cost £1 277, expected to produce £458; good book debts £618; and doubtful and bad debts £152, valued at £40. The company was registered in June, 1926, and took over an existing business as from January 1st of that year. The purchase price was fixed at £1 120, and the company undertook to discharge existing liabilities of £402. The vendors were allotted fully paid shares. The issued capital was £1 902. In 1925, during the year prior to the formation of the company, the sales were £4 340, with a gross profit of £781, and a net profit of £301. In 1926, the turnover increased to £9 453, with a gross profit of £1 441, the net profit being £450. In 1927, the turnover still further increased to £14 743, but the gross profit fell to £1 269, and after allowing for all the expenses, there was a net loss of £1 173. No trading figures had been prepared for the present year, but it was believed the company had traded at a loss. A portion of that loss was attributed to alterations to the showrooms, whilst additional premises were opened at an estimated cost of £750. Just prior to the passing of the resolution for voluntary liquidation, a distress was levied for arrears of rent. After a short discussion a resolution was passed confirming the voluntary liquidation of the company, with Mr. H. Gardner, of 1A, Low Ousegate, York, as liquidator.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

RIGBY (THOS.), LTD. By reason of its liabilities, October 10th. S. Croudson, of Derwick and Croudson, Incorporated Accountants, 12, East Parade, Leeds, appointed as liquidator.

SHORT WAVE COMMUNICATIONS DEVELOPMENT CO., LTD.—By reason of its liabilities, October 3rd. C. L. D. Duff, Chartered Accountant, Norwich Union Chambers, Chelmsford, appointed as liquidator.

### Bankruptcy Information.

BLAIR, Edward Winnington, electrical engineer and contractor, lately trading at 6, Queen's Parade, Brent Street, Hendon, Middlesex, as BLAIR AND SON. First meeting, October 19th, 11.30 a.m., 20, Russell Square, London, W.C.1. Public examination, November 15th, 2.30 p.m., Court House, Barnet.

WOOD, Harry, Market Place, Meltham, Yorks, electrical and radio engineer. Receiving order, October 8th. Debtor's petition. First meeting, October 24th, 10 a.m., and public examination, November 7th, 11 a.m., County Court House, Queen Street, Huddersfield.

### Notice of Intended Dividend.

BRITTAIN, Percival Frederick, trading as BRITTAINS ELECTRIC MOTOR CO., East Down Works, Dermody Road, Lewisham, S.E.13, and at 110, Cannon Street, London, electrical engineer. Last day for receiving proofs, October 26th. Trustee, W. A. J. Osborne, Balfour House, 119, Finsbury Pavement, London, E.C.2.

### Notices of Dividends.

BANKS, George Baldwin, trading as THE REDDITCH RADIO COMPANY, 16, Market Place, Redditch, Worcester, radio engineer. Composition, 13s. 4d. per £, payable October 20th, Official Receiver's Office, 191, Corporation Street, Birmingham.

DIXON, Leslie Arthur Nevett (trading as "C. FORGHAM AND CO."), 23A, Princess Street, Shrewsbury, and Old Post Office Yard, Shrewsbury, electrical engineer. First and final dividend, 3s. 9½d. per £, payable October 23rd, Official Receiver's Offices, 22, Swan Hill, Shrewsbury.

The above notice is in substitution for notice of dividend of 3s. 11½d. per £ published in the "London Gazette" of September 14th, 1928, the dividend then advertised not having been paid.

OSBORN, Herbert, 3, High Street, Normanton, Yorks, wireless dealer. First and final dividend, 2s. 2½d. per £, payable October 17th. Official Receiver's Office, County Chambers, King Street, Wakefield.

### Bankruptcy Proceedings.

ELLIOTT, William, and ELAND, Percy, trading as BURNLEY ARMATURE REPAIRS, 13, Cow Lane, Burnley, Lancs, electrical engineers. The public examination of these debtors was held recently at the County Court House, Bankhouse Street, Burnley. According to the statement of affairs there were gross liabilities of £305, of which £384 was expected to rank, and a deficiency of £337. Debtors attributed the failure to bad trade and lack of capital and gradual depression in business since March, 1928. It appeared they commenced business in partnership as electrical engineers on May 11th, 1928, debtor W. Elliott having carried on business there on his own account since June, 1926. No partnership agreement was prepared, but debtor Eland deposited with the bank the title deeds of a house, to secure an overdraft. The business had not been successful and since the commencement the weekly takings had not averaged more than £4 to £5 weekly.

HODGES (Cecil) AND CO., LTD., electrical engineers, Empire Works, Horley. In this compulsory liquidation the creditors have now received from the Official Receiver a summary of the company's statement of affairs, showing liabilities £25 319, of which £16 503 are returned as unsecured (294 creditors), and assets estimated to realise a net amount of £2 521 after payment in full of preferential claims amounting to £311 and debenture claims £8 403. A deficiency of £13 081 is accordingly shown in regard to the creditors while in relation to the shareholders the accounts disclose a total deficiency of £28 481. Particulars of the company have already appeared in our columns (June 15, p. 698; and April 6, p. 405). The registered offices of the company have been at Balfour House, Finsbury Pavement, London, E.C., 105-107, Dalston Lane, Hackney, E., and Empire Works, Horley, Surrey. The receiver appointed by the company's bankers in January last, and who has carried on the business with a view to completing orders in hand and disposing of the business as a going concern, has recently sold the remaining assets for £10 500. The lease of the Dalston Lane works has also been disposed of for £450. As a result of the statutory meetings of creditors and contributories, the Court appointed Mr. W. A. J. Osborne, of Balfour House, Finsbury Pavement, London, E.C.2, as liquidator of the company with a committee of inspection.

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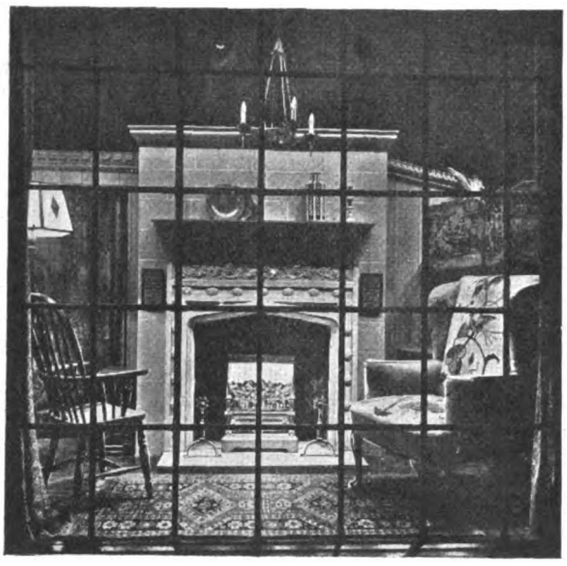
# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### September 28th.

27 928 J. L. Baird, and Television, Ltd. Television apparatus. (30/11/27.)
27 937 British Automatic Refrigerator Co., Ltd., and H. D. E. Saunders. Thermostatic devices.
27 898 British Thomson-Houston Co., Ltd. Electric switches. (29/9/27, U.S.)
27 920 Burgess Battery Co. Electric hand lamp. (10/10/27, U.S.)
27 865 J. A. Crabtree. Electric switches.
27 875 C. J. Nesbitt-Dufort, and O. and S. Oilless Bearing Co., Ltd. Coil-driven loud speakers.
27 876 C. J. Nesbitt-Dufort and O. and S. Oilless Bearing Co., Ltd. Wireless receiving apparatus.



*AMONG the attractions of Liverpool Civic Week was a general shop window display of the products of local industries, and one of the most pleasing of these exhibits was that of a Tudor period Xcel "Cosyglo" imitation coal fire manufactured by the Automatic Telephone Manufacturing Co., Ltd., set in appropriate surroundings with period furniture, in a window of the Corporation Electricity Department Showrooms.*

27 899 Edison Swan Electric Co., Ltd. Electric wiring devices.
27 877, 27 878 S. Z. de Ferranti and Ferranti, Ltd. Electromagnetic acoustic devices.
27 917 M. E. J. Gheury de Bray. Shop window lighting displays, etc.
27 931 A. D'A. Hodgson and Igranic Electric Co., Ltd. Radio valve circuits.
27 938 Marconi's Wireless Telegraph Co., Ltd. Thermionic valves. (29/9/27, U.S.)
27 913 P. S. Newbound and J. M. Newton Vitreo-Colloid (1928), Ltd. Electric insulating material.
27 914 P. S. Newbound and J. M. Newton Vitreo-Colloid (1928), Ltd. Colouring incandescent lamps.
27 915 P. S. Newbound and J. M. Newton Vitreo-Colloid (1928), Ltd. Substance for moulding lampshades.
27 899 S. Rogers. Electric wiring devices.
27 810 W. R. Wainwright. Filler for electric batteries.
27 892 Waygood-Otis, Ltd. Elevator system. (28/9/27, U.S.)
27 893 Western Union Telegraph Co. Operating simplex printers in a multiplex system. (18/8/28, U.S.)

### September 29th.

28 016 Automatic Signal Corporation. Traffic control systems. (20/10/27, U.S.)
27 961 W. Breffit. Electric heater, etc.
27 953 J. A. Crabtree and B. G. Harrison. Electrical ceiling roses, etc.
27 973 W. C. Fairweather (Underwood Elliott Fisher Co.). Electric motors
27 976 R. C. Graseby. Electric switches.
27 977 A. D'A. Hodgson and Igranic Electric Co., Ltd. Transformers.
28 024 N. Koomans. Directive aerials. (3/10/27, Holland.)
28 009 J. Neale. Mercury switches.
28 010 J. Neale. Means for varying electrical resistance of a light-sensitive bridge.
28 014 R. Sowerbutts. Inductance coils.
27 960 J. Wilson. Magnetic pick ups.

### October 1st.

28 148 R. Austin. Illuminated signs, etc.
28 109 T. E. Beacham. Electric control for valves, etc.
28 137 British Insulated Cables, Ltd. Moulding machines.
28 104 British Thomson-Houston Co., Ltd. Magnetic alloys. (6/7/28, U.S.)
28 106 British Thomson-Houston Co., Ltd., and H. C. Wheat. Lighting fixtures.
28 236 H. G. Brown. Accumulator plates, etc.
28 031 S. O. Cowper-Coles. Manufacture of electrotypes from wax moulds.
28 095 Cie des Forges et Acieries de la Marine et d'Homécourt E. Granat. Distant electric control device. (16/11/27, France.)
28 058 G. N. Deane. Portable telephone sets.
28 131 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Wireless receiving sets.
28 117 C. Filmer, Metropolitan-Vickers Electrical Co., Ltd., and L. Miller Control systems of electric machines.
28 135 F. J. Gee and Siemens Bros. and Co., Ltd. Thermostatically controlled electric protective devices.
28 085 C. Greter. Electric switches. (17/4/28, Germany.)
28 081 E. R. Grote. Incandescent lamps.
28 110 Igranic Electric Co., Ltd. Means for fastening plates together.
28 102 P. Pestalozza. Electrolytic cells for alkali chlorides.
28 133 Soc. des Ateliers de Montage et d' Ebenisterie.—Amplifying devices for wireless apparatus. (16/5/28, France.)
28 147 Soc. Francaise des Lampes a Incandescence Luxor. Hot cathode for lamps, etc. (1/10/27, France.)
28 042 C. Vinegrad. Control devices for electric lighting circuits of automobiles, etc.

### October 2nd.

28 278 Associated Telephone and Telegraph Co. Telephone systems. (8/10/27, Belgium.)
28 176 R. A. Bedford and C. V. Brindley. Electric furnaces.
28 220 E. S. Cluderay. Electric relays.
28 177 Credenda Conduits Co., Ltd., and P. W. Davis. Electric fires, etc.
28 178 Credenda Conduits Co., Ltd., and P. W. Davis. Electric heaters.
28 236 D.P. Battery Co., Ltd. Accumulators, etc.
28 185 H. E. Fugill. Electric hand lamps, etc.
28 189 N. V. Machinerieen en Apparaten Fabrieken. Electrical resistances (7/10/27, Germany.)
28 182 C. R. D. Pritchett, and Pritchett and Gold and E.P.S. Co., Ltd. Vent plugs for accumulators.

# METAL AND CHEMICAL PRICES.

Tuesday, October 16th.

| | Price. | Inc. | Dec. |
|---|---|---|---|
| *Copper*— | | | |
| Best Selected .. .. .. per ton | £68 0 0 | — | — |
| Electro Wirebars .. .. „ | £71 15 0 | — | — |
| H.C. Wires, basis .. .. per lb. | 10 1/16d. | — | — |
| Sheet .. .. .. .. „ | 10 1/8d. | — | — |
| *Phosphor Bronze*— | | | |
| Wire (Telephone) basis .. per lb. | 1s. 1 1/8d. | — | — |
| *Brass* 60/40— | | | |
| Rod, basis .. .. .. per lb. | 8 1/4d. | — | — |
| Sheet „ .. .. .. „ | 9 1/4d. | — | — |
| Wire „ .. .. .. „ | 10 1/4d. | — | — |
| *Pig Iron*— | | | |
| Cleveland Warrants .. .. per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „ | £14 15 0 | — | — |
| *Lead Pig*— | | | |
| English .. .. .. per ton | £23 10 0 | — | — |
| Foreign or Colonial .. .. „ | £22 5 0 | 5s. | — |
| *Tin*— | | | |
| Ingot .. .. .. .. per ton | £220 2 6 | £1 2 6 | — |
| Wire, basis .. .. .. per lb. | 2s. 10 1/4d. | — | — |
| *Aluminium Ingots* .. .. per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. .. „ | £24 0 0 | 2s. 6d. | — |
| *Mercury* .. .. .. .. per bottle | £23 10 0 | — | 10s. |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 15 0 *Boric Acid* (Crystals) „ £30
*Sulphuric Acid* (Pyrites, 168°) 1on £6 15 0 *Sodium Chlorate*—Per lb. 2 1/2d.
*Sodium Bichromate*—Per lb. 3 1/2d.
*Rubber*—Para fine, 10 1/2d.; plantation 1st latex, 9 1/2d. to 9 3/4d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

## LEAD MARKET REPORT.

James Forster and Co. state that the lead market last week was firmer, although business was not so active.

Closing prices on October 12th were £22 2s. 6d. for October, £22 for November, £21 18s. 9d. for December, and £21 17s. 6d. for January, 2s. 6d. per ton up on the week.

# Coming Events.

### Saturday, October 20th.

Institution of Heating and Ventilating Engineers.—Visit to the Home Office Industrial Museum, Horseferry Road, London. 2.30 *p.m.*

### Monday, October 22nd.

Institute of Transport (Leeds and District Section).—Annual Dinner.
Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Inaugural address by the chairman, Mr. C. W. Salt. 7 *p.m.*
Illuminating Engineering Society.—Chamber of Commerce, New Street, Birmingham. Paper by Mr. J. L. H. Cooper on "An Investigation of Electric Lighting in the Engineering Industry." 7 *p.m.*
Croydon Wireless and Physical Society.—5, Altyre Road, East Croydon. Paper by Mr. F. W. Smurthwaite on "Electrical Pick-ups and Gramophone Reproduction." 8 *p.m.*
Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

### Tuesday, October 23rd.

Electrical Contractors' Association (Chesterfield Sub-Branch).—Falcon Cafe. Ordinary meeting.
Electrical Association for Women (Manchester District Branch).—Lighting Service Bureau, 4, Fountain Street. Electric Outlet Campaign meeting. 2.15 *p.m.*
Electrical Association for Women.—Visit to the Model Dairies of the London Wholesale Dairies, Ltd., The Grove, Vauxhall. 3 *p.m.*
Electrical Power Engineers' Association.—Junior Institution of Engineers, 39, Victoria Street, Westminster. Paper by Mr. C. H. Sparks on "Developments in Furnace Construction."

### Thursday, October 25th.

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Inaugural address by the President, Lieut.-Colonel K. Edgcumbe. 6 *p.m.*
Scottish Electric Lighting Service Bureau.—20, Trongate, Glasgow. Eighteenth Illumination Design Course. Lecture on "Light and Visibility." 7.30 *p.m.*

### Friday, October 26th.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. G. W. Tookey on "Legal Protection for Originality and Inventions." 7.30 *p.m.*
Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture on "The Singing Arc," by Professor W. Cramp. 7 *p.m.*
Institution of Electrical Engineers (North-Eastern Centre, Students' Section).—Paper by Mr. L. B. Harmer on "Post Office Telephones and the Public." 7.15 *p.m.*
Scottish Electric Lighting Service Bureau.—Society of Arts Hall, Edinburgh. Lecture to the Edinburgh electrical trades on "Modern Factory Lighting." 7.30 *p.m.*

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Electrical Christmas Gifts.

BATHED in bright sunlight of the natural kind we do not find it easy to bring thought to bear on Christmas, which seems, and is, far away. Recollections of misplaced mirth on seeing Christmas numbers of magazines during the dog days and summer numbers full of pictures of bathing belles after fighting our precarious way through snowdrifts, come quickly to mind. But, seriously, it is time that everyone concerned with the sale of small domestic electrical appliances should do something about Christmas presents. We do not, of course, refer to the personal benevolence which is required of each one of us at a later date, but to the stimulation of that spirit in others, with special reference to electrical goods. In several recent years some attempt has been made to popularise the idea of electrical Christmas gifts, but we doubt whether these efforts have done much in the way of stemming the flood of futuristic ties, multi-coloured scarves, "cabbagey" cigars and similar time-honoured but usually unappreciated gifts. It was not to be expected that a new idea, however attractive, would suddenly change the habits of a lifetime, but, even when due allowance is made for conservatism on the part of the buyer, we are compelled to think that there is something wrong with the way the electrical trade has been tackling this potentially big seasonal market. One fault is, perhaps, that we have not entirely convinced ourselves of the benefits to be obtained, and have therefore lacked the live enthusiasm needful for real success. A moment's thought of the sort of rubbish that is bought for Christmas presents is quite enough to convince anyone that small pieces of electrical apparatus—the little luxuries that are always so welcome—are ideal for the purpose. The other fault, as we see it, is that the electrical trade does not start the Christmas trade campaign early enough. The middle of December is much too late to begin to think about it; that is why many people now make their purchases, in order to avoid a rush at the last minute. Now is the time to order stock, plan special window displays and other publicity, and, in order that electrical traders may make an immediate start, we have devoted a considerable amount of space in this issue to articles designed to give practical assistance to those who want to sell electrical Christmas gifts. Ideas are put forward for window displays for various types of premises, and there is also a concise review of some of the goods which manufacturers are providing this season. The choice in this respect is so wide that it is impossible to cover the whole ground in one issue; further suggestions will therefore be given in succeeding issues. Meanwhile, let us concentrate on the idea that an Electrical Christmas means a happier Christmas both for trader and recipient.

## Electrical Salesmanship.

THE first of the new series of London Salesmanship Conferences organised by the E.D.A. was held on Friday last and Mr. W. MILLNER is to be congratulated upon his authorship of a highly controversial paper, for the discussion which followed contributed very largely to the success of the evening. Mr. Millner explained that he regarded his paper in much the same way as a target, namely something to be shot at, and, with such a view in mind, introduced several points for marksmanship. The subjects with which the author dealt were electrical showroom design and the displaying of electric fires. Mr. L. E. BUCKELL voiced the opinion for further discussion that possibly the method now adopted of showing electric fires in a fireplace setting, was one of the reasons why electric fires were not more widely used. We take this one point as illustrating the liveliness of the meeting, and also because we agree with it. The idea of using an electric fire as a substitute for something else is to convey that electricity is something secondary, whereas by arranging a setting different from that of a coal or other fire a new line of thought would be developed and electric heating would come into its own. As Mr. BUCKELL stated, electric lighting designs first followed those of gas, with detrimental results, whereas now it is the habit of gas lighting fittings to resemble the shapes of those for electric lighting. Reverting to the paper proper, we would certainly have liked to have heard the electrical contractor better catered for in the matter of showroom suggestions, but possibly his needs will be met on a later occasion.

## The North-Western Area Scheme.

THE scheme submitted to the Central Electricity Board by the Commissioners last June, has this week, in the main, been adopted. The chief amendments consist only of some slight changes in the routes to be followed by the transmission lines, while the recommendation for the erection of the Carrington and Clarence Dock stations has been accepted. Twenty-seven of the seventy existing stations will serve as selected stations, and the names of these will be found elsewhere in this issue, together with complete details of the scheme as published. In addition to these selected stations the scheme also provides for the operation of six other existing stations under temporary

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arrangements between the Board and the owners, comprising Blackburn, Barrow, Burnley, Greenhill, Macclesfield and Tame Valley. Those of the temporary stations not used for base load purposes will be worked in such a way as to meet the peak load demands in the area, and should be gradually reduced in number as the plant in them approaches the end of its effective life. The output of the two hydro-electric stations of the North Wales Power Co. will be combined with the steam derived output in the area. The scheme provides for the erection of twenty-two principal transmission lines, fourteen of which will be designed for operation at 132 000 V. The remaining eight will operate at voltages not yet determined. Twelve 33 000 V lines have been arranged for, while the transformer stations covering both networks number fifty-five. The existing frequency of 40 cycles used by Stalybridge, Hyde, Mossley and Dukinfield Board will be brought into line with 50-cycle practice, the Hartshead station being in the selected group. The area covered by the scheme includes one of the most densely populated industrial areas in the country, including such industries as textile, coal mining, stone and slate quarrying, engineering, shipbuilding and chemical manufacture. Further, wide tracts of agricultural land are covered which hitherto have been unprovided for in the electrical sense. As in the case of previously adopted schemes, that of the North Western Area should do much to develop the expansion not only of electricity supply but also the sales of electrical equipment for domestic and agricultural purposes.

## Edison and the Incandescent Lamp.

WE have no wish to decry the work of Mr. T. A. EDISON which was fittingly rewarded last Saturday by the presentation to him of a gold medal voted to him by the United States Congress for his achievements. We do, however, beg leave to question the statement which has been circulated in the public newspapers—on whose authority we do not know—that the presentation took place " on the fiftieth anniversary of EDISON'S discovery of the incandescent electric lamp." We have always understood that the incandescent electric lamp was discovered by Sir JOSEPH WILSON SWAN, who was born in Sunderland almost exactly a hundred years ago. Although the names of EDISON and SWAN have for many years been closely associated, the two workers did not collaborate in any way in this invention. SWAN'S entirely independent work led him to a discovery which was followed in December, 1878, by a public exhibition in Newcastle-upon-Tyne of an incandescent carbon lamp which he apparently took no steps to patent until January, 1880. Now, while it is claimed that EDISON applied for a British patent of what was believed to be a similar invention in November, 1879, nobody saw the EDISON lamp in this country until 1880, and even then it appeared to differ from that described in his original patent.

## Conflicting Claims.

REFERENCE to contemporary literature is decidedly confusing, for at the beginning of 1879 the invention of incandescent lamps was a popular direction for experiment, and there were many " inventors " in the field. It is, however, perfectly clear that in all the contemporary references to EDISON'S system, including his own patent claim, there is no suggestion of similarity between his device and the vacuum lamp for which SWAN was responsible. On the contrary, his method, as described in various issues of THE ELECTRICIAN during 1879, was to heat a coil of platinum wires in air to a state of incandescence. Then, to prevent the wires from melting, he used " a regulator consisting of a bar of metal, through which the current flowed, which, when the current became too strong, expanded and switched off a part of the current and thus saved the lamp." According to a report in " The Times " in March, 1879, this regulator failed in practice to perform the service required of it, for " when the current becomes strong the platinum burner melts in the twinkling of an eye, and the mischief is done before the regulator can act. The inventor believed that he could overcome this practical difficulty, but he has not succeeded. His lamps have continually melted, and he has been unable to stop them from doing so." It was also stated that there had been no public exhibition of the lamp, and only a favoured few had seen it at the Menlo Park laboratory. Yet several months earlier SWAN was publicly showing his lamp in Newcastle and developing his parchmentised thread filament, which was generally used until the arrival of the squirted filament, also the invention of SWAN. There is so much conflicting evidence that we must defer judgment until it has all been carefully sifted. In the meantime we can only say that on the information at present before us the claim that EDISON was the discoverer of the incandescent electric lamp is singularly lacking in support.

## The " Electrified " Crane.

QUICK to recognise something with which to tickle the palate of the general public, the daily Press has recently given publicity to the fact that a crane being worked in the vicinity of the aerial of 2LO " has been accidentally electrified," and one paper even suggested that we had thus discovered the transmission of electrical power by radio. Actually this absorption by metal objects of the power radiated by a neighbouring transmitting aerial is no new thing, and can at times be distinctly unpleasant. Our first experience of it was in New York in 1913, when signals from the then existing radio station on the Battery, belonging to the " New York Herald," were responsible for the writer receiving an unpleasant surprise in the way of a shock by coming into contact with a disused and rusty iron mast on the top of a building in Fulton Street. The mast was guyed with steel rope, and subsequent investigation showed that these stays were accepting a charge which left alone would leak away on its own, but on this occasion found an earth of lower resistance.

## Talking Films.

WHILE the film-making studio has always been an example of modern electrical methods where lighting is concerned, the recent launching of talking-films has made such studios more dependent than ever upon electrical aid. We mention the fact, not in a boastful way, but as a matter of interest, in illustration of the fact that the electrical engineer or his work may be found in almost every industry there is. The apparatus involved for the making of " talkies," which we believe is the popular name for such films, is, of course, an application of the thermionic valve and amplifier circuits incorporating it. A microphone of a sensitiveness equal to that used for broadcasting is placed in proximity to the actors being photographed, and this transmits to the amplifier circuits those words which it is desired to record, without limiting the actors as to freedom of movement. The variation of volume resulting from the actors moving away from the microphone is controlled by a suitable adjustment of the amplifier, with the result that it is possible to record both acting and speaking at the same time.

## Returning American Prosperity.

THOSE who ascribed the recent setback in American prosperity to an over-development of the system of instalment buying must now revise their views. America is definitely on the up-grade again. A typical indication of the improving situation is contained in the September report of the National City Bank, which states that " the past summer has given convincing evidence of business recovery, and few persons now have any doubts about business being good this fall. One industry after another has been falling in line with the better trend, so that, while some unsatisfactory spots can still be found, general business is unquestionably getting back rapidly to a normal footing. Again the country's recuperative powers have been underestimated, and revival has come more swiftly and vigorously than even the optimistic had anticipated."

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# THE HIGH-SPEED CIRCUIT BREAKER.

## Arrangement of Arcing Horns—What Happens in Circuits under Short Circuit Conditions—Rate of Building-up of Flux—Inductance Practically Constant at Saturation Point.

By W. H. THOMPSON, A.M.I.E.E.

(*Concluded from page* 372.)

THE iron circuit of the magnetic blow-out will be laminated in order to reduce eddy currents that would otherwise occur, and thus retard the building up of the magnetic field. In Fig. 5 a curve is given which shows the times taken for such a blow-out field flux to reach its maximum value with various rates of current growth in the main circuit.

Having thus determined the strength of the magnetic blow-out field, attention must be given to the arcing horns. These should be of ample section to conduct the current, of large thermal capacity to absorb the heat, and of high melting point for obvious reasons. The relationship of the two horns should be, to each other, such that the arc, during its travel along them, is stretched out as much as possible.

In the arc chute there are often fitted cooling divisions to lower the temperature of the arc.

The arc chute is necessarily narrow, and, in consequence, there is little clearance between the side of the chute and the side of the contacts. If, therefore, the material of the arc box is such that, after exposure to an arc, the surface is damaged and becomes conducting, it is highly probable that the arc will be re-established by the high potential that exists between the two contacts immediately after the break. This effect is aided by the copper-laden fumes that surround the contact after the break.

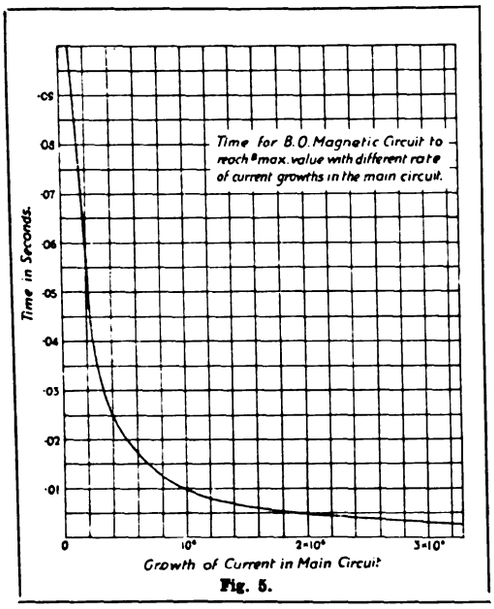


Fig. 5.

One or two oscillograms are given in Figs. 6 and 7, which are an analysis of what happens in the circuits under short circuit conditions. In considering the d.c. current curve, it will be observed that this rises in almost a straight line, and is thus very steep. The time period represented by the positive values of $\frac{di}{dt}$ of this curve is that which has been denoted by $\alpha + \beta$; or, in other words, it is the period in which the tripping circuit reaches operating value, plus that due to the inertia lag of the moving parts. The first differential of the curve then assumes zero value. It should be clear, however, that the arc tips will have commenced to part at some instant before this, and have put in circuit the resistance of the arc which checks the rate of current increase and eventually gives the minus sign to the differential which is referred to above. The extenuation of the arc, as it is blown upwards, and along the arc horns, increases the resistance in the circuit and further reduces the current value, all of which is represented in the right hand part of the curve.

As regards the d.c. voltage curve, which represents the

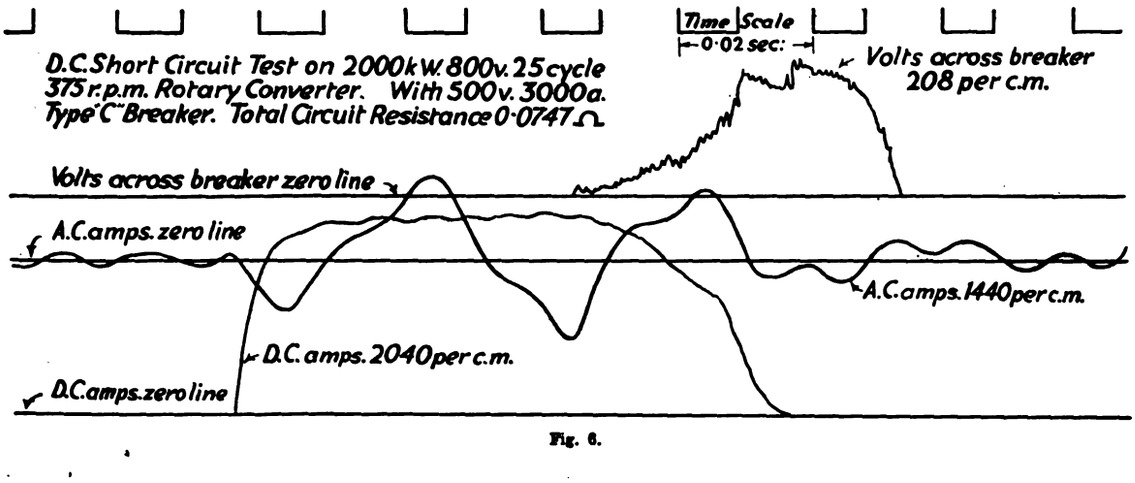


Fig. 6.

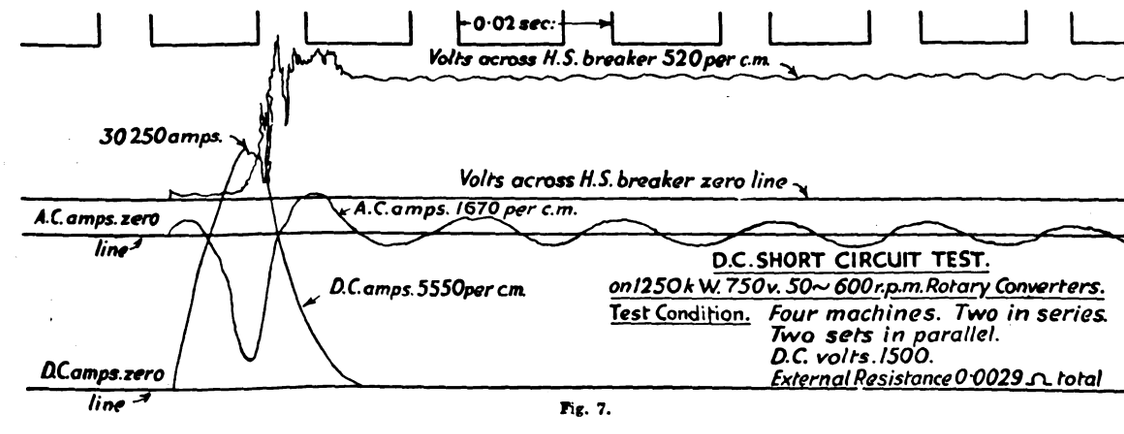


Fig. 7.



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pressure across the breaker, it will be noticed that there is a small but very definite peak in the curve which starts from the instant of closing the circuit. This is due to the voltage induced in the blow-out coils as a result of the flux in the blow-out magnetic circuit building up from zero values to saturation. This building up of flux will start rapidly and continue with decreasing rapidity until saturation point is reached.

Compare the curve in Fig. 8 with the small peak in the oscillogram. The initial increasing rate of change of flux is represented by the steep rise in the small peak curve of the oscillogram, and the later decreasing rate of flux growth, in the falling side of the same curve. At saturation point the inductance of the blow-out circuit may be said to be practically constant.

Therefore a steady value of induced voltage is maintained for so long a period as the main current increases at a steady rate. This is represented in the straight portion of the voltage wave that follows the first small peak. As the rate of change of the main current decreases, there is a fluctuating voltage wave which results from the varying reactance of the blow-out magnetic circuit and the growth of the voltage on the main system.

When the arc has been extinguished the voltage wave assumes a straight form except for the usual d.c. wave and commutator ripples.

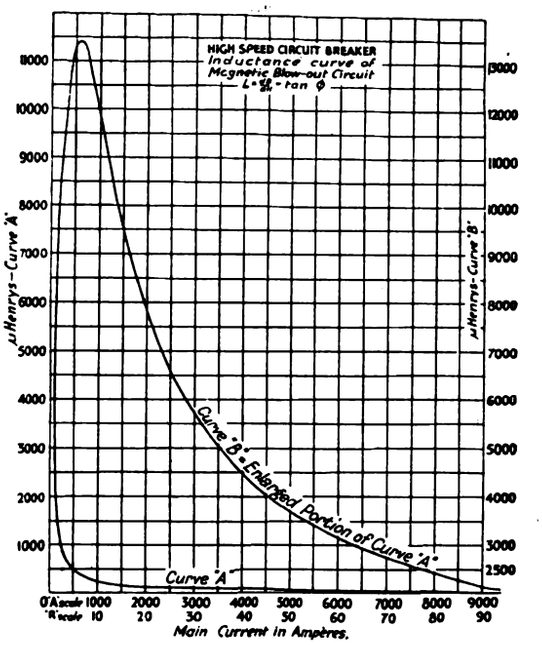


Fig. 8.

# OVERHEAD LINES PROGRESS.

## Developments Outlined in O.L.A. President's Address—Construction at Less than £70 per Mile—Induction Dangers—Use of Galvanised Wires—Election of Officers.

IN his Presidential Address to the Overhead Lines' Association, held at the Institution of Electrical Engineers on October 17th, Mr. R. Borlase Matthews pointed out that while every good engineer would bear in mind the slogan "Safety First," it must obviously be tempered with reason, and there was no need to make an overhead line on the principle of the parson's "one-horse shay," when other public utility services adopted a far lower standard.

Mr. W. Fennell, the new President of the Overhead Lines' Association.

The experience of the Council of the O.L.A. was that the Electricity Commissioners often adopted a broader point of view as regards rules and regulations than did many of the electricity supply undertakings of this country. "In fact," he said, "if the electricity supply industry were more of one mind, the Electricity Commissioners would undoubtedly have granted even further concessions." Considerable further ameliorations were, nevertheless, required for lines with voltages running into four or more figures, the difficulty, however, being to get the engineers building such lines to appreciate the necessity for improvement and so make up their minds definitely as to what was really needed in the best interests of the public—reasonable safety coupled with low cost of distribution.

Amongst other items with which it was proposed to deal next session were: insulators—of which it was anticipated there will be a shortage; railway crossings; earthing and induction effects on telephone systems; cheaper and more effective forms of line protection that dispense with extra or pilot conductors; a consideration of model rules for overhead line construction based upon the principle of the I.E.E. wiring rules, but expressed in a simpler form; the effect of geographical position on line construction regulations; the encouragement of rural electrification by various means, such as the adoption of low intermediate pressures of, say, 3 300 V; employment of cheaper pole construction and the like.

As a demonstration of what can be done in the matter of cheap overhead line construction, Mr. Matthews referred to an unusual type of pole which has been erected on his all-electric farm, and is also being used for rural line work in the United States, where it originated. The general principle of the design is the already accepted one of employing stout stayed anchoring posts at quarter mile intervals with flexible intermediate supports.* Whereas standard commercial sections of angle steel were used in the construction of steel towers, it had been the custom, where wooden poles had been employed, to use natural tree trunks with the bark stripped off. It was in this connection that this new method introduced a radical change, for in place of the natural tree trunk, commercially sawn timber was substituted. The intermediate supports were constructed of two 20 to 22 ft. sawn lengths of 4 in. by 2 in. cross-section creosoted fir. These were bolted together just above the centres with a $\frac{3}{8}$ in. diameter bolt to form an "X" shaped frame, tied together at the top with another short cross-brace of similar section. The complete structure was mounted by hinging upon two 2 ft. lengths of iron piping, set in rot-proof footings, constructed of small reinforced-concrete blocks. The total weight of such a pole was under 75 lb.

The cross-member, while forming a tie to the framework, also acted as a spacer for the insulators. These latter were of the pin type, and were screwed into the ends of the upper arms of the frame. The iron piping was pre-cast into pyramidal concrete blocks, each of about 1 cu. ft., and were lined up in position ready to take the frame.

Where the direction of the line varied slightly the frames were stiffened by a vertical piece of timber which carried the side pull to the foundation block, while on a sharper bend a third block was introduced, thus making the frame self-supporting. Where a transformer was to be mounted on the pole an additional cross-brace was fitted, and the transformer was hung on one side of the centre of the cross-brace so that its weight helped to balance the pull of the service wires.

When these frames were used on hilly ground, one of the legs was made longer, to suit the slope of the ground, so that it was unnecessary to place the footings on the same level.

The anchor frames were placed at intervals of a quarter of a mile at road or line crossings, at transformer points, and

* "Extra High Pressure Transmission Lines." Journal I.E.E., 1911. Vol. 46, p. 207, by R. Borlase Matthews and C. T. Wilkinson.

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where the lines changed in direction. These frames were of a stronger construction, being of 3 in. by 4 in. cross-section, and were anchored to concrete stay blocks with anchor rods, strain insulators and ¼ in. guy ropes attached to the frame cross-brace.

The usual procedure in erection was to transport the poles to the job in a collapsed form. The complete frame was then bolted up on the ground and the line wires bound on to the insulators, and the whole frame raised into position and bolted to the footing pipes, which had previously been lined up into position. Such an operation could be carried out by two men, instead of the six or eight required to handle ordinary poles.

Financially, this system had much to commend it, for according to figures available, a single-phase rural line 9 miles long could be erected at a cost of under £70 per mile (of this the conductor accounted for £20 6s. 8d.). This was one-eighth to one-third of the usual costs. The details of costs were then given.

The design of this pole line must not be taken as final; it should rather be regarded as an idea that ought to serve as a basis for food for thought. It demonstrated that there were other methods than the orthodox ones for the construction of overhead lines.

### Earthing Problems.

Among the new problems that have arisen for solution by the overhead line engineer was that of adequately earthing lines transmitting considerable power at very high pressures. Several new factors had come to light during the past few months, and in particular the danger due to induction. Two accidents had occurred recently where men working on telephone lines had been killed. In one case the telephone line was many miles away from the power lines. Contrary to previous ideas on the subject, practical and methodical investigations showed that the effect of a heavy short-circuit on a big line was transmitted for the best part of a mile into the earth.

Closely allied with this was the method of providing protection in the event of three-phase overhead lines falling. Hitherto this had been accomplished most successfully by the aid of protective relays operated by pilot wires. The cost of the latter was, however, excessive, and hence of late serious attention had been given to other methods, the most promising of which depended upon the principle of out of balance caused by the earthing of one of the phase wires, causing relays to com into operation.

Since such a large percentage of the price charged for electricity was accounted for by transmission and distribution costs the first step towards a satisfactory solution of the problems of supplying the rural areas was the design of the distribution and transmission system. Due care, however, must be taken to see that the first cost was not unnecesarily high, and all suggested methods for reducing the cost should be carefully studied. For instance, a great deal of saving could be effected if care were takeo when designing the lines to see that most of the construction work on the poles was done in the factory and not by the roadside. The poles should also be of circular or polyhedral cross-section with circular caps, as much time could be saved if they had not to be aligned to match the lie of the conductors, while the design of insulators and cross-arms should permit of their being clamped on to the poles without any special drilling; at any rate, not more than two coach screws should be employed for fixing on the arms.

The use of special ferro-concrete pole footings was also to be recommended as the life of wooden poles could be considerably lengthened in this way, while with existing poles these footings could be used for replacing the rotted parts in the ground.

Mr. W. A. Turnbull had shown how satisfactory were the results obtained from the use of galvanised steel wires for 11 000 V branch lines to country houses and villages. It was claimed that a saving of £300 per mile was effected by the use of such a line, whilst in addition the span could be increased from 300 to 400 ft. owing to the increased strength of the wire. A common objection made to the use of galvanised wires was that their impedance is high, while a common cause of failure of such lines had been bad galvanising. This however, was a manufacturing trouble that could easily be overcome. Where the current consumption was low there could be no question that galvanised wire formed a good temporary expedient.

One of the great difficulties encountered in overhead line work is the high cost of tapping an extra high-tension transmission line. The main requirement of a cheap tapping transformer point was a simple method of breaking the circuit without any risk of surges or causing a continuous arc across the break. One of the simplest methods of doing this was to employ isolating switch links with horns, operated by mechanical gear from the ground. One of their special advantages was that a greater spacing could be employed, since their cost was not in such direct proportion to their height as was the case with other supports.

An interesting contradiction of the view that the last word had been said on overhead line construction was provided by recent work in connection with the behaviour of copper wire under high tension. It had been shown that though a tension considerably above the limit of elasticity produced permanent elongation it raised, at the same time, the limit of proportionality of the material, besides which the breaking limit was also increased. While the modulus of elasticity was not greatly effected, it was increased to some extent. This work had shown that the limit of proportionality of copper may be raised from 15·5 to 20·3 tons per sq. in., as an increased tension improves the material. As a result of these findings the following practical advantages were to be gained: Owing to reduction in the sag of the line the height of the poles could be reduced; the risk of the lines becoming entangled was reduced; and lines which had become permanently elongated due to overloading of ice, hoar frost, etc., could be restrung to their original tension without any deterioration in quality.

Dealing with rural electrification costs Mr. Matthews pointed out that a 33 000 V line, when erected according to the requirements of the Commissioners, would cost about £343 (without wayleaves). It could, however, be erected at £261 per mile (without wayleaves) if the rules of the Commissioners could be ignored, and reference only made to modern engineering practice. 33 000/3 300 V sub-stations could be designed so as not to cost more than £600, while 3 300/400/230 V sub-stations could be constructed for about £100.

During the evening a ballot was taken for the election of President and members of Council. Mr. W. Fennell was elected President, and Mr. J. H. C. Brooking, Major T. Rich, Mr. F. H. Clough, and Mr. F. Swarbrick, were added to the Council, with Mr. C. O. Boyse as associate member. Mr. Theodore Stevens was unanimously re-elected as honorary secretary.

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## BOILER HOUSE INSTRUMENTS.

### Low Expense in Relation to Total Cost of Boilers.

IN a paper read before the Junior Institution of Engineers, on October 12th. Mr. F. Squirrell expressed his views on the "Use of Boiler House Instruments." The author considered that automatic control was far more likely to be successful with plants using pulverised fuel than chain grate stokers. While automatic control might be the logical conclusion of progress from the point of view of utilising instruments to the fullest extent, it was not necessarily the proper or best method of control; it was thought by some that thermal storage would intervene and boiler houses would be run at constant loads for long periods, the thermal storage acting as a buffer to absorb temporary variations, the boiler load being altered only when the average load over considerable periods, such as an hour or so, was altered.

In conclusion, Mr. Squirrell gave some interesting figures from plants recently put in operation, of the total cost of the boilers and of the instruments used in their operation, showing that the cost of the latter was about 2 per cent. of the cost of the former. It was also pointed out that while the maintenance of instruments might cost £100 per annum without their indications, the efficiency of the boiler plant might easily be reduced by 3 per cent., which might make a difference of about £375 per annum in the coal bill. He considered the provision of recording instruments for hand-fired boilers superfluous, but in medium size—up to 30 000 lb./hour mechanically-fired boilers, while the margin of loss due to inefficiency might be less, the increased quantity of fuel dealt with justified some means of proper control. He therefore recommended the provision of instruments in the following order, going as far in the list as funds permitted; a $CO_2$ indicator for each boiler, recording mechanism if possible, but not of primary importance; a portable index thermometer about 4 ft. long with a 4 in. dial reading up to 800 deg. F. for common use; a simple form of draught gauge to each boiler, with several different connections; a steam meter to each boiler, or a common water meter; coal measuring arrangements.

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# N.W. ENGLAND AND N. WALES ELECTRICITY SCHEME.

## Adoption by the Central Electricity Board of the North Western Area Scheme—Two New Stations to be Erected—Routes for Transmission Lines.

THE scheme submitted by the Electricity Commissioners to the Central Board for North West England and North Wales was adopted by the Board on October 12th, and published on Tuesday. (H.M. Stationery Office, price 1s. 6d.)

The scheme as submitted was given in detail in THE ELECTRICIAN of June 29th, and though the amendments do not seriously alter the suggested arrangements, there is nevertheless some adjustment in the routes to be followed by the transmission lines. The area to which the scheme relates is of about 9 082 miles in extent, the population at the last census being 6 980 925. Broadly, the area covered comprises the administrative county of Anglesey; so much of the administrative county of Cardigan as comprises the municipal borough of Aberystwyth; the rural district of Aberystwyth and the rural district consisting of the township of Scybor-y-Coed administered by the rural district council of Machynlleth in the county of Montgomery; the administrative county of Carnarvon; the administrative county of Chester except the municipal borough of Congleton and the urban district of Buglawton; the city and county of the city of Chester; the county boroughs of Birkenhead, Stockport and Wallasey; the administrative county of Cumberland; the city and county borough of Carlisle; the administrative county of Denbigh; so much of the administrative county of Derby as comprises the municipal boroughs of Buxton and Glossop; the urban district of New Mills; the rural districts of Glossop Dale and Hayfield, and the parishes of Chapel-en-le-Frith, Fernilee, Green Fairfield, Hartington Upper Quarter, King Sterndale and Peak Forest and the townships of Chingley Bugsworth and Brownside, and Wormhill in the rural district of Chapel-en-le-Frith; the administrative county of Flint; the administrative county of Lancaster; the cities and county boroughs of Liverpool, Manchester and Salford; the county boroughs of Barrow-in-Furness, Blackburn, Blackpool, Bolton, Bootle, Burnley, Bury, Oldham, Preston, Rochdale, St. Helens, Southport, Warrington and Wigan; the administrative county of Merioneth; the administrative county of Montgomery; so much of the administrative county of Salop as comprises the municipal borough of Oswestry; the urban districts of Ellesmere, Wem and Whitchurch; the rural districts of Ellesmere, Oswestry, Wem and Whitchurch; the administrative county of Westmorland; and so much of the administrative county of the West Riding of York as comprises the urban districts of Saddleworth and Springhead.

### Selected Stations.

The existing stations determined to be selected stations are as follows:—Agecroft (Salford Corporation), Barton (Manchester Corporation), Chadderton (Oldham Corporation), Hartshead (Stalybridge, etc., Board), Kearsley (Lancashire Electric Power Co.), Padiham (Lancashire Electric Power Co.), Ribble (Preston Corporation), Willowholme (Carlisle Corporation), Accrington (Accrington Corporation), Ashton-under-Lyne (Ashton-under-Lyne Corporation), Atherton (South Lancashire Tramways Company), Bolton (Bolton Corporation), Bury (Bury Corporation), Lancaster (Lancaster Corporation), Lister Drive (Liverpool Corporation), Nelson (Nelson Corporation), Percival Lane (Mersey Power Co., Ltd.), Radcliffe (Lancashire Electric Power Co.), Rawtenstall (Rawtenstall Corporation), St. Helens (St. Helens Corporation), Southport (Southport Corporation), Stockport (Stockport Corporation), Stuart Street (Manchester Corporation), Trafford (Stretford Urban District Council), Wallasey (Wallasey Corporation), Warrington (Warrington Corporation), and Wigan (Wigan Corporation), representing 27 stations out of the 70 public generating stations now in operation in the North Western area.

In addition to these existing stations the Central Electricity Board has catered for two new stations, namely, Carrington (Manchester Corporation), the first section of which will comprise an installation of 50 000 kW of three-phase 50-cycle generating plant and equivalent boiler equipment, so designed that succeeding sections may be of not less capacity, and Clarence Dock (Liverpool Corporation). The first section of the latter station will comprise the installation of 100 000 kW of three-phase 50-cycle plant with equivalent boiler equipment. Both these stations it will be remembered were included in the scheme as originally submitted by the Electricity Commissioners.

### Transmission Lines.

For the interconnection of selected stations with one another and with the systems of authorised undertakers the Board has arranged for the erection of twenty-two principal transmission lines, fourteen of which will be three-phase lines designed for operation at 132 000 V between phases, and capable in each case of transmitting not less than 50 000 kW, or, where such lines cannot reasonably be constructed, overhead lines or underground mains designed for operation at such voltages between phases as may be subsequently approved by the Commissioners, by the most convenient route in each case. The remaining eight lines will comprise three-phase overhead or underground mains for operation at voltages to be later determined. The routes followed by the 132 000 V lines will be from Barton to Carrington and Warrington; Warrington to Percival Lane and Crewe; Crewe to Stoke-on-Trent as far as the boundary of the area of the scheme; Warrington to Lister Drive, Southport and Ribble; Warrington to St. Helens, Wigan and Ribble; Barton to Agecroft, Chadderton and Hartshead; Barton to Stockport and Hartshead; Hartshead to Ashton-under-Lyne; Barton to Kearsley; Kearsley to Bolton, Blackburn and Padiham; Kearsley to Rawtenstall, Padiham and Nelson; Nelson to Keighley as far as the boundary of the area of the scheme; Ribble to Lancaster; and Lancaster to Willowholme via Kendal. The remaining lines will extend from Lister Drive to Clarence Dock, Clarence Dock to Wallasey via Birkenhead; Barton to Stuart Street; Barton to Trafford; Kearsley to Radcliffe; Kearsley to Atherton; Kearsley to Bury; Padiham to Accrington.

In connection with these principal main transmission lines, transforming stations are to be provided at points which as time goes on the Central Electricity Board may consider convenient for the purposes of supply to or from such places as Accrington, Agecroft, Ashton-under-Lyne, Atherton, Barton, Blackburn, Bolton, Bury, Carrington, Chadderton, Crewe, Hartshead, Kearsley, Kendal, Lancaster, Lister Drive, Nelson, Padiham, Percival Lane, Rawtenstall, Ribble, St. Helens, Southport, Stockport, Trafford, Wallasey, Warrington, Wigan, and Willowholme.

For interconnection between the system of the Board as has been officially adopted and the systems of authorised undertakers entitled to receive a supply of electricity directly or indirectly from the Board, a number of secondary main transmission lines have been included in the scheme. These will be three-phase overhead lines designed for operation at 33 000 V or other approved voltage between phases, or, where such lines cannot reasonably be constructed, underground mains designed for operation at such voltages between phases as may subsequently be approved by the Electricity Commissioners by the most convenient route from Stockport to Macclesfield; Stockport to Altrincham, Knutsford, Wilmslow and Macclesfield, Stockport to Marple, Macclesfield, Buxton, Chapel-en-le-Frith, and New Mills; Hartshead to Glossop, New Mills and Marple; Padiham to Burnley and Nelson; Percival Lane to Chester; Wallasey to Hoylake and Birkenhead; Southport to Ormskirk; Ribble to Blackpool and Fleetwood; Kendal to Windermere and Barrow-in-Furness; Kendal to Barrow-in-Furness; Willowholme to Penrith, Keswick, Cleator Moor, Whitehaven, Workington and Willowholme.

Transformer stations for use in connection with these secondary main transmission lines, will be provided as conditions require them at Altrincham, Barrow-in-Furness, Birkenhead, Burnley, Buxton, Chapel-en-le-Frith, Chester, Cleator Moor, Fleetwood, Glossop, Hoylake, Keswick, Knutsford, Macclesfield, Marple, New Mills, Ormskirk, Penrith, Whitehaven, Wilmslow, Windermere and Workington.

The existing frequency of 40 cycles employed in the undertaking of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board is as suggested by the Commissioners to be amended or altered to a frequency of 50 cycles

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in accordance with a programme to be agreed between the Board and the owners of the undertaking, or failing agreement to be determined by an engineer to be appointed, unless otherwise agreed, by the Electricity Commissioners.

Temporary arrangements which have been decided upon for purposes of carrying out the scheme include a number of existing generating stations classed as selected stations, the full list consisting of Accrington (Accrington Corporation), Agecroft (Salford Corporation), Ashton-under-Lyne (Ashton-under-Lyne Corporation), Atherton (South Lancashire Tramways Co.), Barton and Stuart Street (Manchester Corporation), Barrow-in-Furness (Barrow-in-Furness Corporation), Blackburn (Blackburn Corporation), Bolton (Bolton Corporation), Burnley (Burnley Corporation), Bury (Bury Corporation), Chadderton and Greenhill (Oldham Corporation), Cwm Dyli and Maentwrog (North Wales Power Co., Ltd.), Hartshead and Tame Valley (Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board), Kearsley, Padiham and Radcliffe (Lancashire Electric Power Co.), Lancaster (Lancaster Corporation), Lister Drive (Liverpool Corporation), Macclesfield (Electricity Company of Macclesfield, Ltd.), Nelson (Nelson Corporation), Percival Lane (Mersey Power Co., Ltd.), Rawtenstall (Rawtenstall Corporation), Ribble (Preston Corporation), St. Helens (St. Helens Corporation), Southport (Southport Corporation), Stockport (Stockport Corporation), Trafford (Stretford U.D.C.), Wallasey (Wallasey Corporation), Warrington (Warrington Corporation), Wigan (Wigan Corporation), and Willowholme (Carlisle Corporation).

# THE VIENNA FAIR.

## Some Novelties in the Electrical Section.

[From Our Own Correspondent.]

THE electrical exhibition at the Vienna Fair which has recently come to a conclusion took on an international aspect. The exhibitors, in addition to German and Austrian firms, included American, Swedish, Dutch, Swiss and British manufacturers. This Fair is of extreme importance to the countries in Eastern Europe, who come here to cover their annual requirements in electrical apparatus and accessories. Great Britain was only represented by the Standard Electrical Engineering Co and the Marconiphone Co., Ltd., who should have shared in the general good business, reported by most of the exhibitors.

The electrical section was mainly concerned with appliances calculated to save labour in the home.

The firm of Siemens-Schuckert exhibited their multi-purpose electrically-driven machine, which is capable of many different services, including meat mincing, coffee grinding, extracting juices from fruit, knife cleaning, bread cutting, lemon slicing, knife sharpening, etc. Similar machines of British make have, of course, been on the market several years. An exhibit of agricultural interest by the same firm was an electrical device for keeping warm food for animals.

Amongst other exhibits of agricultural interest were some electrical grass-mowers ranging from the largest size to the small lawn-cutter which is guided by hand. Then there were some large tractor size ploughs for farms and plantations and the smaller variety which can be used for small kitchen gardens.

An American firm, the New York Savage Co., showed a laundry drying machine of a size suitable for use in private houses. Another machine of theirs will press any type of clothing in much the same manner as the well-known steam presser.

Amongst the electrical sweepers and floor polishers was a machine called the "Monopol-Bohner," which has a polisher fixed at each end of the dust case, and these polishers create a suction by turning inversely against each other.

A novelty was a cheap electric air purifying apparatus shown by Messrs. Wengraf and Platzer. This machine is intended to take the place of the small hand pumps which are used for spraying moisture disinfectants and perfumes into the dry air of cinemas, theatres, and even private homes.

Hotels will, I think, welcome an electrical device for waking their guests in the morning. The guest himself arranges the time at which he wants the bell to work by simply plugging in on a dial which registers the hours.

A small and compact high frequency violet-ray apparatus was shown by the firm of Carl Otto Sikor. The machine, with a set of accessories, which packed in neat case, costs only 45s. retail in Vienna, is called the "Kos," and is supplied for both d.c. and a.c. supplies.

# AUSTRALIAN LETTER.

## An Electricity Commission Proposed for New South Wales.

By W. DAVEY, Managing Editor "The Australasian Electrical Times."

Melbourne, September 20th.

THE month of September has been one of stocktaking among the electrical trade organisations of the Commonwealth, a number of which have considered their annual reports and celebrated the end of another term of work by holding an annual dinner or other function.

The speeches made at these gatherings sometimes throw a light on the trend of thought. One instance of this was shown in a remark made by the President of the Electrical Manufacturers' Association of New South Wales: "There are some people who think we know that the only way to keep the local manufacturing plants going is to cry for Protection on anything and everything, whether it is being commercially manufactured in Australia or not. I say definitely that such people constitute a danger to our own industries, and that we desire Protection sometimes from within as well as from without."

It is good to hear such words from the head of an Australian manufacturing organisation. Too long has it been considered the height of patriotism in Australia to clap a heavy duty on "anything and everything," and stigmatise the man who imported anything for sale as a kind of trader. The only bright star in that firmament has been that the patriots who preached such doctrines invariably wore imported hats, boots, and underwear, smoked imported cigars, and wouldn't dream of reading a book either written or published in Australia.

* * *

Another significant word was spoken, at the annual dinner of the Electrical Employers' Association of New South Wales, by the Under-Treasurer of the State, who said that the Government was desirous of forming an Electricity Commission to control the generation and sale of electrical energy. At the same meeting, Mr. H. R. Forbes Mackay, general manager of the Sydney municipal electricity department, pointed out that although his department is incurring capital expenditure at the rate of 3½ millions a year, while the railways department is expending 4 millions a year on extending its power plants, and smaller undertakings are spending at least another half a million a year, results are not so efficacious as they should be. His own department last year experienced an increase of 33⅓ per cent. in connected load, but realised an increase of only 10 per cent. in units sold. This result was brought about largely by a general slackness of business, which has caused manufacturers to use considerably less current than they normally would have done, but Mr. Mackay pointed out that without co-ordination of the various services a high load factor would not be attained.

* * *

In Victoria, traders are a little bit disturbed at the purchase by the Melbourne Electric Supply Co., Ltd. (which is in course of purchase by the State Electricity Commission of Victoria), of a valuable retail trading site in Melbourne, with a five-storey building upon it. The company has paid £210 000 for the building, and will establish showrooms for electrical appliances.

The new owners will not take possession of the new building until the latter half of 1929, and one result of the new move will certainly be a marked stimulation of the sales of domestic appliances in this State.

On the personal side, Mr. F. M. Nicholl, who has been sales engineer of the State Electricity Commission of Victoria for the past four and a half years, and who, before he came to Australia, was connected with large electricity undertakings in Britain and India, has resigned, and is at present taking a holiday in Tasmania.

Mr. John S. Just, engineer and manager of the City Electric Light Co., Ltd., Brisbane, which supplies practically the whole metropolitan area of that city with current, has resigned to enter into private practice on his own account. Mr. Just has held this position for over thirteen years. His new activities will doubtless have a bearing on the electrical developments in the Northern State referred to in earlier letters. Queensland is a State with a magnificent future before it.

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Bedford Electricity Committee has prepared a scheme for the provision of sidings and coal handling plant at the electricity works, at an estimated cost of £13 850.

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# DOMESTIC APPLIANCE MANUFACTURE.

## Big New Birmingham Works Equipped to Cater for Growing Public Demand—Details of Production Processes and Equipment—Industrial Heating and Cooking.

IN order to cope with the increasing demand for domestic electrical appliances the General Electric Co., Ltd., has recently acquired an extensive group of factories in Landor Street, Birmingham, which has been re-equipped and re-christened, " Magnet " Works.

The new works, which we had the opportunity of inspecting last Friday, are situated close to the centre of Birmingham, with a wide frontage to the main London-Birmingham line, and adjoining both main lines of the L.M.S. which pass through Birmingham. A private siding runs into the works, so that direct communication is available with London, Manchester, Liverpool, Bristol, Sheffield, Leeds, York, and other important centres. Another valuable medium of transport adjoining the works is the Birmingham and Warwickshire Junction canal.

The main factory consists of a three-storey building, arranged in four intercommunicating blocks. In all there are eleven spacious bays, each 300 ft. long and 50 ft. wide. Grouped round this main factory are several further extensive work-shops, in addition to a large administrative building.

### Modern Factory Practice.

The layout and equipment of the works is in accordance with modern principles, and each stage in production is so arranged that there is a regular and ordered flow of material continually available in each department. In every part of the factory special attention has been given to handling and transport, this remark applying particularly to the reception, stores and despatch departments.

The principal sections of the works devoted to the various preliminary operations which are necessary before parts are ready for assembly, comprise the casting shop, grinding shop, press shop, capstan shop, general machine shop, sheet metal working shop, and industrial heating and cooking equipment machine shop.

The press, capstan, and general machine shops are principally concerned in quantity production of components required for domestic electrical appliances and electric light accessories. In the press shop, for example, the body of an electric kettle is pressed from a circular sheet of copper; the two halves of the kettle's spout are similarly produced, and subsequently soldered together forming an invisible joint.

These shops naturally contain many aisles of machinery engaged in repetition operations. The machine tools in the industrial heating and cooking machine shop are of an entirely different character. They comprise punching and shearing machines, flattening rolls and the like, which are of a very robust construction in order that they may perform rapidly the necessary operations upon the heavy plates required in the construction of large baking ovens, furnaces, etc.

All finished components for domestic appliances, the lighter forms. of cooking and heating equipment, and electric light accessories, are taken to the stores, and are then requisitioned for assembly as required.

Two of the main 300 ft. bays are required for the assembly of domestic electrical appliances; and a third bay is already ear-marked for the same purpose. In one of the bays at present in action, the smaller ranges of appliances are handled, including irons, kettles, toasters, saucepans, radiators, milk sterilisers, warming plates, and so forth. In the other bay electric cookers, water boilers and the larger ranges of apparatus are constructed. In the other bay, resistance elements are wound.

The assembly of electric lighting accessories is carried out in one of the top floor bays. The staff employed for the delicate handling operations involved is almost entirely female, and it is most interesting to watch the extremely rapid manipulative skill shown by the women and girls in producing the finished accessory.

Housed in a building adjacent to the packing and despatch department is the testing department where all domestic electric heating and cooking appliances are thoroughly tested. The heavy industrial equipment is tested in the shops where it has been erected. Testing boards have been installed in the department, fitted with all necessary instruments, while motor generator plant enables any voltage to be tapped as required by the particular appliance under test. Boiling appliances, such as kettles, are subjected to a boiling test to ensure that the temperature of the liquid is raised by a definite amount in a given time. A special testing board for domestic cookers is installed, and each cooker is placed on test for one hour, during which time the current consumption is checked. A thorough mechanical inspection is also made.

Two bays of the main building are fitted up as the G.E.C. Central Stores, where are carried stocks of several important lines of G.E.C. appliances and accessories. These stocks are so arranged that demands from the company's head office or branches can be immediately satisfied. The geographical situation of " Magnet " works and its exceptional transport facilities render it an ideal spot for the housing of Central Stores.

In these works the G.E.C. has installed a system of lighting based on the most modern methods of factory illumination. General illumination has been adopted throughout, with the addition of local lights where high intensity is necessary on such work as chasing, spinning, etc. This local lighting is carried out by means of an industrial type, adjustable bracket, with concentrating reflector. The general installation embodies the " Geco " dispersive type enamelled steel reflector and in conjunction with " Pearl Osram " lamps, intensities varying from 5 to 12-ft. candles are provided on the plane of work, according to the operations in hand. The offices have been dealt with in a similar manner, except that " Britalux " dust-proof totally enclosed units are installed.

During our tour of the works a number of special demonstrations were presented. One of these was the electric annealing furnace, which has been in use for some considerable time annealing sheet brass and copper stampings and spinnings. The loading is 80 kW, the furnace working at 440 V three-phase, 25 cycles a.c. Resistance heaters are fitted under the hearth plate and in the side walls. The furnace body is built up of sheet steel and angle iron, and the heat insulation is such that the exterior of the casing is not appreciably warm to the hand. A movable loading shelf is fitted in front to enable the furnace to be loaded and discharged easily, and alongside the furnace is the automatic temperature control gear and main switch with a three-pole contactor. By means of this gear the furnace can be automatically maintained at any desired temperature, the maximum being 1 000 deg. C. A water heating demonstration illustrated the application of 2 kW immersion heaters to the heating of water. A water storage tank of the usual type had three immersion heaters fitted into the side, an arrangement which showed the adaptability of these heaters to the conversion of ordinary tanks to electric heating.

### Electrical Baking.

For the baking demonstration, a " Magnet " standard 4 ft. by 4 ft. double-deck baking oven (Peel type) fitted with the Humidor steam injection apparatus, was employed. The oven, which is fitted with a fireclay tile sole, has detachable tubular heating elements, and its loading is 10 kW per deck. Switches giving three-heat control and pilot lamps are fitted. The Humidor apparatus consists of a small steam boiler heated by immersion heaters. When the necessary pressure is generated, the valves are opened and a mixture of steam and atomised water is injected through a special jet into the baking oven.

Other exhibits included a small (4·8 kW) japanning oven, intended for garages and businesses where it is desired to japan smaller articles; an electric muffle furnace with automatic temperature control gear; and an automatic kettle of the fusible cut-out type.

At first glance it may seem surprising that an electrical company, even of the magnitude and scope of the G.E.C. should require 10 acres of manufacturing floor space for what is—after all—but a fraction of their total range of products. But the new works were taken over not only to meet present-day requirements, but in order that there should be a reserve of space available to meet the greatly increased demand for electrical appliances that is rapidly developing.

Already the new factories are completing over 1 000 electric radiators each week, while the weekly output of electric irons is considerably more than three times this quantity. Similarly, the output of electric grills, toasters, kettles, coffee percolators, curling tong heaters, shaving pots and the like, is on a correspondingly large scale.

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## A NEW BIRMINGHAM WORKS FOR DOMESTIC APPLIANCES.

*THE new "Magnet" Works at Birmingham, described on the opposite page, are pictured above, Fig. 3 being an exterior view of one of the four blocks of the main building. The other pictures show :—(1) Assembled domestic heating appliances awaiting inspection at end of assembly bay ; (2) one of the bays devoted to electric light supplies ; (4) capstan and press shops for electric light supplies ; (5) the machine section for domestic appliances ; (6) assembly shop for electric light supplies ; and (7) a group of the new pressed steel cookers.*

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# SELLING IN ELECTRICAL SHOWROOMS.

## Value of Decentralised Premises—Demonstrating Flexibility of Service—A Wall Bracket Difficulty Overcome—A Special Wiring Plan—Window Lighting and Display—Points from the Discussion.

MR. W. MILLNER, of the Westminster Electric Supply Corporation, Ltd., read a paper on "Better Selling in Electrical Showrooms" at the first E.D.A. Salesmanship Conference, held at the Royal Society of Arts on October 19th. Mr. C. H. Cox, of the Edison Swan Electric Co., Ltd., was in the chair.

Mr. Millner said that although different districts required different types of showroom, in all cases it should be clearly understood that the electrical showroom was only a background for the display, demonstration, and sale of electrical appliances, and that the frame must not overshadow the picture.

The sale of electricity and electrical goods differed vastly from the sale of most other merchandise. He felt that the design of an electrical showroom should be primarily designed by a competent sales engineer, who should then take his ideas to the architect. Showrooms should be centrally situated, and to be of real value should be on a main shopping street. It was false economy to select a site off the main street because of its lower rental.

In districts and towns where one authority supplied energy over a wide area, more effective results could be obtained by decentralising the showroom, than by concentrating all the effort in one building at headquarters. A number of small showrooms with good display windows, located at suitable strategic points in the area, would make contact with a large portion of the population than would be possible with a single large showroom.

One of the most important parts of an electrical showroom was the wiring installation. This should provide a suitable supply of electrical energy within 6 ft. of wherever a demonstrator was standing, or wherever a piece of apparatus was placed. Nothing more impressed the lay mind with the flexibility and convenience of electricity than seeing apparatus casually connected to outlets close at hand.

The wiring should be planned so that drastic alterations could be made in the general showroom lay-out, without alteration to the wiring.

With the wiring should also be considered the plumbing, for where water heating apparatus was to be demonstrated this was a vital point.

Wiring in an electrical showroom should be particularly well laid out and installed, and more than usual precaution taken against failure. At busy times it was no uncommon occurrence to have ten or a dozen radiator circuits on at the same time. It was therefore essential that all power circuits were run separately and were separately fused. Heating points in showrooms were sometimes looped together, but this practice was thoroughly bad. Lighting points should be generously switched, and ceiling points should be provided with some device to make change of fittings simple. Wall brackets were perhaps the most difficult to deal with, as walls were invariably marked by fitting and removing them. One method of overcoming this difficulty was to have a number of panels on which the brackets could be fixed, and which could be hung up like pictures, and connections made to suitable two-pin sockets.

### Up-to-Date Lighting.

Window lighting required special consideration, and an electrical showroom window should have its lighting arrangements at least two years ahead of anyone else; no electrical man ought to be proud because his window was illuminated only to the standard which was usual in the case of a first-class confectioner.

The window should have at least two rows of closely spaced, concealed reflectors, with provision for fixing colour screens. Points should be allowed for window floodlights and spot lights on the ceiling and floor. Footlights should be available, and sockets should be liberally spread round the side and back of the window, and on the floor. All window points should be separately switched, and the switches should be conveniently grouped together. It was a convenient arrangement to have terminals looped out from the switches, from which wires could be connected to motor-driven flashing devices, etc. With a thoroughly equipped window it was possible to have new lighting effects with each display, with little more trouble than was required to close a few switches. All electrical showrooms should have the natural daylight either partially or entirely excluded. It was impossible to demonstrate to the best advantage either lighting equipment or fires in daylight, and furthermore, an artificially-lighted showroom gave the opportunity of permanently showing novel lighting applications, such as artificial windows, laylights, and cornice lighting.

Window display space was so valuable that it was worth while to spend both time and money in seeing that it was always utilised to the best advantage.

The electrical industry had only itself to blame if a large proportion of the domestic electrical apparatus reached the public through the stores, ironmongers and drapery establishments. When one found large departmental drapery stores selling electrical apparatus it seemed that the electrical ndustry had been throwing away its birthright.

### The Discussion.

MR. H. ROGERS contended that a showroom should be constructed absolutely on the same level throughout, without any steps.

MR. L. E. BUCKELL thought it would assist consumers in purchasing lamps if some means of comparison was available in the showrooms. Speaking of the design of heaters and the author's idea of placing them in dummy fireplaces, he deprecated the habit of imitating older forms of heating and cooking apparatus, and held the view that electric cooking development had been held back because cookers too much resembled the gas cooker.

MR. BROWN disagreed with the suggestion that daylight should be excluded, mainly on the score of expense of artificial illumination. In order to get over the difficulty of continually getting new ideas for window and other displays, he thought certain showrooms might arrange to exchange window displays.

MR. DAIN urged the necessity for the service side of the undertaking to back up the work that was done in the showroom.

MR. W. A. GILLOTT pointed out that contractors were under a disadvantage compared with the showroom of the supply undertaking, because the latter could arrange for accounts to be paid in the showroom, and thus bring the consumers there quite often.

MR. F. H. HOWELL said the great thing desired was organisation to get people into the showrooms as often as possible. A larger outdoor staff was necessary, in order constantly to be bringing new ideas and developments to the notice of the consumer.

MR. MORRIS said householders were getting thoroughly tired of canvassers calling at their homes. He urged that electrical contractors should be encouraged by being allowed special rates for lighting their showrooms, and they should also be allowed better discounts off apparatus by the manufacturers.

MR. JACKSON asked for the author's opinion on the question of sale or return to the manufacturers of apparatus on view in showrooms. That policy was supposed to have been abandoned, but in actual practice it had not been, and he urged some of the supply authorities to play the game in this respect.

MRS. HOLLIS suggested that one means of educating the consumer was to teach the housewife to read the electricity meter, as that gave her a much greater interest and enabled her to ascertain the actual cost.

MAJOR LEITH, speaking on the question of discounts, said the manufacturers had decided that 25 per cent. was a fair discount to allow, and if a higher rate was agreed to it would certainly mean that the price of the apparatus would have to be increased.

LT.-COL. W. A. VIGNOLES expressed the view that at present the contractor had an advantage over the supply undertaking showroom, because he could show wireless and other goods to attract the public. He hoped the E.D.A. would be able to do something in the way of exchanging window displays in the manner suggested.

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# RURAL ELECTRIFICATION.*

## Limitations of Present Economic Scope for Development—Progress at Chester—Guarantees from Consumers—Conditions for Remunerative Supply.

By S. E. BRITTON, M.I.E.E.

WHAT is meant by rural electrification? It should mean the provision of a comprehensive system of transmission and distributing lines designed to supply complete electrification of homes, businesses and industries.

Now what is the present position with regard to the service of electricity in rural areas? Briefly it is this: The total area of England and Wales is 58 340 sq. miles of which 6 500sq. miles is scheduled as urban area and 51 840 sq. miles as rural area. Of the rural area 29 350 sq. miles, having a population of 5 468 514 is included in areas of supply and 22 490 sq. miles of rural area, having a population of 2 383 768 is not within the area of any distributing authority.

The extent of rural electrification in the sparsely populated parts is obviously governed by the spending powers of the individual occupiers of premises, the nature of the demand for the service and current required. It is therefore important to know the economic value of electricity for the various purposes to which it can be used, and to educate the public in the fullest use of the supply for these purposes to which electricity is suited.

Mr. S. E. Britton, extracts from whose Address to the Liverpool Centre of the I.E.E. on Monday are given on this page.

In rural areas, the average number of potential consumers along a street of a given length is less than in urban areas, and in giving a supply under a requisition from six or more owners or occupiers of premises, the guarantee from these consumers, representing 20 per cent. of the expenditure, seldom leaves a balance of potential consumers to be connected at a later date to advance the income to as high a percentage as in urban areas. Herein lies the great difficulty and weakness in the obligations and privileges contained in the Electricity (Supply) Acts when dealing with rural electrification, and the necessity for a more appropriate method for arriving at a minimum charge or guarantee is clearly indicated.

There can be little doubt that the present economic scope of development is limited to the parts wherein the spending power of the potential consumers exceeds 20 per cent. of the cost of the distributing system. It is therefore important to have some knowledge of the customary spending on light, heat and power of the various classes of people who make up a rural community.

The Chester Corporation have two Special Orders, the first obtained in 1923 and the other in 1927. These apply to an area of 139 square miles. The area contains two urban and two rural district councils comprising 95 parishes, a population of 33 664, with 6 992 occupied premises and 395 miles of main and secondary roads.

The electrification of the area began in 1924, and the supply is now available in 52 parishes. At March of this year there were in use 25 miles of high tension overhead transmission lines, 23 sub-stations, 36 miles of low tension overhead lines and 7 miles of underground cables supplying in all 1 459 consumers.

The consumers represent 40 per cent. of the occupied premises along the route of the distributing lines and 21 per cent. of the whole of the premises in the area.

Capital expenditure at March 1928 totalled £46 732, and represents an expenditure of £687 per mile of high and low tension lines and £1 087 per mile of low tension lines, £34 per consumer, £6·74 per premises, £6·62 per capital supplied (taken at 4·842 per premises) and 1s. 1d. per kilowatt hour sold.

Income for the year amounted to £10 064 and represents £148 per mile of high and low tension line, £244 per mile of low tension line, £6·898 per consumer, 28·5s. per capita, 2·802d. per kWh sold and 21·5 per cent. of the capital expenditure.

The units sold amounted to 861 926, and represent 12 675 per mile of high and low tension line, 20 045 per mile of low tension line, 590 per consumer, and 122 per capita. The units sold to the first or part year consumer average 230, the second year consumer 637, the third year consumer 684, and the fourth year consumer 745.

In considering these particulars it should be remembered that much of the capital expenditure is in respect of a transmission system into parts of the district not yet served, and is therefore a burden on the undertaking during the development period. It should also be remembered that there remain 60 per cent. of the premises not connected, and when saturation is reached the income will probably be increased by approximately 100 per cent.

If the rateable value of premises may be taken as an approximate measure of the spending power, the rural areas are only one-tenth to one-fifteenth of the value of the urban areas. This demonstrates clearly that a supply given upon a requisition of six or more occupiers in a rural street may in many cases absorb all the potential consumers, and involve the undertakers in a perpetual loss. It also emphasises the importance of the electrification being developed on the cheapest practical lines.

At Chester, in order to ensure the rural supply being remunerative, a guarantee is imposed upon each consumer with the object of obtaining an income of at least 20 per cent. of the expenditure, the method employed being the allocation of a sum which represents 20 per cent. upon the estimated cost of an extension between the occupiers of the premises in proportion to the rateable value of the premises which come within reach of the supply. By the adoption of this method, guarantees as low as 4s. and as high as 15s. per £1 of rateable value have been asked and accepted.

In the generality of cases where the mileage of transmission lines does not exceed the mileage of distribution lines and the number of potential consumers is not less than 30 per mile there is a prospect of the development of a remunerative supply. In connection with the Chester rural electrification area of 139 square miles, with 390 miles of streets, it is estimated that the complete economic electrification under present conditions will be served by 75 miles of high tension and 90 miles of low tension lines, and that the supply will be ultimately available to approximately 75 per cent. of the premises in the area.

This attempt at rural electrification has created a considerable market for the sale of agricultural land bordering the streets where the supply is available. It has helped many who have helped themselves to obtain the service of electricity. It has influenced the building of about 300 houses. It has induced a number of families to move into the country, and other families to come into the district. It has created new rural industries and revived others which were flagging. It has increased employment amongst rural communities and has added materially to the brightness and comfort of many homes.

* Extracts from the Chairman's Address to the I.E.E. (Mersey and North Wales (Liverpool) Centre) on October 22nd.

### TELEGRAPH AND TELEPHONE STATISTICS.

In a table in the October issue of "The Post Office Electrical Engineers' Journal," the number of telephones owned and maintained by the Post Office at June 30th, 1928, is given as 1 668 098, of which 588 706 are in the London district. Next in density comes the South Lancs district with 156 403, followed by North Wales with 102 443.

Overhead wire mileages were:—Telegraph, 70 768; trunk, 370 327; exchange, 707 061; and spare, 38 951. Mileages of underground wire were:—Telegraph, 184 835; trunk, 517 854; exchange, 4 859 655; and spare, 897 031.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## Wiring at 4s. 6d. per Point.

[To the Editor.]

Sir,—With reference to the correspondence that has been appearing in The Electrician and various other trade papers of late with regard to shoddy wiring, we feel that we should like you to see one or two specimens of joints which we recently pulled out of a job.

This was a steam laundry, and we were told that the existing installation had only been in five years, but as all the machinery in the place was "live," it was decided that something must be done.

Most of the cable was stapled to the joists, and in one case tied to a 60 ft. run of ½ in. gas pipe.

The distribution consisted of a 10 A link switch (no covers) and a pair of 5 A cut-outs, the fuse in one being a very rusty hairpin.

The joints we enclose are just a specimen, the total number cut out being twenty-seven. Surely something must soon be done to make this sort of thing illegal.

We happen to know that the price charged for the original work was 4s. 6d. per point, and at the present time work which is very little better than this is being carried out in this district. and quite probably in many others. It seems that the biggest offenders are men who start in business for themselves, with no capital, whose only chance of getting work is to do it at this price and leave the rest to luck.

We trust you will pardon this outburst on our part, but we pride ourselves on doing our job right, and when one comes up against workmanship of this description one wonders exactly where things are going to end up if this sort of thing is allowed to go on.—I am, etc.,

A. H. Seager,
Engineer-Director, A. H. Seager, Ltd.
Orient House, Station Road,
Belmont, Surrey.
October 19th.

[The joints to which Mr. Seager refers have been photographed, and the result is reproduced on this page. The only practical remedy we can see at the moment is for every competent electrical installation contractor to become a Registered Contractor. The National Register stands for good installation work, and its activity in acquainting the public of this fact cannot fail to effect an improvement in the standard of wiring in this country. If all the unregistered qualified contractors would now apply for enrolment, the task of the National Register would be simplified and its hand strengthened by having on its roll the names of all the reputable contractors in the Kingdom.—Ed.]

## "Shoddy Wiring in Churches."

[To the Editor.]

Sir,—I was gratified to see in your issue of October 19th a letter from the National Register of Electrical Installation Contractors dealing with this important matter.

One of the declared objects of the National Register is "to maintain or assist in maintaining by all lawful means a high standard of workmanship, so as to secure for the registered electrical installation contractor the confidence of the public." By its decision to follow up cases of shoddy wiring, the National Register is, it seems to me, taking a big forward step in the task which it was set up to perform, and I feel sure that the majority of registered contractors will not only heartily approve the policy, but will also assist the National Register in this work by bringing to its notice matters which call for action of the kind taken in the London church case.

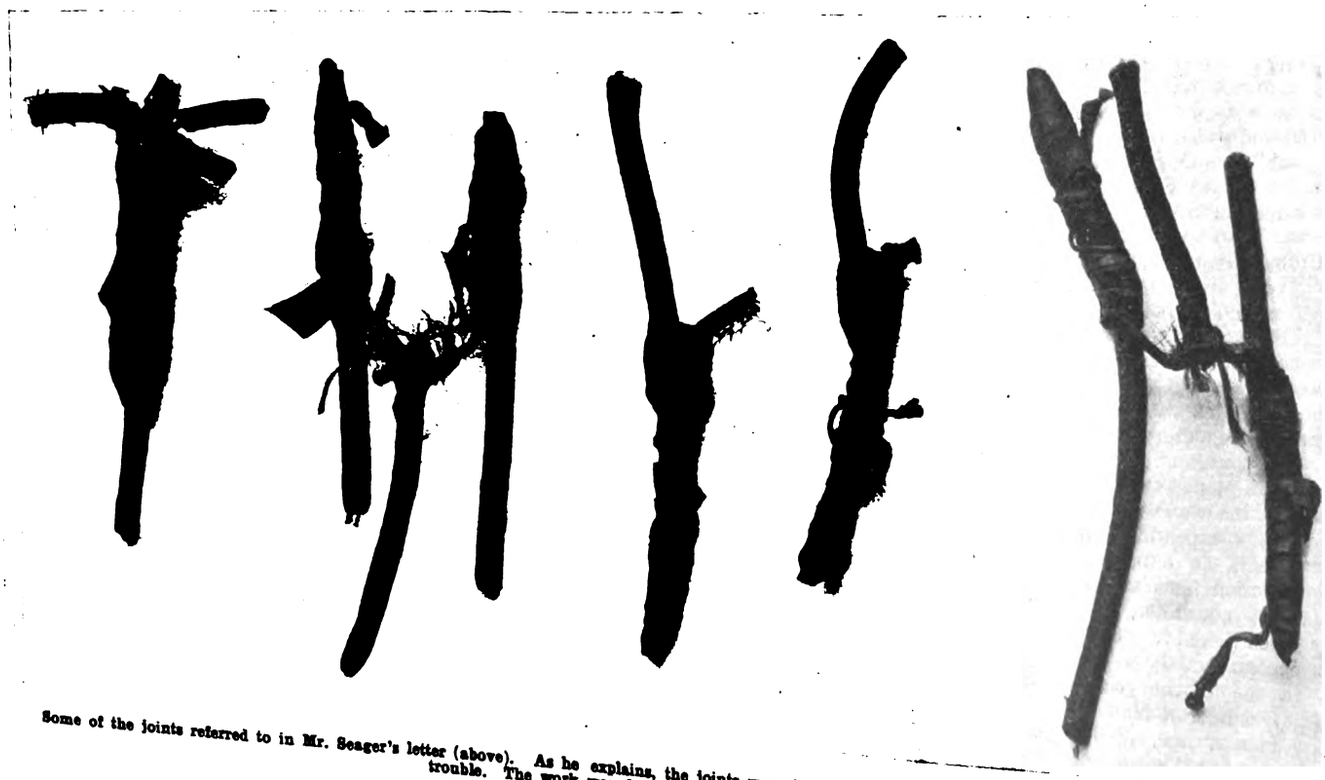
As one of the first to be enrolled on the National Register, I have derived considerable benefit from the status which the possession of its certificate confers, and I welcome this extension of its propaganda policy as a practical way to further enhance the reputation of the registered contractor.—I am, etc.,

"Natreg."

Manchester.
October 20th.

[To the Editor.]

Sir,—The statement by Mr. Trimnell in your correspondence column last week that the National Register of Electrical Installation Contractors is endeavouring to investigate all known cases of shoddy wiring is of particular interest to contractors who, like the writer, are enrolled on the National Register because they believe it is a potentially good thing, but who have so far derived but little apparent benefit from it, due to the aloof policy formerly pursued by the Executive Committee. If it is generally felt amongst contractors that the National Register is actively promoting good workmanship a much larger number of applications for registration will undoubtedly result, and so long as the requirements from candidates are maintained at their present level, the influx of new members will greatly add to the influence of the Register.



Some of the joints referred to in Mr. Seager's letter (above). As he explains, the joints were found in a steam laundry, where they had been giving considerable trouble. The work was done at the price of 4s. 6d. per point.

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I have more than once heard the view expressed that once a contractor has got his name on the National Register there was no check on the sort of work he did, and that he could, without doing definitely "shoddy" work, put in installations of a somewhat mediocre nature. If, however, cases of shoddy work are to be officially investigated, the contractor who in the past has been content to take a risk will be more careful, as he will readily see that the discovery of a bad piece of workmanship is an ever-present possibility, and that once he has been found out he will have his certificate of registration withdrawn.

The contractor who obeys the spirit and the letter of the National Register's requirements has nothing whatever to fear; the unscrupulous contractor is better removed from a list which stands for good craftsmanship and materials.—I am, etc.,

"REGISTERED."

October 22nd.

[TO THE EDITOR.]

SIR,—I have read with interest the letter from Mr. Trimnell in your current issue, and also several letters that have appeared of late, criticising the National Register, its lack of advertising, etc.

Some people expect a great lot from the Register, but do they realise that £1 per year will not go very far for publicity work? I am satisfied that the Register is doing very valuable work and could do more if we all paid an increased annual renewal fee. Probably some of the disgruntled ones don't know all the Register has done, and is doing, in publicity work. In one of your April issues, you published a long illustrated article on "The Need for Compulsory Registration," and some of the illustrations were of shoddy wiring in churches and other buildings.

It has since come to my knowledge that the Registration Authority got permission to reprint this article from your pages and, for a start, had five thousand copies printed, and circulated these to central station engineers, consultants, architects, etc. There was such a demand for copies that a further five thousand were printed, and are being circulated.

This, to my mind, is very valuable advertising propaganda for the Register, and must do good, but apparently such activities are not known to the grousers who evidently want "the moon" at once, and are disappointed because they can't get it.

Registration is growing, and, I think, compulsory registration is coming, but not just yet. But so long as every "curbstoner" is allowed his freedom, and so long as we do not adopt Compulsory Registration on a national basis, then just so long and no longer, shall we have shoddy wiring carried out.—I am, etc.,

"REGISTRICIAN."

October 22nd.

## "A New Description of 'j'."

[TO THE EDITOR.]

SIR,—I am pleased to note from your issue of October 19th that some interest in the use of complex numbers has been occasioned by Mr. Turnbull's recent letter under the above heading. It might, however, be more accurate to say that some interest has been revived, since such methods of working in respect to electrical theory were used extensively by C. P. Steinmetz in his electrical writings towards the close of last century, and his paper "Complex Quantities and their Use in Electrical Engineering," published in the Proceedings of the International Electrical Congress, Chicago, pp. 33–76, August, 1893, would well repay the study of anyone interested in the applications of the method to electrical theory.

The subject does not belong to the theory of exponentials, as Mr. A. M. Taylor seems to think, but rather to the theory of equations; being a direct development of the work of Cardan who published, in the famous "Ars Magna" of 1545, a demonstration of the existence of complex numbers in the roots of certain quadratic equations. The demonstrations given by Mr. W. Fordham Cooper on p. 428 puts the matter very logically, and I am entirely in agreement with his concluding remarks to the effect that simplicity of notation is essential to the progress of the theory. In point of fact, the recent great advances in the theory of equations are in no small measure due to the simplification of the methods of representation.

It is very difficult to trace the development of the theory to the stage of its first practical applications, but I think it was used in analysis both by Euler and Gauss.

In the theory of fluid motion and the corresponding electrical problems in two dimensions, the conception of conjugate functions, i.e., functions of the form $f(a+jb)=\phi(x+jy)$ are fundamental to the theory. In fact the conception of such quantities has made possible the mathematical solution of these important problems, and provided a very powerful weapon of analysis for analagous hydrodynamical problems in two dimensions. Probably the best extant demonstration of the applications of these methods to electrical theory is contained in Arts. 182-206 of Clerk Maxwell's "Treatise on Electricity and Magnetism" (3rd Ed., Oxford, 1904). The theory is also expounded in considerable detail by Sir J. J. Thomson in his "Recent Researches," Chap. III, pp. 208-250, but this work is now unfortunately out of print.

In electrical circuit theory the method has an extensive application, based chiefly on the writings of C. P. Steinmetz, which I have already mentioned. At this point it is desirable to remark that these writings are not entirely free from erroneous conceptions. These have received the able consideration of W. F. Dunton in his paper "Researches in Engineering Mathematics," in "Beama Journal," September, 1923.

I have already attempted in these pages to show the applications of the theory of complex numbers to electrical engineering calculations ("Complex Numbers in Engineering," ibid., February 11th, 1927), and have also discussed the application of the theory to electrical problems in two dimensions ("The Complex Number and its Use in Electrical Theory," ibid., August 17th and 24th, 1928). A complete example of the theory in its application to the solution of complicated alternating current circuits is contained in my recently published small work "The Operation of Single-Phase Induction Motors," in which the method is applied to the theory of equivalent circuits.—I am, etc.,

G. WINDRED.

Bedford.

October 22nd.

## "Vector Notation."

[TO THE EDITOR.]

SIR,—I regret that in my article "Vector Notation," two typing errors have occurred, the symbol $\pi$ having got lost in two places.

Equation 2 should read:

$$\left[\cos\left(\frac{2m-1}{n}\right)\pi + j\sin\left(\frac{2m-1}{n}\right)\pi\right]^n = [\cos(2m-1)\pi + j\sin(2-1)\pi]$$

whence

$$\sqrt[3]{-1} = \left[\cos\left(\frac{2m-1}{3}\right)\pi + j\sin\left(\frac{2m-1}{3}\right)\pi\right]$$

The result is rather confusing, though the correct reading can easily be deduced from the context, since equation 3 reads correctly

$$(-1)^n = \left[\cos(n\pi) + j\sin(n\pi)\right]_{m=1}$$

Incidentally, at the beginning, an $n$ has become an $x$, but this correction is obvious.—I am, etc.,

W. FORDHAM COOPER.

16, Ferme Park Mansions,
London, N.8.
October 23rd.

## Standardised Page Sizes for Technical Journals.

[TO THE EDITOR.]

SIR,—Everyone connected with technical periodicals must be strongly interested in the standardising of page sizes. Those of your readers who have discussed this question in your correspondence columns may be interested to learn that in Sweden during the last five years a real start has been made with standardisation, with the result that 28 of the technical journals, to be found in the library of which I have charge, have altered their old sizes in favour of one standard size, and the few new journals have started out with this size, i.e., that of "World Power."

This, it is true, is only a beginning, but, now the principle has found some practical support, it is to be hoped that standardisation will proceed much more rapidly than heretofore, and will include all printed matter which is intended to be kept.—I am, etc.,

OLOV BORG.

Västeras, Sweden.
October 16th.

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*THIS suggestion for a Christmas Presents window display in an electrical shop or showroom is one of several described in the accompanying article. This idea is best carried out in two windows, the second providing the answer to the natural question: "What is in the Parcels?"*

# CHRISTMAS WINDOW DRESSING.

## Practical Suggestions for Producing Simple and Effective Displays of Seasonable Electrical Goods in Various Types of Window.

By A. EDWARD HAMMOND (Author of "Shopfittings and Display" and "Practical Aids to Retail Selling").

IF the electrical contractor proposes to get in an extra stock of a representative collection of things electrical which suitably suggest themselves for Christmas presents he must be prepared to devote a little time to the preparation of plans for displaying them, and as he will not wish to leave his Christmas selling arrangements until the last minute, he should make up his mind to get busy with window dressing schemes during the coming week.

### Improvised Settings.

Now, the first thing to do is to see how far he can improvise Christmas settings and display features without going to unnecessary expense in buying decorative materials and painted scenery and so on, although, of course, if he is willing to spend a little in this direction, it will add considerably to the appearance of his display.

If he is anything of a handy man or has any one answering this description on his staff, the matter should not present difficulties, and, after all, what electrical fitter is not a handy man? To judge from the ticklish jobs which he occasionally has to tackle, it would be a sad day for his work if he were not. The main idea is to get something suggestive of "the spirit of Christmas," which will bring his window into line with those of the shops around his premises.

Each year, as the festive season approaches, the ordinary trader finds it necessary to exercise more and more ingenuity and originality in arranging his window displays, in the hope that he may satisfy the requirements of the public for novelty and variety, and, in view of the immense number of shoppers thronging the streets from early morning until quite late at night, the electrical contractor whose premises are situated in or near a shopping centre will be wise to see that his window display is one in which the fullest possible use is made of bright, interest-arousing display aids and ideas, in order that the electrical goods exhibited may have their fair share of the attention of passers-by on the look-out for "something different" in the way of Christmas presents, and may also compare favourably with the windows of neighbouring shops.

With a view to making this article of use to the greatest possible number of readers, I propose to take three different types of electrical shop premises, and to see how far simple "home-made" display settings can be arranged in each case. Each of these "windows" will be capable of adaptation for different classes of premises, the object being to give the contractor a good working basis.

Let us take the case of the quite small contractor's window. To judge by the huge "rooms" behind colossal sheets of plate-glass which go by that name in the large stores, our small contractor's display space may hardly seem to justify the name; but that is no reason why he should not put up a brave show in proportion to the size of his premises. His window will not justify the use of a scenic setting, but it can be given a "splash of colour."

There are ways and means of supplementing the display space at seasonable times when it is more than usually necessary to attract the attention of the passer-by. The following three ideas which have been applied by other retailers may be helpful to electrical contractors similarly situated.

Some of the old-fashioned shop windows have projecting window-sills like ordinary private houses. One small retailer who was handicapped with one of these unnecessary appendages turned it to advantage by having a glass showcase with a sloping front specially constructed to fit on to the window-sill. By this means he was able to extend his display space at very little expense; further, he was able to cover up, and turn to good use, a section of his shop front which hitherto had been unsightly and useless.

### Utilising a Small Window.

Another shopkeeper, handicapped with a small window, had a long sloping window base. This extended from the bottom of the window-glass to a distance of several feet into the shop. The additional space thus obtained enabled him to introduce

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better window displays, and provided him with a means of exhibiting a wider range of goods. This window extension overlapped a certain part of the counter in the shop, and it was necessary, of course, to board up the part of the extension which was exposed to the customers' side of the counter. But this apparent drawback provided the trader with a good space for showcards and advertising matter, and one of which he did not fail to take advantage.

A retailer with high, old-fashioned windows, profited by the fact that he had a low fence in front of his shop. He had display cases fixed on the wall beneath each window, the fence providing the necessary protection against damage which might ordinarily result to showcases displayed so near to the ground.

Again, on premises with small windows, it is generally possible to add outside showcases to the side walls. Of these, several inexpensive varieties can be procured.

With his small window plus his supplementary display space, the contractor has scope for representative displays of small electrical goods suitable for presents. He should cover the back of the window or showcase with a glossy surface paper or crepe paper, of red, white, and green—the Christmas colours—all obtainable very cheaply in rolls. A sprig of real or artificial holly in each corner, and cotton wool interspersed with loose holly leaves along the front would be sufficient to provide tangible support to seasonably worded appeals, such as " Give Something Electrical," or " Electrical Presents are Always Appreciated."

The next type of window for which I propose to make suggestions is one of reasonable depth, say 3 ft., in premises with a frontage of from 6 to 12 ft., and having an open back. In such a window, the contractor has opportunity to give a freer rein to his ideas, although he is handicapped by the absence of an enclosure. The first consideration is a suitable background, and for a " snowy " display a white sheet suspended double from cord about three parts of the way up the window makes one good improvised setting. To add a touch of realism pine trees could be cut out in green casement cloth and sewn on to the white sheet. The mere outline of the trees would be sufficient to convey the effect, especially if the base of the window was covered with cotton wool, sprinkled with glittering " frost," which can be obtained in sixpenny boxes.

## An Expanding Background.

An alternative background for such a window might be arranged by the use of a length of trellis, which can be purchased quite cheaply. This has the advantage that its expanding nature makes it possible to fit it into any window. This should be painted green or red, and into the interstices hould be threaded strands of artificial ivy, or trails of artificial holly or fir—the latter two would probably be the most effective, for they have red berries which add considerably to the effect. A greater touch of realism is introduced if a strip of imitation icicles is arranged along the top, and the whole sprinkled with imitation frost.

The base of the window should then be covered with soft down wool—obtainable in 1 lb. packets specially for window dressing purposes, and more satisfactory in many ways than the ordinary cotton wool. Display stands of different heights should be employed for exhibiting the various electrical presents, and in order that these shall not spoil the effect, the legs of pedestals should be draped round with red or white crepe.

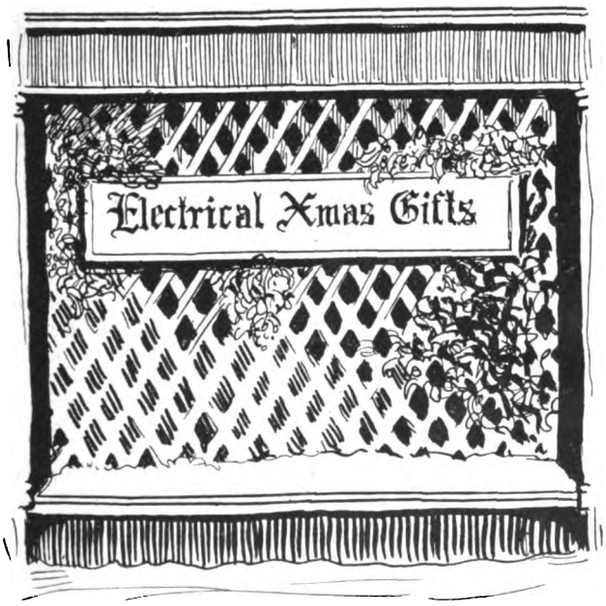
## Scheme for Large Windows.

For the shop with large windows, it is preferable to arrange a display in which the presents can be shown in use. A room with a fireplace containing an electric fire, with an electric kettle and electric toaster in the hearth with a table laid for breakfast, say for five or six people. At each person's place on the table would be two or three brown paper parcels, and on or alongside each of those chairs, and visible from the front of the window, would be larger parcels. Some of the parcels could be labelled plainly enough to be read by passers-by. " For Mother," " For Dad," " To Ivy from Fred," and so on. The parcels would be packed to represent, in both size and appearance, the actual articles, and in an adjoining window (for a one-window front, the window could be divided into two sections) a special display could be arranged containing such articles as wireless outfits, electric cleaners, floor polishers, electric heating pads, curling irons, egg boilers, shaving mugs, table stoves, toasters, electric griddles, waffle irons, coffee percolators and urns, coffee urn sets, and electric irons; electric flash lamps, cycle lighting sets, electrical accessories for the motor car dashboard, and so on.

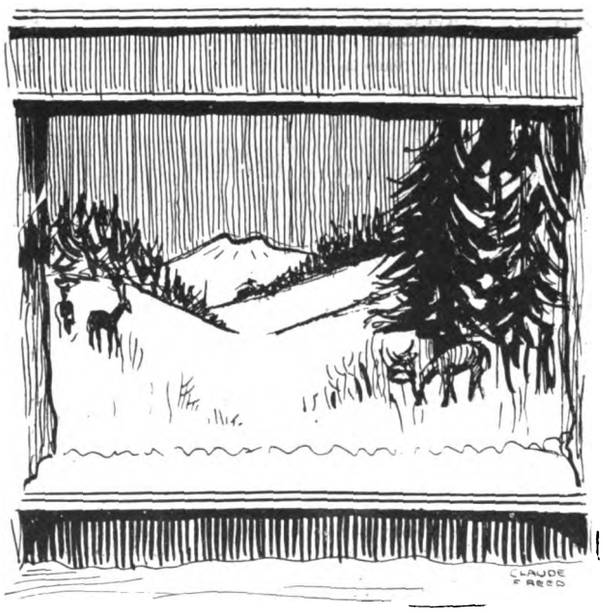
The display might be entitled, " What the Parcels Contained," and in smaller letters below, " See Next Window "; while the window in which the Christmas breakfast table appeared might have a large showcard bearing the following message, or words of similar purport: " Christmas Morning, What is for Breakfast ?—no one knows or cares. But everybody wants to know what is inside the brown paper parcels of all shapes and sizes in their place at the breakfast table. If you would like to be let into the secret in advance, see the next window."

The contents of the window in which the suggested presents are on display might be divided into sets or groups according to the recipients for whom they were intended, the various groups being headed respectively: " Presents Suitable for Men," " Useful Gifts for Mother," and " For ' Grown-Up ' Boys and Girls."

The Christmas tree is a time-worn but ever-popular method




A rough idea for a simple and economical scheme employing a trellis background. Trails of leaves and berries can easily be threaded through the trellis.



A further window background suggestion referred to in the accompanying article employs an outdoor scene. This plan can be carried out quite cheaply.

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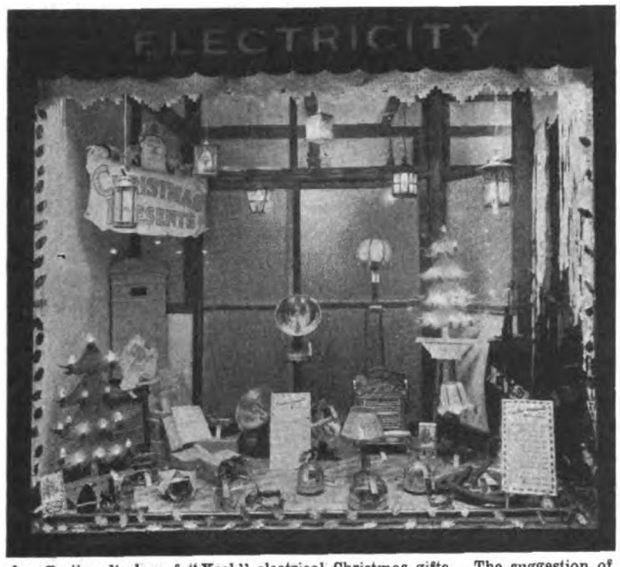
of displaying Christmas presents. It has that suggestion of "an old-fashioned Christmas" about it which appeals to the vast majority of passers-by. Christmas tree displays are suitable for all but the really cramped window, the various




An effective display of "Xcel" electrical Christmas gifts. The suggestion of parcels and a pillar box at the left hand side of the window is excellently conveyed in a small space. The showcards give a list of 24 articles suitable for gifts.

small electrical goods suitable for presents being tied on to the branches.

In a window in which a Christmas tree is depicted it is a good plan to have a "snow" covered base, and also to show it in a "falling snow" scene. The latter can be easily arranged by tying tufts of cotton wool on to black thread at irregular distances—2, 3 and 4 in.—apart. It is better to have two or three lengths of thread running across the top of the window out of sight, behind the pelmet and along the bottom of the window, and to tie the lengths to which the tufts of cotton wool are attached to these, rather than to pin or nail each thread to the ceiling and floor. The contractor will find, too, that the best policy is to make only one or two lengths of snowflakes at a time and to fasten these immediately they are made, otherwise hopeless tangles will result. Care must be taken, when dressing the window, to avoid touching the threads. They should not be more than a few inches from the glass, and should, of course, be arranged before the finishing touches are given to the display.

## Crepe Paper Settings.

Attractive settings for the Christmas tree window can be obtained by using some of the special fancy Christmas varieties of crepe paper. These are obtainable in red and green in half-a-dozen or so different designs depicting Santa Claus

This gift window, which attracted large crowds last Christmas, has a tree bearing electrical gifts as a centrepiece.

driving a sleigh or descending a chimney, size 10 ft. long by 20 in. wide, at about 1s. each.

For outdoor scenes, window dressing paper of a plain red-brick design, or imitating the building finish known as "rough cast," used in conjunction with paper icicles, is very effective. The latter are obtainable in lengths of 10 ft., 8 in. deep, at 6d. each.

Another means of producing a snow effect is by the use of white confetti and mica snow mixed together and scattered where needed. To produce snow-covered branches, natural or artificial wooden branches should be covered with paste, and sprinkled thickly with confetti and mica. Care should, of course, be taken that these are well dried before they are brought into use.

Models of every description are now available for the contractor's use—from those which portray a Christmas fireside to the more pretentious ones which enable the window-dresser to devote the whole window to a Christmas scene. Models and scenic backgrounds combined make excellent materials for demonstration windows.

## Other Display Aids.

Among other display aids which help to inculcate a Christmas spirit into the window are model Christmas bells covered with bright glittering frost, ornamented with sprays of holly and large red silk bows; these are available in dozen lots, or singly, in two sizes; 4 in. high by 4 in. diameter, or 12 in. high by 12 in. diameter; fancy crepe papers, 10 ft. long by 20 in. wide for friezes or bordering for the window in various designs such as holly in natural colours, poinsettia, Santa Claus, carillon of bells, and general Christmas scenes.

Then there are automatic models in the form of Santa Claus in a sleigh, as well as plaster models of plum puddings or snowballs. There are also several new designs in Christmas pelmets, and scenic backgrounds, and novel patterns in Christmas lanterns for display purposes have been produced. Another useful aid for seasonable sales is the special Christmas display ticket or tag for marking prices in the window, or for tying to Christmas parcels.

Many forms of coloured lighting are well suited to Christmas display purposes, and the contractor should not forget the

An attractive and dignified Christmas display in a Glasgow window.

attractive effects produced by the use of strings of coloured "decoration" lamps. A set of Christmas tree lamp outfits is obtainable with nine or eighteen olive-shaped lamps, 7 W, 14 V, varnished white, red, orange yellow, green and blue, with M.E.S. caps for pressures of 100-125, 200-230, and 240-260 V, with 25, 41 and 45 ft. of flex, respectively.

I am indebted to Messrs. Siemens Electric Lamps and Supplies, Ltd. and to the General Electric Co., Ltd. for the courtesy of the loan of photographs of the accompanying excellent examples of Christmas window displays.

## POINTS OF VIEW.

The profit of the Post Office on its telephone business is higher than its average profit; the profit of cable makers on Post Office business is lower than its average.—*Mr. Llewelyn B. Atkinson.*

* * *

It has been said that broadcasting is an evil influence in this country. That is all rubbish.—*Sir Landon Ronald.*

* * *

Too much emphasis cannot be laid on the value of several outlets for electricity in the principal rooms of a dwelling-house.—*Mrs. H. C. Lamb.*

* * *

How much longer is the system of lighting trains by gas to be tolerated in this country? It is a national scandal.—*Mr. A. Leonard Summers.*

* * *

I am prepared to accept private enterprise if it can justify itself.—*Mr. Ramsay MacDonald.*

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# ELECTRICAL GIFTS FOR CHRISTMAS.

## Electrical and Wireless Appliances Which Appeal as Yuletide Presents—Goods for the Christmas Window—Manufacturers' Suggestions—Many New Small Domestic Devices.

WHEN it is remembered that it is but eight weeks to Christmas the question of stocking appliances suitable as presents becomes one of outstanding importance. Apart from showroom displays, the window also claims attention, for unless this is carefully dressed with large and small devices within the financial reach of local pockets much of the Christmas trade will be lost. In order that we may assist electrical contractors as far as possible in reaching a decision as to the type of electrical equipment likely to be most popular within the next few weeks, we publish below a brief description of the suggestions made by manufacturers, including wireless receivers and accessories.

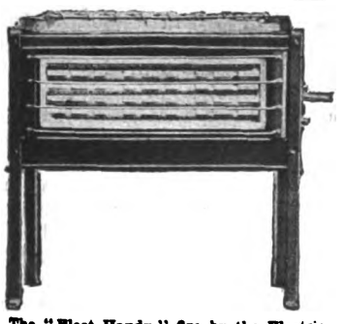
Our descriptions are necessarily brief on account of the space available, but sufficient details are given to enable the reader to form an opinion as to whether or not the articles are likely to prove popular in his district; further, the illustrations are self-explanatory.

Such items as electric irons and kettles, electric toasters and bowl fires are always popular, but are especially so at Christmas-time as solutions to the ever vexing question—what to give. In this connection may be mentioned the safety switch kettle of the Jackson Electric Stove Co., Ltd., which is made in sizes ranging from 2 pints, with loadings from 650–1 250 W. The same firm also manufactures an Atom fire, which by its construction may be adapted for boiling, frying, etc. Fires and small domestic appliances are also offered by Drake and Gorham Wholesale, Ltd., including such items as glue pots, soldering irons, heating pads, etc. The Bergmann Electric Co., Ltd., point out that in addition to the usual range of domestic appliances, the sewing machine motor is also of interest. This is a small equipment fitted with a lamp adaptor which may be moved into positions most suitable to the work in hand; the output of the motor is 40 W, at a speed of 1 600 revs. per min., sufficing for a rate of 1 400 stitches per min.

Electric vacuum cleaners are again suitable appliances for displaying as Christmas presents, and these are available at prices within the limits of practically everyone. The wide selection offered and the variety of makes forbid our mentioning each one in the space available. Electric washers and ironers are suggested by the Hurley Machine Co., and it will be remembered that we published a description of this apparatus in our issue of September 28th. Best and Lloyd, Ltd., are of the opinion that their 2 kW fire and parchment shade table standard are likely to prove of popular interest, and both these devices will be illustrated next week. The two-colour silk shade will also be shown. The bed-warmer by the Cooper Stewart Engineering Co., Ltd., is another suggestion, this being a portable heater measuring 9¼ in. in diameter with a loading of 400 W. Belling and Co. offer an extensive range of electric fires, cookers, water heaters, and other domestic appliances of Christmas interest. In the range of fires there is a wide selection offered at prices to suit all tastes, while the small appliances, such as boiling rings, grillers, irons, etc., are again of considerable interest. The British Resistor Co., Ltd., has drawn our attention to the Imberg Whitehouse heat accumulator which has recently been placed on the market. This device is suitable for bed warming or for use as a foot warmer, and is quite compact as to dimensions. An electric car heater is also made by the Arora Co., heaters being available for both 6 and 12 V supplies. The current taken by a 12 V equipment is 3 A, while the measurements are 11 in. by 6 in. by 1¼ in., weighing a little over 2 lb. The same firm also offers a range of fires and electric kettles.

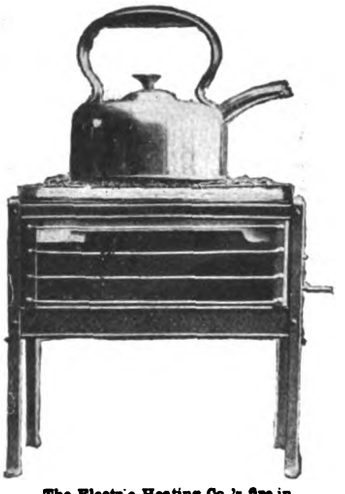
The General Electric Co., Ltd., has, during the past two or three years made special efforts to advance the cause reflected in the slogan, "give electrically," and again this year the energies of the company are being directed into a similar channel. The company's plans include directing attention to the selection of electrical products suitable for Christmas presents which it manufactures, by means of a series of advertisements in newspapers and journals, supplementing this

### MANUFACTURERS' SUGGESTIONS FOR THE CHRISTMAS TRADE.



The "Elect Handy" fire by the Electric Heating Co., Ltd.

A useful model by Veritys, Ltd.



The Electric Heating Co.'s fire in "cooker" service.

Another practical suggestion by Veritys, Ltd.

An electric iron is always popular. (Messrs. Chesterton Jones.)

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particular phase of publicity with the usual dealer selling-aids. Such devices as irons, cleaners, washers and wringers, cooking appliances, massage vibrators, hair dryers, electric curling tong heaters, fires, etc., will all form part of the publicity campaign, while the public will also be urged to buy such presents as lighting fittings, table and floor standards, decoration lamps, wireless sets, loud speakers, valves, etc. Hector C. Adam, Ltd., has introduced an automatic electric toaster which is so constructed that the degree to which the bread is toasted is regulated by means of a lever, and upon attaining that state is automatically released from the device, the current being switched off at the same time. Both sides are toasted simultaneously. Two new lines recently introduced by the British B.A.G., Ltd., are the Maxim toaster and an electric iron. The former has a loading of 400 W and is guaranteed by the makers to toast two slices of bread on both sides in two minutes. The iron is made in three sizes, namely, 3¾, 5, and 6 lb., with loadings of 275, 325 and 450W respectively. The portable immersion heater by George Green and Co., with a loading of 500 W, and the electric soldering iron with a loading of 50 W, are again likely to prove popular; the latter device should be of special interest to wireless enthusiasts. The Thermo-Path Co., Ltd., offers a wide range of Meracol fires, including screen fires and the Naldera; the latter, it will be recalled, was described in THE ELECTRICIAN of October 5th. Richson and Co. (1925), Ltd., have added several new designs to their range of lighting figures, one of which we illustrate. These figures are made of coloured porcelain in the shape of various animals and birds, and are fitted to take a candle lamp. Coloured glass table standards and water vase standards are also offered. Christmas tree lighting sets are always a feature at this time of the year, and among the sets available may be mentioned that of the Nico Light Co., Ltd. A number of nightlight and watchstand fittings have been introduced by John Shaw and Sons, Wolverhampton, Ltd., including such designs as owls, cats, etc. Other Christmas novelties include cigar lighters, electric poultry singers, ornaments, Dresden china lighting fittings, toasters, irons, etc. The Wholesale Fittings Co., Ltd., offers two new novelties this year: the first represents a sailing ship of crystal cut glass, with sails of strung crystal beads, arranged so that the lamp is fitted within the body of the boat. The second novelty is an ornamented table lamp of glass with red and blue veins giving an alabaster effect. Dim-a-lite portable fittings by the Benjamin Electric, Ltd., are also sure to be a popular line, suggesting themselves as reading lamps for bedroom use, desk lights, etc. Pellon radiators by the British Domestic Arts, Ltd., are suggestive of Christmas gifts, while the company's Boudoir series of lamp fittings are again appropriate. The Electric Heating Co. has drawn our attention to the Elect Handy fire with a loading of 1 kW, which may, when desired, be used for cooking purposes. Two novelties by the Gregson Manufacturing Co., Ltd., include desk or writing lamps in oak or mahogany, fitted with tilting reflectors. Each lamp is fitted with two cut glass ink pots and an ash or pin tray. The second novelty is a Parwood (parchment and wood) shade, which is made in both oak and mahogany.

## Further Fires.

Veritys, Ltd., are marketing several new fires this year including the "All the Year Round" model. It has three trivets, the top one being for keeping dishes or food warm, the centre for boiling a kettle or simple cooking, while the bottom trivet is removable and can be used for many purposes. The Maxlumette Reflectofire has been designed for bedrooms and small rooms. The top is flat and is arranged to keep liquids or food warm, and will boil a small kettle. A wide range of floor and table standards is offered by Messrs. G. E. Southam, of 42, Denmark Street, High Wycombe, in various finishes including lacquer. The standard illustrated is representative of the types available.

A number of interesting lighting fittings have been introduced by H. G. Ascher, Ltd. These include a series of icicle shades suitable for use in theatres, cinemas, dance halls, hotels, etc., as well as for domestic purposes. Various effects may be obtained with these fittings, and the company, as an example, suggests a 36-in. icicle shade surrounded by circles of the smaller sizes as a centre piece for public rooms such as dance halls, etc., while the ceiling bowl with three or four small icicle shades makes an effective arrangement in a drawing-room. The shades are available in ranges from 9½-in. to 36-in. diameter, while the bowls range from 10 in. to 14 in. The two illustrations which we give on page 474 indicate the effectiveness of the designs. These shades also suggest themselves as useful accessories to the dressing of Christmas windows, this time of the year being particularly appropriate.

Metro-Vick Supplies, Ltd., also offers considerable opportunities in the way of domestic electrical appliances. The extensive range of Cosmos fires, the variety of irons, kettles, toasters, etc., are both augmented by the range of wireless equipment. This includes both complete sets and component, while the variety of battery eliminators and valves available makes selection difficult by the very quantity of models available. The Hotpoint Electric Appliance Co., Ltd., also offers a wide range of domestic equipment, including cleaners, washers, floor polishers and the small appliances such as irons, kettles, etc. The British Thomson-Houston Co., Ltd. has introduced a number of new lines in the way of fittings and these again afford an opportunity for selecting gifts.

## Wireless Gifts.

An all-electric wireless receiver for loud speaker operation is without doubt also among the electrical appliances most suitable as Christmas gifts, and in this connection Gambrell Radio, Ltd., is offering a wide selection of three-valve and portable equipment; loud speakers and components are suggested by Wingrove and Rogers, while batteries of the heavy duty type are featured by Siemens Brothers and Co., Ltd. The latter firm also makes a very useful range of testing instruments, any of which would be acceptable to the radio enthusiast. In the Marconiphone range may be mentioned the Universal and Ideal transformers, trickle charges, battery eliminators, loud speakers, and, of course, complete receivers for both battery and mains operation. Portable sets are suggested by the Portable Utilities Co., Ltd., and by the Halcyon Wireless Co., Ltd. Accumulators for both low and high tension work are always suitable presents, and in this respect the Hart-Plaxit type 10 V accumulator has a capacity of 5 000 mAh. A wide range of similar equipment is offered by the Chloride Electrical Storage Co., Ltd., while the Tudor Accumulator Co., Ltd., has brought out a new 6 V 30 Ah battery in a one-piece moulded glass container. Components of all types, including a combined R.C. unit and valve holder, are suggested by the Dubilier Condenser Co. (1925), Ltd. Among the products of the Igranic Electric Co., Ltd., the "Igranikit" is sure to be popular as a present, while the more expensive portable and other equipment should also receive attention.

Another range of accumulators is that offered by the Fuller Accumulator Co., Ltd., which firm also manufactures trickle charges. C. A. Vandervell and Co., Ltd., also offer a good selection of accumulators, while the same firm also list a wide range of components. Special constructor equipments will also be popular, most of these having been given good publicity at the recent Radio Exhibition. The Ediswan "R.C. Threesome" should receive its share of interest, while the Ediswan valves will again find favour as suitable gifts among wireless enthusiasts. The same firm also manufactures a wide range of components, and these together with the company's accumulators should be considered. Loud speakers of various types are being featured by M.P.A. Wireless, Ltd., Graham Amplion, Ltd., the Celestion Radio, Ltd., the General Electric Co., Ltd., the British Thomson-Houston Co., Ltd., Philips Lamps, Ltd., the Mullard Wireless Service Co., Ltd., Ferranti, Ltd., Burndept Wireless, Ltd., and others. The General Electric Co., Ltd., are featuring the "All-Electric Three" receiver, while the British Thomson-Houston Co., Ltd., suggest the moving coil loud speaker lines as being particularly attractive. Multi-valve sets and components, battery eliminators and charges are the lines suggested by Metro-Vick Supplies, Ltd., while Philip Lamps, Ltd., have drawn attention to battery charges, eliminators, valves, etc. Among the latest additions to the Ferranti range is a portable valve tester which by means of an adaptor will give readings of l.t. and h.t. voltages, grid potential, anode current, and will detect grid current. The instrument is designed to work under operating conditions. Components of all descriptions are among the lines of the London Electric Wire Co., and Smiths, Ltd., while Burndept Wireless, Ltd., has a wide range of complete receivers from which to select.

Owing to pressure upon our space it has not been possible to include this week the whole of the suggestions which have been received. We shall, therefore, next week continue to publish a number of illustrations of equipment of special Christmas appeal, including suggestions of both purely electrical and wireless interest.

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# FURTHER ELECTRICAL GIFTS FOR CHRISTMAS.

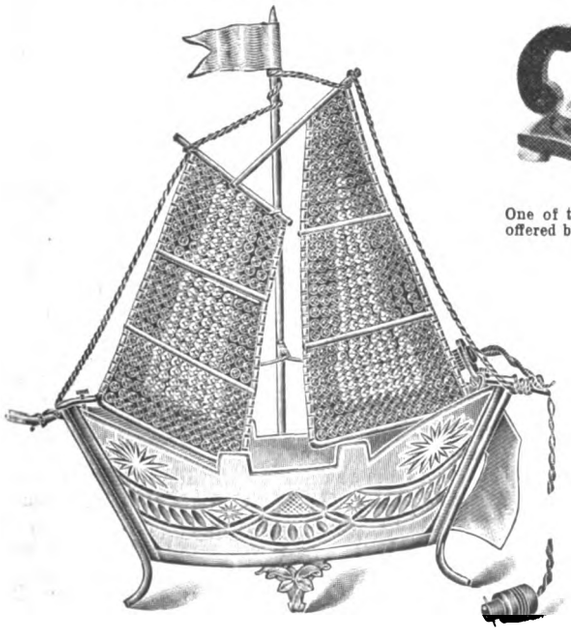
A suggestion by Wholesale Fittings Ltd.

A novelty by Richson and Co., Ltd.

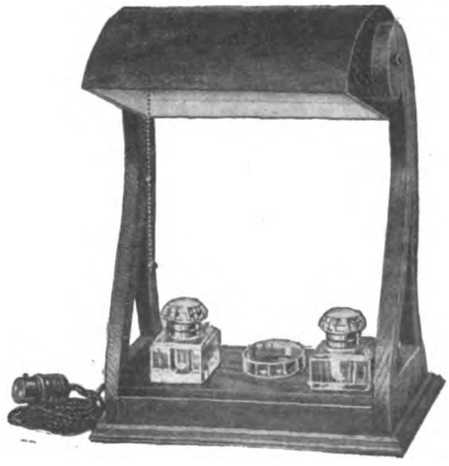
A table standard by the Gregson Manufacturing Co., Ltd.

One of the many floor standards offered by Messrs. G. E. Southam.

The Boudoir radiator by British Domestic Arts, Ltd.



Another novel design by Wholesale Fittings Ltd.



A useful desk fitting by the Gregson Manufacturing Co., Ltd.



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# NEWS IN BRIEF.

## Appointments Vacant — Weald Company's Electrical Exhibition—Physical and Optical Societies' Exhibition—Proposed Assisted Wiring Scheme at Eastbourne—Lighting Service Bureau's Illumination Design Course—Glasgow Buys German Wire.

THE number of telephones in the London area has now reached 100 000.

A qualified electrician is wanted by Tilbury U.D.C.

Newry U.D.C. invites applications for the position of manager and engineer of the Electricity Department.

The anniversary of Edison's discovery of the incandescent electric lamp was celebrated in the United States on Sunday.

The annual dinner of the North Western Centre of the I.E.E. will be held at the Midland Hotel, Manchester, on January 23rd.

The Weald Electricity Supply Co. held an electrical exhibition last week at Crowborough, and it was opened by Mr. John Glynn, who was introduced by Sir Tom Callender.

The Mayor of Lancaster opened the Corporation's new electricity showrooms in North Road last week. The showrooms have cost £8 000 to build and equip.

The new offices of Birkenhead Electricity Department, in Craven Street, were formally opened on October 18th by Mr. W. E. Power, deputy chairman of the Electricity Committee.

The opening meeting of the Mersey and North Wales (Liverpool) Centre of the I.E.E. was held on Monday when Mr. S. E. Britton delivered an address entitled "Rural Electrification."

It is stated that orders have been placed with British Insulated Cables, Ltd., for 900 miles and 400 miles of aluminium strand for electrical work in a manufacturing district of Scotland and in the south-east of England, respectively.

The nineteenth annual exhibition of Electrical, Optical, and other Physical Apparatus is to be held by the Physical Society and the Optical Society on January 8th, 9th and 10th, at the Imperial College of Science and Technology, South Kensington.

Dr. A. P. Thurston, at the annual conference of the Association of Special Libraries and Information Bureaux, recently, said the Patent Office made a profit in 1927 of £112 939.

The number of telephone stations in the Post Office system at the end of June was 1 662 201, representing an increase of 10 961 on the total at the end of May. The increase in London was 4 157 and in the provinces 6 804. Inland trunk calls during April were 8 489 292, an increase of 476 503 on the previous April.

Mr. C. Furness, borough electrical engineer of Blackpool, has submitted a scheme for the construction in Blundell Street, of joint administrative offices for the Gas, Tramways and Electricity departments, and the provision of showrooms if thought necessary. The scheme has been provisionally approved.

Application, it is said, will shortly be made to the Industrial Court by the unions embracing workers in the electricity supply industry throughout the country for the ending of the cost-of-living sliding scale. An increase of 10 per cent. on the ascertained rate of wages at the termination of the agreement for the stabilisation of wages is proposed.

Edinburgh Lord Provost's Committee has approved the principles of a report by the Chief Constable, recommending the abolition of nine district police stations and the erection of 113 police boxes, equipped with telephones. The cost of the installation is estimated at £6 745, and the annual maintenance cost at £2 375.

Bookings of stand space in the London section of the British Industries Fair, to be held at White City from February 18th to March 1st, have exceeded the record figure of 257 000 square feet at the last Fair. This means that both the London and Birmingham sections will be larger than ever before, the Birmingham bookings having exceeded the previous figures some time ago.

Coventry City Council has arranged for the supply by the Forest City Electric Co. of electric traffic-control signalling apparatus for an important street junction in the city. Green, amber and red lights are used at night to indicate "go," "caution" and "stop," respectively, and the apparatus also comprises an automatic timing device which may be set to release the traffic in a particular direction for periods ranging from 40 to 120 seconds.

Two power station charge engineers are required for the Great Indian Peninsula Railway.

Applications are invited for the post of commercial assistant in the Birmingham Electricity Supply Department.

A meeting of the Birmingham Electric Club will be held to-day (Friday), at 7 p.m., at the Grand Hotel, when Prof. W. Cramp will read a paper on "The Singing Arc."

Electric lighting was recently inaugurated in St. Mary's Church, Stretton. Col. J. Gretton and his late brother, Major H. F. Gretton, defrayed the cost of the installation.

Nottingham Tramways Committee has selected eight of the applications for the post of manager of the undertaking (in succession to Mr. J. Aldworth, who is retiring) for consideration at a further meeting.

A joint meeting of the Faraday Society and the Electroplaters' and Depositors' Technical Society will be held at the Northampton Polytechnic Institute., St. John Street, E.C., on October 31st, when four papers will be discussed.

In the electrical and wireless section of the recent Inventions Exhibition, organised by the Institute of Patentees, Mr. H. Rhodes, of Barnsley, was awarded the bronze medal and first prize for an improved electric lamp locking device.

The second Heat and Light Exhibition and Conference will be opened at the University of London, South Kensington, by Sir John Snell on October 29th. The Conference will extend over four days, and papers on the uses of light and heat in medical practice will be read.

Eastbourne Electricity Committee has deferred for further consideration a letter from the Eastbourne branch of the Electrical Contractors' Association, inquiring whether the Corporation would be willing to consider the introduction of an assisted wiring scheme.

At a meeting of the Dundee Business Club last week, Mr. Geo. S. Francis, of the British Electrical Development Association, delivered an address on "Electricity: the Power of the Future." He said electric power meant the de-urbanisation of industry and the reversal of the great human trek to the towns.

On October 18th the Anglo-Italian telephone service, hitherto available to Milan only, was extended to Turin and Genoa. For the present, calls for Turin and Genoa can only be made in the London area. Day calls for Turin cost 9s. 6d. and for Genoa 10s. 9d. per 3 minutes; and night call rates are 5s. 9d. and 6s. 6d. respectively.

The third lecture of the 18th Illumination Design Course was held at the Lighting Service Bureau, Savoy Street, on Wednesday, when Mr. J. L. H. Cooper dealt with the subject of "Lighting in the Engineering Industries." It will be remembered that last year Mr. J. L. H. Cooper spent a considerable amount of time investigating the lighting conditions in a large number of factories in the Midlands.

The report of Mr. J. M. Carey, H.M. Inspector of Mines for the Cardiff and Newport division, states, in his report for the year 1927, that 80 mines used 352 coal cutting machines, of which 53 were electrical, an increase of eight. Coal cut by electricity increased from 238 204 to 433 264 tons Eight conveyors at the coal face were electrical. Electric safety lamps decreased from 82 117 in 1925 to 80 314 in 1927. Electrical plant totalled 323 366 H.P., an increase of 7 H.P.

Glasgow Tramways Committee last week endorsed the recommendation of the Sub-Committee on Works and Stores to accept the offer of a German firm for a supply of trolley wire. It is understood that the German offer was £1 106, while the British offers were in the neighbourhood of £1 262, and so near each other that the suggestion of a "ring" has been put forward.

On the occasion of his election as President of the British Engineers' Association Mr. Gilbert C. Vyle said "productive costs figured largely in competitive struggles for business, and a high load factor in each works was a potent help to lower production costs. We could achieve this with greater facility if we had the British market for the British people. The only effective way of increasing and strengthening British engineering was by a close organisation of all those who are concerned."

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# PERSONAL.

MR. P. J. Pybus has been adopted as Liberal candidate for the Harwich, Essex, division.

Mr. E. A. Heaney, chairman, Preston Electricity Committee, is not seeking re-election at the forthcoming municipal elections.

Mr. A. E. Vickery, foreman of the electrical branch at Devonport dockyard, has been appointed acting assistant electrical engineer.

Lowestoft Electricity Committee has increased the salary of the electrical engineer, Mr. W. R. May, from £600 to £750 per annum.

Ashford (Kent), U.D.C. has increased the salary of Mr. H. Wilson, electrical engineer, to £600 per annum, as from October 1st.

Mr. M. Geoffrey Woods has joined the board of S. G. Leach and Co., Ltd., and will take over the charge of the Fan and Motor Department.

Carlisle Electricity Committee has increased the salary of the assistant electrical engineer, Mr. Baynham, from £599 to £636 10s. 4d. per annum.

Estate of the gross value of £6 160, with net personalty £4 432, was left by the late Mr. Alfred Clough, formerly resident electrical engineer, Liverpool.

Mr. E. W. May, of Maidenhead electricity undertaking, has been selected from 80 applicants for the post of assistant mains superintendent at Guildford.

Torquay Town Council has appointed Mr. H. F. Hudson, of Bradford, as meter superintendent in the electricity department at a salary of £318 per annum.

Mr. T. B. Goodyer, the retiring tramways manager at Croydon, has been presented by the staff with a silver salver and a three valve wireless set complete with loud speaker.

The marriage of Mr. Albert Stubbs, of Metropolitan-Vickers Electrical Co., Ltd., and Miss Agnes G. Smiley was solemnised at the Presbyterian Church, Eccles, Lancs, on October 17th.

Mr. M. Clissold, for five years branch manager at Melksham of the West Wilts Electric Supply Co., Ltd., who is leaving the district, has been presented by the staff and employees with an inscribed clock.

Mr. J. B. E. Dahlerus, managing director of Electrolux, Ltd., who has resigned to become director of Ruths' Steam Accumulators, Ltd., in Sweden, has been presented by the members of the staff at Luton and branches with a clock.

The City of London Corporation recommends increasing the salary of Mr. A. Roberts, electrical engineer and inspector, who has been in the service of the Corporation for nearly 34 years, from £659 per annum to £700 and to a maximum of £850.

Bradford Electricity Committee has congratulated Mr. J. N. Waite, the deputy city electrical engineer, on his appointment as electrical engineer of Hull, and arranged to invite applications for the vacancy so created at a salary of £750 per annum, rising to £1 000. A photograph of Mr. Waite appears on page 477.

Ald. A. Wilkinson, who has accepted the mayoralty of Luton for the fourth successive year, has for 32 years been chairman of the Electricity Committee, and is a member of the National Electricity Council and Board, a chairman of No. 9 area Council for Electricity Undertakings (South-Eastern England).

Mr. H. M. Pease has relinquished the position of managing director of Standard Telephones and Cables, Ltd., due to the pressure of work occasioned by his position as vice-president and general manager in Europe of the International Standard Electric Corporation. Mr. Frank Gill has been appointed chairman of the board and Mr. E. S. Byng, managing director of the company.

Mr. W. T. Harrop, who recently resigned as claims superintendent in Bolton Tramways Department, to join the Church of England ministry, received a pocket communion set in solid silver, and a fountain pen and propelling pencil subscribed by the staff and employees, on October 10th. A tribute was paid to the way in which Mr. Harrop fulfilled his duties during the 25 years he had been in the department.

Mr. Thomas A. Edison was on Sunday night presented with a gold medal in the laboratory at West Orange, New Jersey, in which he had developed most of his inventions, the medal having been voted to him by Congress for his achievements. The presentation was made by Mr. Mellon, Secretary of the Treasury, and President Coolidge, whose address was carried over a link of broadcasting stations from the White House, spoke in eulogy of the inventor, now in his 81st year. Mr. Edison confined his speech in accepting the medal to 90 words, saying that he would always be grateful for the great honour done him. The ceremony was broadcast over a network of 48 stations.

## Obituary.

MRS. JULIA AUGUSTA BASTIAN, on October 15th. She was the mother of the late Mr. Charles Orme Bastian.

MR. HERBERT WATSON, on October 5th, aged 66 years. He was one of the senior partners in the firm of Watson and Sons, electricians, of Oldbury.

MR. N. WRIGHT, on October 13th, suddenly from paratyphoid and enteric. He was public lighting engineer, Bournemouth, and President-elect of the Association of Public Lighting Engineers.

MR. FRANK RIGDEN HARROP, on October 12th. He was formerly on the power station staff at Chatham Dockyard as a shift engineer, a position he relinquished to join the Technical School at Kingston-on-Thames as an assistant master in engineering. At the time of his death he filled a similar position at the Darlington Technical School.

MR. BASIL F. HOWARD, on August 22nd, aged 63 years. He was born at Croydon and began his electrical career with telephone interests in this country. Among his early undertakings was the installation of telephones in Buckingham Palace. In 1905 he went to America and became associated with the Colorado Telephone Co. and had been successively with that company and its successor, the Mountain States Telephone and Telegraph Co., up to the time of his death, his work lying in the field of transmission and protection.

## BUSINESS ITEMS.

SADIA, Ltd., announces price reductions of electric boiling plates with loadings ranging from 500 to 2 700 W.

Woodfyt Sales, Ltd., announce that they have removed their showrooms to 10A, Newman Street, London, W.1.

E. Powell, Ltd., electricians, 41, High Street, Tunbridge Wells, are shortly opening new electricity showrooms at 39, High Street, at that town.

An arrangement has been entered into between Alfred Herbert, Ltd., and Wild-Barfield Electric Furnaces, Ltd., whereby the latter in addition to representing Wild-Barfield, furnaces in Scotland, India, Paraguay, Uruguay and the Argentine, will in future also introduce and sell these apparatus from all their remaining British branches.

S. G. Leach and Co., Ltd., and M. W. Woods, Ltd., Colchester, make the joint announcement that they have entered into an agreement which will achieve an association of interests. The whole of the selling organisation of M. W. Woods, Ltd., will be carried out by S. G. Leach and Co., Ltd., who will act as the sole selling organisation for the whole of the Colchester works productions.

Mr. J. B. McEneany, a Sydney manufacturers' agent at present visiting this country, desires to get into touch with manufacturers of electrical labour-saving devices, domestic requisites, fittings, insulators and insulating material, with a view to making agency arrangements. Mr. McEneany may be addressed c/o the Bank of New South Wales, 29, Threadneedle Street, London, E.C.

Negotiations between the London County Council and the Eastern Telegraph Co. for the sale to the company of the buildings on the Embankment, near Temple Station, formerly the head office of the School Board for London, at a price of £310 000, are, it is understood, nearing completion. Sir John Denison Pender, chairman of the company, states that the property will be used as offices for the new merger company formed by the merging of the Marconi Company with the Cable Company, under the Government's scheme.

The British Thomson-Houston Co., Ltd., has placed on the market a motor-car lamp cabinet, which is 21½ in. square by 5⅛ in. deep when closed and 26⅛ in. deep when open. It is made of steel, finished in green enamel, and when stocked with Mazda lamps in their orange and blue cartons makes a most effective counter display. It is designed to provide convenient storage for a comprehensive stock and is divided into forty compartments. These compartments are of equal size, and will each accommodate two headlights or six side, tail or dash lamps in their cartons, stood up so that the rating stamped on the carton is visible from the front. A descriptive pamphlet which accompanies each cabinet suggests a representative stock of one gross of lamps comprising twenty-eight varieties, but this can be varied according to local requirements.

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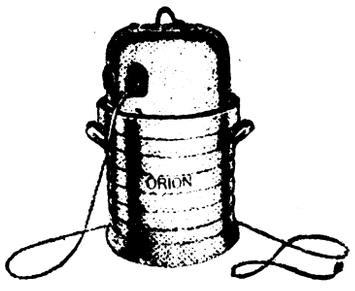
# SELLING LINES.

THE British Electrical and Manufacturing Co., Ltd., have introduced a new Orion electric washer with a loading of 150 W. The machine can be supplied suitable for all voltages, including special low voltages. The tub of the appliance is supplied with a special sieve which enables clothes to be boiled whilst the washer itself is working. A cover is also supplied so that the tub may be utilised as an ordinary boiler before the washer head is put into operation, .i.e, in the case of white clothes, etc. The machine will hold approximately half a stone of dry clothes or one stone of wet. Approximately 5 gals. of water are required, assuming that the washer will be operated to its full capacity. The method adopted for washing is that of the vacuum principle. The vacuum plunger makes 105 strokes per minute, each stroke first forcing the hot soapy water through the clothes and then drawing more soapy water back on the up stroke. This plunger does not operate in the centre of the tub but to one side, thus, in addition to its cleansing action, moving over and over the contents of the tub.

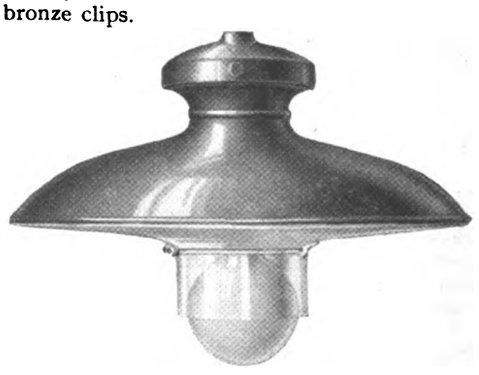


The new Orion electric washer.

With the opening of the lighting season, J. H. Tucker and Co., Ltd., announce the introduction of many new products, including a complete range of 3-pin 5 A and 15 A sockets and plugs, for surface and sunk mounting, complying with the new B.E.S.A. specification No. 317/1928. The earth connection on the 3-pin surface sockets is visible as laid down in the specification, but is protected by being housed in a porcelain base visible through an elongated slot in the cover. Socket tubes are of the spring socket type, and permit the use of plugs of any make manufactured within the tolerances allowed by the specification. The socket tubes and cable terminals are in one piece avoiding possibility of heating or ineffective contact through faulty screwing or riveting.

The plug pins are of one piece construction, the cable terminal forming an integral part. Special attention is drawn to the side entry cord gripping arrangement of the 3-pin plugs, accommodating any standard size of flexible or rubber covered cable (of the capacity concerned) without alteration. The front entry combined switch sockets (surface and sunk) which are offered, consist of 5 A quick make and break heavy duty under-action type tumbler switches, with 2-pin sockets on one base, mounted horizontally. These sockets will shortly be available also in 3-pin sizes, and 15 A surface and semi-recessed types. In the surface type the mechanism is enclosed in a brown " Telacite " cover through which the switch dolly protrudes, and in which holes are provided for insertion of the plug. Where these are required for surface wiring, a groove may be formed readily on any side to accommodate it. In the flush type the mechanism is accommodated in a shallow box for sinking into the wall, complete with stamped bevelled brass plate. The range of ironclad gear has also been extended, and now includes a series of 15 A 500 V cut-outs in combinations of watertight and non-watertight single-pole cut-outs, watertight and non-watertight double-pole cut-outs without sealing chambers, double-pole cut-outs with triple entry sealing chambers for twin (or two single) V.I.R. or C.T.S. cable, and double-pole cut-outs with triple entry sealing chambers for concentric chambers with conical fittings, 2, 3 or 4 way splitter boxes. Fuse units are totally enclosed and loose bushes are eliminated, these forming an integral portion of the fuse base. Fuse handles are non-reversible, correct insertion in the fuse base being further facilitated by guide tongues on the fuse clips which also provide a vibration proof grip. Cases are finished standard stove enamelled green, lined with silicate insulating enamel. We are informed that on independent test, these cut-outs have dealt successfully with a short circuit current of 2 000 A at 240 V d.c. and 100 A at 500 V. A new design of quick make and break switch and switch-fuse, rated at 15 A 500 V, has also been introduced. These switches as standard, are arranged for cable to enter and leave through the top, a solid undrilled adaptor (which may be tapped if specially ordered) being provided at the bottom. Switch-fuses have tapped or bushed adaptors at top and bottom. The rating in volts and amperes is cast on the front of the lid, which is interlocked with the operating handle. The standard finish is green stove enamelled, switch-fuses being additionally lined with silicate insulating enamel. Two new cooker control units have also been added. An ironclad (enclosed type) is a 30 A unit suitable up to 250 V, equipped with a 30 A d.p. quick break switch with external side handle for operating outside the case interlocked with lid, acting as main control for the cooker and sub-circuits, or it can be arranged to control the cooker only if specially ordered ; a socket sub-circuit for portable domestic apparatus, an opening being provided in the lid to enable plug to be inserted without opening case ; a s.p. Home Office porcelain fuse unit with replacement handle protecting socket sub-circuit ; a batten lampholder mounted inside the case with opening provided in the lid to insert the lamp, two porcelain blocks (one top and one bottom) with terminals to accommodate incoming mains and cooker feeder cables respectively. The whole unit is fitted with inter-cable connections, an earthing terminal on outside of case, and live parts are suitably shielded. The open type cooker control unit on a wood base is a 15 A control suitable up to 250 V. It consists of a 5-ply wood baseboard with surrounding skirt giving 11/16 in. space below the board for wiring. It is equipped with a 15 A 250 V d.p. quick make and quick break ironclad Home Office type main switch ; a 5 A 3-pin wall socket and hand-shield plug ; a 5/15 A s.p. Home Office type fuse ; and a 5 A quick make and quick break s.p. insulated tumbler switch. The wall socket, fuse and tumbler switch are intended for the sub-circuit, these being interconnected as a standard. The necessary cable connections to main and switch are made, but the ends of the cables are left disconnected so that they can be connected to the " live " or " dead " side of the main switch depending on whether the main switch is required to control both the cooker and sub-circuit or cooker only.

The British Electric Resistance Co., Ltd. has added to the range of vitreous enamelled resistances offered as suitable for lamp resistances in electric signs. This component is of the screwed base type and is made in a variety of values. This and other units, forming a very wide range, consist of special heat resisting porcelain tubes wound with alloy wire, fired at a high temperature and embedded in vitreous enamel, thus ensuring a damp-proof component. A permanent electrical circuit is made by electrically welding the resistance wire to a band of copper flex on each end of the tube, these two ends being brought out through the enamel as connections. The resistance range available is from 0·1 to 150 000 Ω, and units can be wound with tappings up to 12 on the larger sizes and in proportion for the smaller units. Where desired non-inductive windings are available. The standard unit is finished with two end connections in wire form, while the tapped component also has wire extensions for further connections. In addition to the screwed base type referred to above, there is also a mounted unit fitted with phosphor bronze clips.


The lighting fitting developed by the Siemens Electric Lamps and Supplies, Ltd.

The accompanying illustrations shows a new type of fitting which has been developed by Siemens Electric tric Lamps and Supplies, Ltd., specially for use with Silvalux lamps. The fitting consists of a cast canopy surmounting a vitreous enamelled reflector of special curvature designed to assist in the distribution of light at an angle of approximately 15 deg. below horizontal. This fitting can be supplied in two sizes, one suitable for 100 and 150 W lamps and the larger size for 300 W lamps. The larger fitting is equipped with a clear glass cylinder which protects the upper surface of the lamp bulb from any driving rain.

Philips Lamps, Ltd., announce that they have placed on the market a new gramophone pick-up, type 4005, and a two-valve gramophone amplifier, type 2781, which is effectively screened. Another new line is a cone model loud speaker, type 2 007, designed on what is claimed to be a new principle.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

DUNDEE CORPORATION.—Electric lighting installation at Corso Street housing estate. Particulars from the Director of Housing, 91, Commercial Street, Dundee.

TYNEMOUTH CORPORATION.—Supply of three-phase, automatic regulating, 250 kVA transformer. Further particulars and form of tender from Mr. C. Turnbull, Electricity Works, Tynemouth.

EDINBURGH CORPORATION, October 27th.—Electric lighting installations in (*a*) 24 dwelling houses and 12 shops at Stenhousemills; and (*b*) one house, one office and six shops at Lochend. Specifications, etc., from the Engineer, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s. for each section.

OLDBURY EDUCATION COMMITTEE, October 27th.—Electrical installation at Bristnall Hall Lane Public Elementary School. Specifications, etc., can be seen at Engineer's Department, Council Offices, Oldbury.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, October 29th.—Overhead distribution scheme (Contract No. 43). Specification, etc., from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit 10s. 6d.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., October 29th.—Insulation and refrigeration of approximately 100 000 cu. ft., with compressors, electric motors, etc., at the Fruit Storage Testing Station, East Malling, Maidstone. Specification, etc., from Contracts Branch, King Charles Street, London, S.W.1; deposit £1 1s.

HULL CORPORATION, October 30th.—Electric light installation and fittings for new East Hull Clinic, Durham House, Holderness Road, Hull. Specification from Mr. D. Harvey, city architect, Guildhall, Hull.

METROPOLITAN ASYLUMS BOARD, October 31st.—Automatic telephone System at High Wood Hospital for Children, Brentwood. Specification from the office of the Board, Victoria Embankment, E.C.4; deposit £1.

ROCHDALE CORPORATION, October 31st.—Wiring installation work for 12 months, by registered electrical installation contractors. Tenders to the Engineer and Manager, Electricity Works, Rochdale.

STEPNEY (LONDON) GUARDIANS, November 7th.—Installation of new electric passenger lift at St. Peter's (Whitechapel) Hospital. Specifications from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1; deposit 10s. 6d.

MANCHESTER WATERWORKS COMMITTEE, November 8th.—Supply and erection at Lostock Booster Station, near Bolton, of one 400 kW rotary converter, with transformer, switchgear, cables, etc. (contract No. 7); and four electrically driven centrifugal pumps, to deliver 3 250/4 750 gallons per minute against a head of 40/90 ft., with switchgear, pipes, etc. Specifications from the Waterworks Engineer, Town Hall, Manchester; deposit £2 2s. for each.

BRADFORD CORPORATION, November 10th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, porcelain insulators, controller contacts, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

LONDON COUNTY COUNCIL, November 12th.—Four electrically driven sewage pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc.; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £5.

PORT OF BRISTOL AUTHORITY, November 12th.—Supply and installation of telephone and electric hooter signalling systems on the Eastern Arm Extension of the Royal Edward Dock, Avonmouth. Specification, etc., from Mr. Thos. A. Peace, Chief Engineer, Avonmouth Docks, Bristol. Deposit £2, to the Acting Manager and Secretary, Docks Office, 19, Queen Square, Bristol.

ROCHDALE CORPORATION, November 13th.—Supply of single-phase prepayment meters for twelve months. Specifications from Mr. F. H. Rudd, Electricity Works, Dane Street, Rochdale.

STOKE-ON-TRENT CORPORATION, November 14th.—Overhead wiring and services to 64 new houses on Sutton Estate, Trent Vale. Specification, etc. (£2), from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent.

ROCHDALE CORPORATION, November 17th.—Supply and installation of 12 000 kVA, three-phase, 32 000/6 400 V transformer, with boosting transformers and necessary switchgear, at the power house, Dane Street, Rochdale. Specification, etc., from Mr. F. H. Rudd, enginee and manager, Electricity Department.

LONDON COUNTY COUNCIL, November 19th.—Supply of (1) about 5 590 tons of tramway track rails, guard rails and fishplates (Section A); about 150 tons of bolts and nuts (Section B); and about 450 tons of slot rails (Section C); and (2) about 1 025 tons of conductor tee rails. Specifications, etc., from General Manager, L.C.C. Tramways, Victoria Embankment, W.C.2; deposit £2 in each case (Nos. 1 and 2).

WEST RIDING EDUCATION COMMITTEE, November 20th.—Electric lighting installation at Bentley New Middle School. Specifications, etc., from the Education Department, County Hall, Wakefield.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. [*Note.—An asterisk denotes that local representation is, in practice, essential.*]

EGYPTIAN STATE RAILWAYS.—Supply of 1 730 metres of armoured underground cable, one watertight protected fuseboard and 11 unipolar removable fuses. Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference E.S.R. 7825.)

JERVIS STREET HOSPITAL, DUBLIN.—Wiring of new wing, by registered contractors. Specifications, etc., from Mr. A. E. Porte, 27, Lower Leeson Street, Dublin.

KERRY BOARD OF HEALTH.—Electric light installation in Kenmare Hospital.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., October 26th.—Supply of gasfilled and vacuum lamps. Specification, etc. (10s., not returnable) from the company's offices, The White Mansion, 91 Petty France, Westminster. S.W.1.

DURBAN MUNICIPALITY, October 26th.—Supply of single-phase transformer. (Reference B.X. 4 762.)

DURBAN MUNICIPALITY, October 26th.—Supply of 10 single-phase and two three-phase transformers. (Reference B.X. 4 761.)

JOHANNESBURG MUNICIPALITY, October 26th.—Supply of plant and equipment for hydro-electric power station and outdoor sub-station. (Reference B.X. 4 622.)

MELBOURNE CITY COUNCIL, October 26th.—Supply of totally enclosed, metal-clad switchgear. (Specification 944.) (Reference B.X. 4 698.)

SOUTH AFRICAN ELECTRICTY SUPPLY COMMISSION, October 26th.—Supply and erection of equipment for hydro-electric station, in connection with Gordon's Bay scheme, and two outdoor sub-stations.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 27th.—Supply of loading coil-pots. (Schedule C. 361.) (Reference B.X. 4 695.)

EGYPTIAN MINISTRY OF THE INTERIOR, October 29th.—Supply of d.c. generator, for Beni Mazar power station. (Reference B.X. 4 660.)

SOFIA MUNICIPALITY, October 29th.—Supply of tramway rails, etc. (Reference A.X. 7 000.)

ANGORA RAILWAY AND PORTS DEPARTMENT, October 30th.—Supply of overhead electric travelling crane. (Reference A.X. 6 954.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 30th.—Protective relay system. (Reference B.X. 4 573.)

BANKS PENINSULA (N.Z.) ELECTRIC POWER BOARD, October 31st.—Supply of transformers. (Reference B.X. 4 801.)

VICTORIAN ELECTRICITY COMMISSION, October 31st.—Manufacture, delivery and erection of water-tube boilers with auxiliary and accessory equipment, for the Yallourn power scheme. Specification (No. 28/37) from the Agent-

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General for Victoria, Melbourne Place, Strand, London, W.C.; deposit £1 1s.

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of six induction voltage regulators. (Contract No. 55.) (Reference B.X. 4 768.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of truck type switchboard cubicles (Contract No. 54.) (Reference B.X. 4 782.)

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of 1 500 pairs of ironclad cut-outs. (Reference B.X. 4 795.)

*THE effective lighting fittings by H. G. Ascher and Co., Ltd., referred to on page 468. A number of suggested arrangements for their use in public halls and rooms are given in our description, while their effectiveness in Christmas window decoration should not be overlooked.*

JOHANNESBURG MUNICIPALITY, November 1st.—Supply of transformers. (Contract No. 53.) (Reference B.X. 4 783.)

KILDARE COUNTY COUNCIL, November 1st.—Electric wiring of courthouse and offices of Committee of Agriculture and N.H. Insurance Office, Naas. Specifications from Messrs. McEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s.

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

DUBLIN CORPORATION, November 3rd.—Supply of (1) electric cookers; and (2) meter boards, house service fuses and automatic cut-outs. Specifications (5s. for each) from City Electrical Engineer, Fleet Street, Dublin.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, November 5th.—Supply and erection of switchgear and two transformers, each 5 000 kVA (38 000/10 000 V) for the Shannon transformer station at Milltown, Co. Dublin. Specification, etc., from Mr. P. J. Dempsey, secretary, Electricity Supply Board, 60–62, Upper Mount Street, Dublin; deposit £5.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Supply of 22 000 V armoured type switchgear. (Reference B.X. 4 763.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Steel lattice towers, with cross arms, insulators, etc. (Reference A.X. 6 897.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically driven overhead cranes (tender No. 1 317). (Reference A.X. 6 815.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

DUBLIN UNITED TRAMWAYS CO., LTD., November 12th.—Twelve months' supply of stores, including electric lamps, electrical fittings, trolley fittings, etc. Forms of tender, etc., from the Company's Offices, 59, Upper O'Connell Street, Dublin.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Manufacture, testing, supply, delivery, erection complete and maintenance of mechanical step gates and accessories, for Yallourn power station (Specification No. 28/48). Forms of tender, etc. (£1 1s.), from the Agent-General for Victoria, Victoria House, Strand, London, W.C.; deposit £50.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 13th.—Supply of transformers. (Reference B.X. 4 775.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Switchboard keys and parts. (Schedule C. 362.) (Reference B.X. 4 396.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 13th.—Supply of switchboard keys and parts (schedule C. 362). (Reference B.X. 4 752.)

MELBOURNE CITY COUNCIL, November 14th.—Supply of totally enclosed, metal clad type switchgear and spares (specification 952). (Reference B.X. 4 748.)

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

INDIAN STORES DEPARTMENT, November 15th.—Motor alternator, testing transformer, and induction regulator controller, for Government Test House, Calcutta (Order No. N. 5 217/1). (Reference B.X. 4 790.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of galvanised wire and aerial cable (tender No. 132). (Reference A.X. 6 950.)

WINNIPEG MUNICIPALITY, November 19th.—Supply of two 10 000 kVA and two 450 kVA generators for Slave Falls, Manitoba. (Reference B.X. 4 791.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 749.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737.)

JOHANNESBURG MUNICIPALITY, November 22nd.—Supply of tramcar axles and gear wheels (Contract No. 67). Reference A.X. 6 985.)

JOHANNESBURG MUNICIPALITY, November 22nd.—Supply of electric lamps (Contract No. 65). Reference B.X. 4 794.)

JOHANNESBURG MUNICIPALITY, November 22nd.—Supply of ten miles of copper trolley wire. (Reference A.X. 6 990.)

CHRISTCHURCH (N.Z.) CITY COUNCIL, November 24th.—Supply of pump and electric motor, valves and automatic flow recorder. (Reference A.X. 7 006.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 24th.—Electric light installation, for Sohag. (Reference B.X. 4 777.)

DUBLIN BOROUGH COMMISSIONERS, November 26th.—Supply and erection of six automatically controlled electrically driven pumps. Particulars and forms of tender from Mr. J. S. Alford, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of indicators (schedule C. 371). Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). (Reference B.X. 4 753.)

VICTORIAN RAILWAY COMMISSION, November 28th.—Supply of 10-ton overhead electric crane. (Contract No. 42 090.) (Reference A.X. 6 951.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 29th.—Telephone apparatus. (Reference B.X. 4 757).

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

EGYPTIAN STATE RAILWAYS, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500). Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264 3/34.)

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SOUTH AFRICAN RAILWAYS AND HARBOURS, December 6th.—Supply of 5-ton Diesel electric caterpillar crane (contract 1 350). (Reference A.X. 7 015.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of instrument cords (schedule C. 374). (Reference B.X. 4 811.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of telephone generators (schedule C. 375). (Reference B.X. 4 812.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of 7-ton electrical overhead travelling crane (tender No. 1 347). Reference A.X. 6 989.))

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically operated deep dredger, for Yallourn Brown Coal Works (specification 28/94). Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of motor generator sets. (schedule C. 377). (Reference B.X. 4 810).

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

## Tenders Accepted.

RUGBY URBAN DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., cables, £266.

COLCHESTER CORPORATION.—English Electric Co., Ltd., supply of 300 kVA transformer, £280.

CARLISLE CORPORATION.—Tudor Accumulator Co., Ltd., supply of 100 positive plates for battery, £85 11s. 1d.

DUNGANNON RURAL DISTRICT COUNCIL.—Robert Stewart and Sons, public electric lighting in Coalisland for the ensuing winter.

ISLINGTON (LONDON) BOROUGH COUNCIL.—D.P. Battery Co., Ltd., supply of two electric vehicle batteries, £378. (Recommended.)

ASPENDEN (HERTS) PAROCHIAL CHURCH.—North Metropolitan Electric Power Supply Co., electric light installation at Parish Church, £89 17s. 4d., and heating the church by electricity, £115 15s.

WIMBLEDON CORPORATION.—C. A. Parsons and Co., Ltd., supply of two 400 kVA transformers required in connection with supply to factory of Splibtex Safety Glass Co., Ltd., £367. (Recommended.)

BRADFORD CORPORATION.—Moore and Wright, electric lighting installation at Leeds Road hospital, £1 249; At Reyrolle and Co., Ltd., supply of electrical control gear at Valley Road power station.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL.—Macintosh Cable Co., Ltd., cables for Broadway scheme, and also supply of cables for a year. Switchgear and Cowans, Ltd., and Ferguson, Pailin, Ltd., switchgear.

METROPOLITAN ASYLUMS BOARD.—T. Clarke and Co., Ltd., electric lighting installation apparatus at Collindale Hospital, £1 355; V. G. Middleton and Co., Ltd., installation of automatic telephone system at Princess Mary's Hospital for Children, £440 (both recommended).

RUSSIAN SOVIET GOVERNMENT.—International General Electric Co., electrical apparatus and material, amounting to not less than £1 000 000 nor more than £2 000 000, during the next two years, provision being also made for an extension amounting to not less than £800 000 p.a. for a further four years.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Supply of cable: Pirelli-General Cable Works, Ltd., 1 760 yards of 1 in., £1 399; and 350 yards of 0·55, £164; Hackbridge Cable Co., Ltd., 440 yards of 0·1 in., £56; Greenwich Cable Works, Ltd., 1 760 yards of 0·075, £190; 440 yards of 0·05, £42, and 880 yards of 0·0045/3-core, £62 (all recommended).

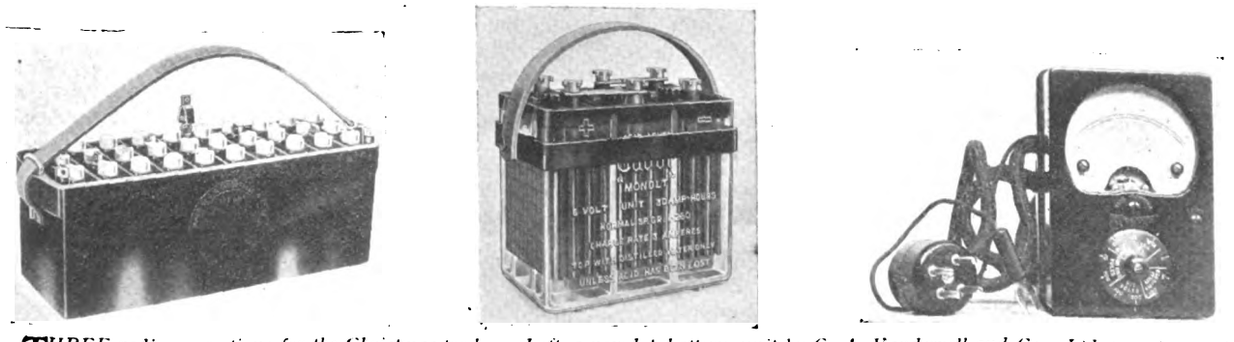
STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—Greenwich Cable Works, Ltd., supply of cables for 12 months; Reason Manufacturing Co., Ltd., quarterly meters; Measurement, Ltd., prepayment meters for 12 months; West Wimbledon Electric Services, installations wired in steel tube; B. Winter and Son, installations with lead covered wire, in connection with assisted wiring scheme. (All recommended.)

CAPE TOWN CORPORATION.—Metropolitan-Vickers Export Co., Ltd., supply of 55 H.P. electric motor, and switchgear, £296 16s. 1d.; Bruce Peebles and Co., Ltd., two 1 250 kW motor converters, £5 138; English Electric Co., Ltd., one 1 250 kW motor converter, £2 900; Siemens Bros. and Co. (£4 666 13s. 4d.); Netherlands Cable Co. (£9 674 3s. 4d.); and British General Electric Co. (£431) cables in connection with southern suburb extensions. (All recommended.)

GLASGOW CORPORATION.—Callender Cable and Construction Co., Ltd., and Power and Lighting Cables, Ltd., supply of cables required in connection with standardisation of frequency Twin core conductor cable: 30 000 yards at £50 per 1 000 yards, General Electric Co., Ltd.; 30 000 yards at £60 15s. per 1 000 yards, Craigpark Electric Cable Co., Ltd.; Bolckow, Vaughan and Co., Ltd., tramway rails; P. R. Jackson and Co., Ltd., armature coils; Bruntons, armature binding wire. (All recommended.)

CENTRAL ELECTRICITY BOARD.—Braithwaite and Co., Ltd., steel line transmission towers, consisting of over 5 000 tons of structural steel work, for part I of South-East England electricity scheme. T. P. Jamieson, foundations for new station at Bonnybridge (about £5 000); Thos. Miller, sub-station foundation at Dalmarnock (about £4 000); Wm. Bain and Co., sub-station foundation at Clydesmill (about £4 000); Melville, Dundas and Whitson, foundations of towers at river crossing of the Cart and the Clyde (about £4 000), and sub-station foundation at Yoker, for the Central Scotland Electricity Scheme.

BIRMINGHAM CORPORATION.—Simon-Carves, Ltd., dismantling existing plant and erecting electrical precipitation plant, at Nechells generating station; Tudor Accumulator Co., Ltd., supply of two electric vehicle batteries; Ferguson, Pailin, Ltd., switchgear for Water Street sub-station; General Electric Co., Ltd., switchgear for Sparbrook and Freeth Street sub-stations; A. Reyrolle and Co., Ltd., switchgear for Chester Street sub-stations; British Vacuum Cleaner and Engineering Co., Ltd., installation of vacuum cleaning plant at Nechells station; Herbert Morris, Ltd., supply and erection of hand-operated overhead travelling cranes at the Sparkbrook and Freeth Street sub-stations.



*THREE radio suggestions for the Christmas trade. Left, a new h.t. battery unit by C. A. Vandervell and Co., Ltd.; centre, one of the batteries in the new range introduced by the Tudor Accumulator Co., Ltd.; and right, the comprehensive testing equipment just placed on the market by Ferranti, Ltd. These devices are described on page 467.*

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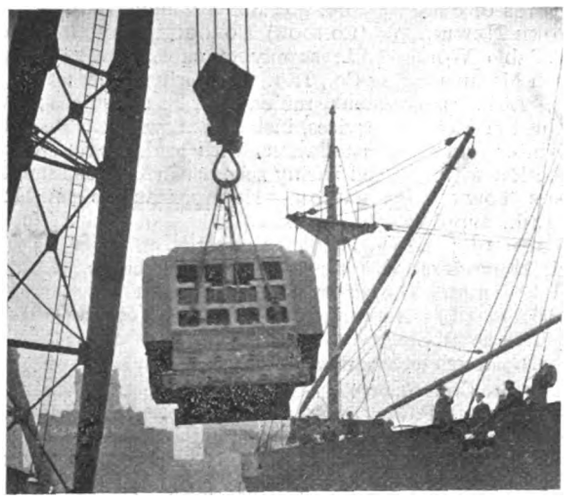
# ELECTRICITY SUPPLY.

## Rural Electrification at Holywell—New Converter for Brighton—Nairn to have an Electricity Supply—Preston's Scheme to Dam the Ribble—Hackney Plant Extension—Applications for Orders for Runcorn Rural District.

AN application for a further loan of £10 000 for hired wiring purposes has been made by Barnsley T.C.

Kennington (Kent) has decided to adopt electricity for street lighting. There will be 11 lamps, and electricity will be supplied by Ashford U.D.C.



*THE increasing size of the individual pieces of plant for modern power stations gives rise to some difficult transport problems. The illustration shows an incident in the transport last week of a 70-ton alternator stator to Glasgow from the Stafford works of the English Electric Co. The piece was shipped from Birkenhead on board the "Ayrshire Coast." The 27 500 kW alternator will be driven by a two-cylinder steam turbine, manufactured at the Rugby works of the same company, and the installation of the new set will mark a further step forward in the frequency change-over of the Glasgow supply from 25 to 50 cycles.*

An electric lighting scheme for Aspley Guise has been carried out. A supply of current to the district by Bedford Corporation has been switched on.

Epsom U.D.C. has applied for a loan of £2 000 for the purchase of domestic electricity apparatus to be let on hire, and for £500 for hired wiring installations.

The Electricity Commissioners have asked for additional information regarding the application by Clitheroe Corporation for sanction to borrow £21 000 for electricity purposes.

Thornton Cleveleys U.D.C. is applying to the Commissioners for sanction to borrow £2 000 for public lighting, £10 000 for cables, mains and services and £1 000 for accessories for sale or hire-purchase.

Holywell R.D.C. has invited representatives of Electricity Distribution of North Wales and District, Ltd., to discuss with the Council the question of extension of the company's mains in certain rural areas.

Negotiations are taking place with the Yorkshire Electric Power Co. for a supply of electricity to Askern and neighbouring villages. The company is extending its supply to Edenthorpe and in the direction of Rossington Bridge.

Dundee Works Committee has agreed to forward to the Central Electricity Board a plan showing a suggested alternative route for the Board's high power cable with a view to avoiding the necessity for its erection along Kingsway.

The Brighton Lighting Committee recommends that application be made to the Electricity Commissioners for sanction to borrow £10 500, for the purchase of a new 1 500 kW converter and accessories, for the North Road sub-station.

A new 900 H.P. eight-cylinder vertical oil engine, supplied by Davey Paxman and Co., to Ashford U.D.C. electricity works, will be formally started by Mrs. Hayward, wife of the Chairman of the Electricity Committee, to-day (October 26th).

Nairn T.C. has accepted the offer of Johnson and Phillips, Ltd., to provide an electricity supply in the town, free of cost to the ratepayers and without any liability on the Council. The prices agreed upon are 8d. for lighting purposes and 4d. for power.

The Holderness Trust, Ltd., has applied for an Order to generate and supply electricity in the urban district of Withernsea, and the rural district of Patrington (other than the parish of Paull). Any objections must be sent to the Electricity Commissioners by November 5th.

Preston T.C. proposes to promote a Parliamentary Bill next Session for powers to dam the river Ribble, in order to obtain an adequate supply of water for the power station, which is to be greatly developed under the Government's scheme. The cost is estimated at £75 000.

In regard to Bedwas and Machen Council's application for sanction to borrow £11 195 for extending its electricity undertaking, the Electricity Commissioners state that it does not appear that the Council has obtained the sanction of the Minister of Transport to the construction of overhead lines, and the Commissioners are unable to sanction the loan until such consent has been obtained.

Hackney (London) Electricity Committee recommends the installation of a 30 000 kW generator which, with buildings, etc., will cost £460 600. Although a 20 000 kW set would be ample for local demands, Sir Andrew Duncan, chairman of the Central Electricity Board, has expressed the opinion that it would be wiser for Hackney to put down a 30 000 kW set and bear the additional loan repayments until the Board requires the set for its own purposes. The alternative would be for the Council to ask the Board for a supplemental supply.

A Ministry of Transport inquiry was held on October 16th with reference to the charges for electricity made by the Sussex Electricity Supply Co. in Crawley. Mr. B. M. Cloutman, K.C., for applicants who alleged that the charges were too high, said the charge had risen from 6d. per kWh in 1914 to the present charge of 1s. in 1921. The undertaking was acquired by the company for £25 000, and it had never paid a penny in dividend. Mr. W. Craig Henderson, K.C., for the company, said they had had to carry out extensive re-organisation of plant, and the revenue barely gave them enough to meet the depreciation allowances and pay interest.

Runcorn R.D.C. has decided to intimate to the Electricity Commissioners that the Council is much concerned at the course being adopted with regard to the respective applications of Warrington Corporation and the Mersey Power Co. for Orders in regard to supply in certain areas in Runcorn rural district and to point out that whereas Warrington Corporation is prepared to include compulsory areas with a two-years' limitation, the Mersey Power Co. has had the necessary powers in the Council's area for about 20 years without exercising them in any way, and there is no suggestion in its application for an increased scale of charges that, even if successful in its application, it will extend its cables to each of the parishes that Warrington Corporation is prepared to give an undertaking that the scale of charges in such parishes shall not exceed the charges in force for the time being in Warrington (the lighting charge is 4½d. per kWh); and that it is against the interests of the ratepayers that they should be left with the probability of having to pay 8d. per kWh to the Mersey Power Co., Ltd.

The Mayor of Abingdon (Mr. A. B. Woodley) recently performed the official opening of the new showrooms and offices for the Abingdon district of the Western Electricity Supply Co. in West St. Helens Street, Abingdon. Mr. A. J. Bridge, the company's general sales manager, said the policy of co-ordinating the generation and bulk transmission of electricity was being carried on in the south and west of England by the Western Electricity Supply Co., and they were acting as engineers for their associated company, the Wessex Electricity Co., and the various other firms under their control. He had pleasure in announcing that reductions in the rates for supply in the borough of Abingdon and the rural area supplied from the mains of the company had recently come into force. The flat rate for lighting was reduced to 10d., the unit charge under the maximum demand rate was reduced from 2½d. to 2d., and new subscription rates for residences and shops had been introduced. They were also introducing a rental wiring scheme.

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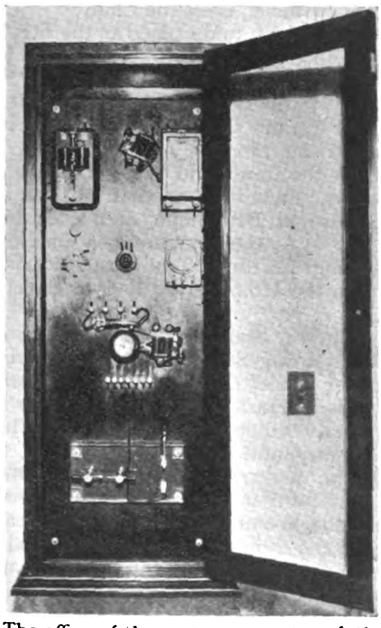
## ELECTRICAL NEWS OF THE WEEK IN PICTURES.

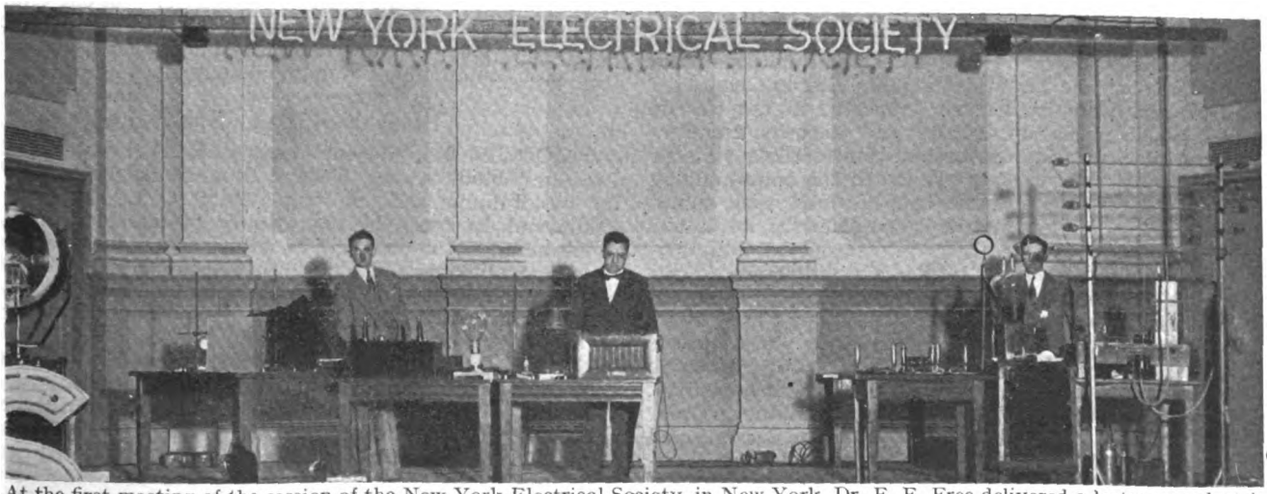
At Brechin, Forfarshire, it is customary to place an ornamental electric lamp standard outside the Provost's residence. The present Provost is manager of the local gas works,.

Mr. J. N. Waite, who, as announced last week, has been appointed electrical engineer at Hull. (*See page* 471).

Considerable local interest is being taken in the erection of the towers for the Central Scotland Scheme as this picture shows. See page 456 for details of the N.W. England scheme.



The office of the system operator of the New York Edison Company (right), where the distribution of power generated by the Edison and Allied Companies is controlled. In case of approaching darkness as the result of a storm, a bell is rung by an automatic storm detector on the roof. The operator then instructs the generating stations accordingly. The pilot board which is shown, indicates the number of feeders in use, the load, and other details. The storm detecting device is shown in the left hand picture.




At the first meeting of the session of the New York Electrical Society, in New York, Dr. E. E. Free delivered a lecture on electric lighting in general, as well as from the point of view of fog penetration. He illustrated his remarks with practical demonstrations, even to the extent of generating smoke screens, and the quantity of apparatus involved will be gathered from this photograph of the stage. As part of the lecture, the special lighting required by aerodromes was touched upon.

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# ELECTRIC TRACTION.

## Inquiry into the Charfield Disaster—Electric Lighting and Gas.

THE official inquiry into the disaster to the express train at Charfield on October 13th was opened last week by Col. Sir John Pringle, at Gloucester Guildhall. Messrs. James Ault and Donald Hewitt, district electrical inspectors, said that the signals were in good order generally. The district foreman of the Carriage and Wagon Department, Bristol, said that three gas cylinders of the four coaches were intact and undamaged, but the fourth had been opened about eight inches. He thought that so soon as the pipes were fractured the gas would have issued from all four cylinders.

Mr. C. R. Byron, chief general superintendent of the L.M.S., said that the number of electrically-lighted stock at the present time was not sufficient to cover the whole of their trains. "We therefore have to use this stock for the most important expresses. The train concerned in the accident is one we look upon as quite a secondary train; in fact, it is a mail train primarily on which, as a general rule, very few passengers travel. It is for that reason low down on the list for electrically-lighted stock."

Sir John: If you had sufficient electrically-lighted stock would you have put it on the train?

Mr. Byron: No, the Coston tunnel prevents us from using our latest types of stock between Birmingham and the West because of the narrow type of gauge.

### Converting Gas-lit Coaches.

Mr. E. J. Lemon, carriage and wagon superintendent of the L.M.S., drew attention to the fact that the company's form of locomotives had been electrical on all main line stock since 1914. By that he meant corridor coaches. Since 1923 all new stock on the L.M.S. had been equipped with electric lighting. They were breaking up the gas-lighted coaches by approximately 1 000 a year. The number of vehicles converted was 1 132.

Mr. Lemon said it would be impossible to provide the necessary meals by electric cooking.

Sir John said that he found it impossible to continue his inquiry as there were a number of witnesses too ill to attend. The inquiry therefore would be postponed *sine die*.

The number of passengers carried on the Blackpool tramways during 16 days of the illuminations was 3 324 553.

Glasgow Tramways Sub-Committee on Works and Stores recommends the reconditioning of over 400 of the Corporation's tramcars, at a cost of nearly £350 000.

Birmingham Tramways and Omnibus Dept. has ordered 80 new tramcars, with transverse upholstered seats on both the upper and lower decks, and with more powerful motors than those hitherto employed. The delivery of the new cars has been commenced.

A gas explosion occurred on September 27th, in the underground workings in connection with the new underground railway station at Piccadilly Circus. Part of the street pavement was wrecked, and eight men were injured and taken to hospital. The gas supply was immediately cut off.

The Minister of Transport (Lt.-Col. Wilfrid Ashley) opened, last week, Liverpool Corporation's new tramway and omnibus construction and repair works, upon the erection of which £350 000 has been spent. The Minister and numerous other visitors, including the Lord Mayor (Miss Beavan) inspected the works, and were particularly interested in the electric traverser which picks up, carries and deposits tramcars bodily, the electric grinding machine for levelling tramcar tyres, and the electric welding plant. In the body-building shop 24 tramcars or omnibuses can be dealt with simultaneously. When the equipment is complete the works will have cost £500 000.

In regard to the question of the discontinuance of the Musselburgh tramways service, the Ministry of Transport states that the tramway company has informed the Ministry that its former reference to Port Seton in its statement regarding an arrangement with Edinburgh Corporation to operate the tramway service should have been to Levenhall. The Ministry is therefore prepared to consider making an Order declaring the company's powers in respect of the discontinued tramways at an end if the company or any of the local authorities concerned apply for such an Order. The East Lothian Western District Committee has resolved to apply jointly with other authorities for such an Order in respect of the line between Levenhall and Port Seton.

# ELECTRICAL WOMEN.

## Three New Branches of the Association Opened During October.

THE inaugural meeting of the Rugby branch of the Electrical Association for Women was, as announced in THE ELECTRICIAN of last week, held in the Benn Buildings, Rugby, on October 11th, with Lady Feilding in the chair.

After an address from the chair, followed by an official welcome to the branch from Mr. B. M. Butler, speaking on behalf of Mr. T. S. Shenton, borough electrical engineer, the past activities of the Association, together with its aims and proposed activities, were outlined by Miss C. Haslett. Miss N. Pedler, the honorary secretary of the branch, briefly reviewed the provisional programme, which included a lecture on "Fuses," another on "House Wiring and Tariffs" and a visit to the Coventry Works of the British Thomson-Houston Co., and submitted the names of the proposed Council (including the provisional honorary treasurer, Miss E. M. Langton), for the approval of the branch.

The first of the evening lectures of the Association (London) on "Electric Light in Factories As It Affects Production and Hygiene," was given, in the absence of Mr. W. J. Jones, by Mr. Lingard, at the E.L.M.A. Lighting Service Bureau, of October 15th. By means of lantern slides and various demonstrations, Mr. Lingard showed how accidents could be prevented and the health of the industrial worker safeguarded by the use of scientific lighting. Miss Redwood, of the Woolwich Electricity Department, took the Chair.

The next evening lecture, which takes place at the E.L.M.A. Lighting Service Bureau on October 30th, at 7 p.m., is being given by Miss Gladys Burlton, on "Salesmanship."

The inaugural meeting of the Hampshire branch will take place on October 29th, at 3 p.m. this being the third branch of the Association formed this month.

The October meeting of the Leeds and West Riding branch was held on Wednesday, including a visit to the home of Mrs. W. B. Woodhouse at Bramhope, and a lecture on "Interior House Lighting." At the next meeting, on November 15th, Mr. B. C. Holding, Editor of THE ELECTRICIAN, will lecture on "Electricity in the Home: the Labour Saver and Comfort Bringer."

A meeting of the Manchester branch of the Association was held at the Manchester Lighting Service Bureau on Tuesday to discuss the "Electrical Outlet Campaign." Addressing a fairly large audience, Miss C. Haslett said that the two main objects were to teach the advantages of electricity in the home, on the farm and in every way, and by means of lectures, visits to works, etc., to bring the woman's point of view before the appropriate authorities. The first step in the campaign had been the publication of the Women's National Specification, which was a brief idea of the number of outlets required.

Mr. H. C. Lamb, borough electrical engineer, said that the cause of the campaign was worthy of and much in need of the Association's attention. The irony of the situation was that hundreds of houses were without the facilities to take advantage of a good and cheap supply. Many small houses erected in Manchester had expensive systems of mains and had only six or seven points to provide for lighting, and nothing was done to provide for the other conveniences. On one estate in Manchester some sixty all-electric houses had been occupied for three or four years and had proved a complete success, the total cost being under seven guineas a year.

## THE SOCIAL SIDE.

On October 8th, the employees of S. G. Leach and Co., Ltd., gathered at the Talbot Restaurant, London Wall, for a staff dinner and sing-song. Mr. S. G. Leach was in the chair, and he took the opportunity of toasting employees of the company whose years of service covered over 20 years. The opportunity was also taken of welcoming Mr. W. J. Wiles and Mr. M. Geoffrey Woods who recently joined the Board. An informal musical and dance programme concluded a successful evening.

The G.E.C. Social and Athletic Club reports that it is running four teams in the West End Amateur Football League this year. Two teams are being fielded regularly in the Netball League, while two Badminton Courts are available for play. The G.E.C. Choral Society has also started work, and proposes staging two operas, one to be produced this month, and the other in March. The Swimming and Tennis Sections are continuing their activities, so far as possible, throughout the winter months.

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# TRADE PUBLICATIONS.

AS a supplement to the electrical catalogue No. 530, the Welsbach Light Co., Ltd., has published a special booklet dealing with glassware fittings. The reference is No. 542.

A new steam trap catalogue has been published by William Geipel, Ltd.

"Light on the H.T. Battery" is the title given to a new publication by Ripaults, Ltd.

The Edison Swan Electric Co., Ltd., has published a new lamp catalogue giving reduced prices.

The Mortimer Engineering Co. has sent us the new wholesale price list of "Davla" reduction gears.

The Lisenin Wireless Co. has sent us a new catalogue of "positive grip" terminals and components.

The current issue of the "Osram G.E.C. Bulletin" includes details of the company's programme for the winter season.

Gent and Co., Ltd., has issued section 10, book 8, which deals with a.c. mains transformers for loud speakers.

## Other Publications.

New literature dealing with mouldings in bakelite has been issued by Ebonestos, Ltd. A new multi-leaf blotter has also been published.

Korting and Mathiesen Electrical, Ltd., have issued new literature relative to Kandem daylight fittings and one-piece units for commercial lighting.

"The Amperite Blue Book of Radio Information" is the title given to a new publication by the Rothermell Radio Corporation (Great Britain), Ltd.

A special leaflet dealing with the "Igranikit" has been issued by the Igranic Electric Co., Ltd. A new component catalogue has also been published.

John Shaw and Sons, Wolverhampton, Ltd., have published two new three-colour leaflets illustrating their new range of hand painted glass shades and bowls.

Illustrations of their work are given in a new folder published by John Thompson Water Tube Boilers, Ltd., under the title "A Century of Boiler Making."

No. 27 of the "B.E.N. Bulletin," published by B.E.N. Patents, Ltd., gives the company's exhibits at the Olympia Motor Show.

We have received from Rikwagaku-Kogyo Kaisha, Ltd., of Kamifujimae-Cho, Komagome, Hongo-Ku, Tokyo, leaflet No. 25 which describes the company's apparatus for photo-elasticity tests.

Catalogue No. 18, devoted to lighting equipment by the Wardle Engineering Co., Ltd., has been received. Among the descriptions given is one dealing with the Bruce lantern, which was exhibited this year at the Conference of the Association of Public Lighting Engineers, at Sheffield.

Brookhirst Switchgear, Ltd., announce that they have now in preparation two new publications on direct current motor control gear. All the information regarding this control gear will be brought within the covers of the two catalogues, one dealing with hand-operated and the other with automatic control gear. The new issues will cancel Catalogue No. 5 and parts of Catalogue No. 10. Information regarding these publications has already been issued in folder form.

We have received from Mather and Platt, Ltd., one of their recent publications entitled "Centrifugal Pumps in the Oil Industry." This is a short monograph on the subject, which claims to have incorporated within it a good deal of information required by the field and refinery engineer, which has never before been published. Some of the tables, we are informed, and particularly the three charts at the end, include information which has not hitherto been available in such a handy form.

The new catalogue of Stationary Storage Batteries just issued by the Chloride Electrical Storage Co., Ltd., is a remarkably good production from the point of view of artistic merit and also from the comprehensive nature of the information given. The cover design shows a power station in silhouette, which "with the lid off" shows the battery room in perspective. The title page shows two typical battery plates, a positive and a negative, printed in self colours in metallic inks, giving a very life-like effect. The blocks throughout are clear and well printed, particularly the "Chloride Box Negative Plate" on page 9 which shows wonderful detail. The tables, graphs, layout of battery rooms and stand details are most complete. Copies of the catalogue may be had from the Chloride Electrical Storage Co., Ltd., Publicity Department, Clifton Junction, nr. Manchester.

# WIRELESS NOTES.

## Statements by the B.B.C. and Baird Television Co. on Future Activities.

THE British Broadcasting Corporation issued the following statement on October 18th :—

"In agreement with the Post Office, the B.B.C. required a studio demonstration of the Baird television apparatus before considering whether there should be public experiments, in which a B.B.C. station would participate. A demonstration took place at the offices of the Baird Television Development Co., Ltd., on October 9th, and was attended by administrative and technical officials of the corporation.

"The opinion of the B.B.C. representatives was that, while the demonstration was interesting as an experiment, it failed to fulfil the conditions which would justify trial through a B.B.C. station.

"The board of the corporation has decided that an experimental transmission through a B.B.C. station shall not be undertaken at present. The corporation would be ready to review this decision if and when development justified it."

An official statement in reply to the above B.B.C. announcement was made by the Baird Television Development Co., Ltd., on October 20th.

The statement was in the following terms :—

"The Baird system of television has now reached a stage of technical advancement which makes it, in the opinion of many independent authorities, fit for a public service. Accordingly, the Baird Television Development Co., Ltd., applied to the Postmaster-General for broadcasting facilities. The Postmaster-General required a demonstration, and stated that the question of authorising the use of a British Broadcasting Corporation station would be considered in the light of the report on that demonstration. Following the demonstration, the Postmaster-General informed the company that he was prepared to agree to the use, subject to suitable conditions, of one of the B.B.C. stations for further television experiments. At the suggestion of the Postmaster-General, a private demonstration of the working of the apparatus was given to officials of the B.B.C for the purposes of enabling the details of the arrangements to be discussed.

"The B.B.C have now announced that they do not propose to proceed further with television at its present stage. Certain adverse criticisms had previously appeared from time to time in the technical Press under the hand of the chief technical officer of the B.B.C. The Baird Television Development Company refrained from answering these criticisms, in view of the fact that at that time no demonstration of the Baird system had been given to the B.B.C. It is unfortunate that the officer in question should have committed himself to such statements before he had an opportunity of examining the results of the system.

"The decision of the B.B.C., which incidentally was not communicated to the company until some time after it had appeared in the public Press, is contrary to the considered opinion of many independent engineers, including those of the Post Office, who, after the demonstration, did not require the apparatus to fulfil any further conditions in order to justify trial through a B.B.C. station. The company is taking steps with a view to securing independent broadcasting facilities for television."

## Experimental Picture Transmissions.

It is understood that a series of experimental transmissions of wireless pictures by means of the Fultograph process will be commenced by the B.B.C. on Tuesday, October 30th. Every day except Sundays and Mondays, between 2 and 2.15 p.m. a picture of some kind will be broadcast, the first being a photograph of the King. During these transmissions which will be from Daventry, 5XX, the B.B.C. will endeavour to find out the strength of the public demand for such broadcasts. Wireless Pictures, Ltd., will send the pictures made up on cylinders, ready for transmission by the B.B.C., who will make selections for specified days.

The first conference of the International Radio Maritime Committee, formed at a meeting at San Sebastian, Spain, in September, and consisting of representatives of the principal wireless maritime companies of the world, was held last week in London. The committee has been called into existence owing to the growing importance of wireless in connection with the trade and commerce of the sea, both as a means of communication and as an aid to navigation.

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# COMPANY NEWS.

## Appreciation of Manufacturing Companies' Shares—Drake and Gorham's Growing Business—Ferranti's Increased Profit—Auto-Electric Devices' Meeting—Directors' Reports and Dividends—New Companies Registered.

NO outstanding feature calls for comment this week in the electrical share market. In the equipment section, Johnson and Phillips shares are marked up half-a-crown to £2. Callender's Cable 7½ per cent. B preference shares, with a rise of 1s. 3d., have reached 27s. 6d., as also have Electric Construction ordinary shares. General Electric ordinary shares have touched 42s. and Telegraph Construction £12 shares are at 25. On the other hand, Ever Readies at 26s. 6d. are 1s. 6d. down. Marconi's Wireless shares have risen half-a-crown.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 33/1½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/- | 42/6 | 68/6 | 14/6 |
| 6 | ,, ,, 6% C.P. .. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1).. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 27/- | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 46/10½ | 46/10½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, Elec. Sup. Ord. .. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B.Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1).. | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 38/- | 38/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, 4% Deb. .. .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. .. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, 4% Deb. .. .. | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 90½ | 90½* | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 65 | 66 | 84½ | 19 |
| 3½ | ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, 3½% Deb. .. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 78½ | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/6 | 26/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 83/9 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 106 | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 85/- | 85/- | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 26/3 | 27/6 | 16/6 |
| 6 | Crompton Parkinson Pref. Ord. .. | 19/- | 19/- | 18/- | 8/- |
| 8 | ,, ,, 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 26/3 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/6 | 28/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 42/- | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 37/6 | 67/11 | 11/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metro-Vickers Ord. .. .. | 34/4½ | 31/4½ | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) .. | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 30/- | 30/- | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 24½ | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½* | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 259½ | 257½* | 213½ | 113/2/6 |
| 3½ | ,, ,, 3½% Pref. Stk. | 69½ | 69½* | 84/17/6 | 49 |
| 4 | ,, ,, 4% Deb. .. | 80½ | 80½* | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 26 | 25½* | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 20† | 38 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 76/3 | 73/9 | 9/10/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 55/- | 54/-* | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7 7/8d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. ·912d. (*g*) 1s. 7·223d.
† Ex. share bonus. ‡ Including 1s. bonus.

BABCOCK AND WILCOX, LTD.—Intm. div. of 7 p.c., tax free (same rate as last year).

ELECTRIC SHOVEL COAL CORPORATION.—Div. of $1 p. sh. on $4 cum. participatg. pfd. stk., payable November 1.

UNITED RIVER PLATE TELEPHONE CO., LTD.—Intm. div. 3 p.c., tax free (same rate as last year) will be payable on Nov. 1.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Intm. div. of 3 p.c., less tax, on ord. shs. (same rate as last year) will be payable on Nov. 15.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. on ord. sh. cap., of 5 p.c. actual, less tax at rate of 2s. in £, for half-year ended June 30, 1928, will be payable on November 15th.

NORWICH ELECTRIC TRAMWAYS CO.—Net pft. for year ended June 30, 1928, £21 988, agst. £22 754, plus £2 309 brt. in. To res. £10 000. Div., 4½ p.c., subject to tax (same as last year). Fwd., £2 417.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Gross earngs. from operation of subsidiary cos. for Sept., 1928, $3 718 263, an increase of $425 146 compared with Sept., 1927; net earngs. $2 210 355, increase $311 159. Aggregate gross earngs. from Jan. 1, $31,692 710, increase $3 273 583; aggregate net earngs. $18 437 648, increase $1 953 197.

WESTERN UNION TELEGRAPH CO.—Gross revs. for nine months ended Sept. 30, 1928, $102 845 770, agst. $100 447 452 in corresponding period of 1927. Deductg. maintenance, repairs, depreciation, and other operating exes, includg. rent of leased lines and taxes, leaves $14 012 739, agst. $13 979 217. After provisn. for int. on bonded debt, net income is $11 306 880, agst. $11 290 074.

STOCK EXCHANGE NOTICES.—The London Stock Exchange Commee. has specially allowed dealings in $162 453 900 cap. stk. of the American Telephone and Telegraph Co., 5 035 £1, fully paid, 5 p.c. non-cum. pref. shs. of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and (after issue of letters of allotment), 400 000 £1, partly paid and fully paid, 6 p.c. cum. pref. shs. of the Mersey Power Co.

NORTH AMERICAN CO.—It is announced that the output of electy. by the group of cos. controlled by the North American Co. in the third quarter of the current year was 1 572 800 000 kWh, an increase of 16·5 p.c., and for the nine months to end of Sept., 4 405 000 000 kWh, increase 14·5 p.c. The cos. supply more than a million customers in California, Missouri, Illinois, Iowa, Ohio, Wisconsin, Michigan and the District of Columbia.

HERBERT MORRIS, LTD.—Pft. from trading for year ended July 31, 1928, £95 022, plus £9 323 divs. from investmts., £9 transfer fees, etc., and £52 386 brt. in. After deductg. directors' fees, pref. divs. for year, ord. div. for first half-year and depreciation, blce. is £108 952. Further div. recommended on ord. shs., makg. 15 p.c. tax free for year (compared with 10 p.c., and 40 p.c. scrip bonus last year). To res. £20 000, agst. £10 000. Fwd. £52 952, agst. £52 386.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The committee recently formed to protect the interests of the £1 ord. shhldrs. of Marconi's Wireless Telegraph Co. in the proposed merger has issued a circular to such shhldrs. The circular states that the Board contemplates an exchange of shs. on a basis which wd. be less favourable to the hldrs. of the £1 ord. shs. than wd. be the case if all the assets of the co. were sold for shs. in the merger co., and if the latter shs. were distributed in a winding up among the Marconi shhldrs. according to their legal rights. The committee awaits the publicatn. of the scheme for the exchge. of shs. before formulatg. proposals. Meantime the committee emphasises the importance of the £1 ord. shhldrs. acting together through the committee in complete unison.

DRAKE AND GORHAM, LTD.—Net pft. for year ended June 30, 1928, £9 628, agst. £9 586, plus £2 692 brt. in. Div. for year, 5 p.c., to gen. res. £2 500; fwd. £3 570. In spite of trade depression, especially in Northern district, profits on contracting side of the business have been maintained at approximately the same figure. In view of the spread of supply mains throughout the country, the works have been reorganised to cope with the growing demand for h.t. substation switchgear. The co.'s patented designs already on

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the market have met with a very favourable receptn. and considerable developmts. are indicated in this directn. as soon as the works are in a position to produce in greater quantity. Co. is obtaining an increasing number of contracts

**An external view of the new London showrooms of John Shaw and Sons, Wolverhampton, Ltd., in Shoe Lane.**

for equipmt. of large buildings in course of constructn., such as the new Bank of England and Lloyd's Bank head offices.

## Company Meetings.

NATIONAL SUN RAY AND HEALTH CENTRES, LTD.—At the statutory meeting mtg. on October 18, Mr. Ernest Beck, who presided, read a speech prepared by Sir Robert Lynn (chairman of the company) in which it was stated that the company would not restrict its operations merely to artificial sunlight, but facilities would be offered for all branches of physiotherapeutic and electrical treatment, which, together with properly equipped nursing homes, would provide the public with a national health institution to which it could turn with benefit and security. Dr. Percy Hall said that the intention of the directors was not only to provide a full range of actinotherapeutic (or what was more popularly, although incorrectly, described as "artificial sunlight") treatments, but also to add to their equipment all forms of natural therapeutic treatments, including electro-therapy, massage and other forms of physio-therapy.

BUELL COMBUSTION CO., LTD.—Mr. J. W. Murray, presiding at the first ordinary general meeting, on October 18, referred to the statements in the directors' report, and added that Messrs. Babcock and Wilcox had a licence for the application of the company's patents to water tube boilers, and, although it would be idle to say that the result of their activities had fulfilled the Board's highest expectations, he was pleased to say that several important installations had been laid down by them, principally one at the North Metropolitan power station, Taylors Lane, of two 75 000 lb. normal evaporation water tube boilers, and among other plants embodying the Buell system, he would mention Horden Collieries, Hayle power station, Brimsdown, the Imperial Japanese Railways, etc. It had been decided to shut down the production and sales side and to devote the remainder of the first year to co-ordinating departments and carrying through important experimental and research work rendered advisable by the experience already gained. In the opinion of the Board, this policy had been amply justified. The Buell burner had completely fulfilled all the claims they made for it, but that in itself was not their goal; they had made considerable progress towards a complete Buell system, capable of dealing with the problem of pulverised fuel in all its stages from the coal truck to the furnace. The report and accounts were adopted.

FERRANTI, LTD.—Dr. S. Z. de Ferranti, presiding at the annual general meeting last week, said the net profit amounted to £54 616, against £35 982 for the previous year. The turnover was approximately the same as in the previous year, but the net profit was increased by £18 634. They had made the usual allocation of £15 000 to depreciation reserve account, and the total now standing to the credit of that account was £136 912. They had transferred a further £35 000 to general reserve account which now stood at £270 000. The directors recommended the payment of a dividend on the ordinary shares of 20 per cent., tax free, leaving £34 116 to be carried forward. The Board tried to deal with the accounts on the most conservative basis possible, the reason being that they knew what serious difficulties lay before manufacturing companies. They were open to attack from every part of the world, and they felt it very seriously. They were continually having markets closed to them. They had only been able to keep the company in its present satisfactory condition by continually fighting for business. They felt it necessary to be extra conservative in husbanding their resources as much as possible, and seeing that their work was done in the most efficient way with the most perfectly equipped manufacturing plant. The report and accounts were unanimously adopted.

AUTO-ELECTRIC DEVICES, LTD.—Mr. Lewis Gordon, presiding at the statutory meeting last week, said no cost had fallen on the company for the promotion, formation, or the underwriting, and the capital position was that out of £35 000 issued and allotted they had a balance on hand of approximately £28 000. The chief asset acquired was the invention of an automatic self-winding motor for use on gramophones. Patent protection had been applied for. Work since the incorporation of the company had been exclusively directed to preparing the way for quantity production. In this respect their programme had been somewhat delayed, but the time had been well spent. There still remained a good deal of preliminary work before they arrived at the producing stage. Present indications encouraged them to look forward to a market for their motors which should yield a satisfactory margin of profit. When the time came, shareholders would be advised—there were some 700 of them—and it was hoped that all who had the advantage of electric current would avail themselves of the opportunity of having an A.E.D. automatic self-winding motor fitted to their gramophones, and would recommend their friends to do the same. They might have recently read comments with reference to 1s. shares, generally referred to as gambling counters. Their capital came under this category as far as the denomination of the shares was concerned. They were engaged in developing a new invention, with the risks and possibilities which, in the nature of things, attached to such an adventure. They had a very small capital, and the issuing house would have experienced more difficulty in distributing the shares so widely if the capital had taken a different form, and a large body of shareholders was an asset. His colleagues and he deprecated indulgence in exaggerated optimism, and he had tried to give a plain statement of their progress and prospects without embellishment. The device was then demonstrated and explained by Mr. N. G. Johnson, the managing director and inventor.

## New Companies.

CORFIELD'S ARGENTINE TRADING CO., LTD.—Cap., £30 000. To acquire business carried on by J. and G. Corfield, Ltd., and to carry on business of merchants, exporters, contractors, electrical and general engineers, etc. Reg. Office: 47, Victoria Street, London, S.W.1.

CITY SPORTS STORES, LTD.—Cap., £3 000. To carry on the business formerly carried on as "H. Mernick and Co." at 263, Old Street, London, E.C., and that of manufacturers of and dealers in wireless and television apparatus, etc. Reg. office: 113, City Road, London, E.C.1.

C. GILBERT AND CO., LTD.—Cap., £60 000. To acquire business of manufacturers and merchants of wireless apparatus, etc., now carried on by C G. Hibbard and E. Hibbard at Sheffield and Hull, as "C. Gilbert and Co." Solicitor: W. Irons, J.P., 9, St. James Street, Sheffield.

MARTINEL STEEL CO., LTD.—Cap., £10 000. To adopt agreement with F. G. Martin and A. T. Wall, to acquire patents and patent rights referred to in said agreement, and to carry on business of general and electrical engineers, etc. Solicitors: Hill, Dickinson and Co., 10, Water Street, Liverpool.

PRESCOTT AND HODGKINSON, LTD.—Cap., £1 000. Industrial and electrical engineers and contractors, suppliers of electricity, manufacturers of and dealers in rail, tram, electric, magnetic, galvanic and other apparatus, etc. Solicitors: Summerhays, Son and Barber, 19, Eastcheap, London, E.C.3.

LIGHT RADIATORS, LTD.—Cap., £100. To carry on business indicated by title, and to promote, participate in and subsidise research work into improvement or substitution of existing secret processes or inventions relating to electrical processes, etc. Solicitor: Lucien Fior, 205, Oxford Street, London, W.1.

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MID-DURHAM CARBONISATION CO., LTD.—Cap., £60 000. To manufacture coke and derive from coal all kinds of by-products, to buy, sell and deal with all such products, gases and waste heat; to acquire, utilise, generate, distribute, sell and deal in electricity, etc. Reg. Office: Washington Colliery, New Washington, co. Durham.

SIR JOHN JACKSON (SINGAPORE), LTD.—Cap., £1 035. To take over and complete contract dated Sept. 27, 1928, between Sir John Jackson, Ltd., and the Admiralty for the construction at Seletar, Singapore, of a naval base; to carry on business of contractors, engineers, producers of electric or other light and motive power, owners of electric light and other works, etc. Reg. Office: 53, Victoria Street, London, S.W.1.

PACTOPHONE RECORDS, LTD.—Cap., £100. Manufacturers of and dealers in apparatus, machines, instruments or materials for recording, transmitting or reproducing speech or other sounds or for transmission or reception of telephonic or telegraphic communications and messages, and the transmission by means of wireless apparatus of pictures, etc. Solicitors: Herbert Oppenheimer, Nathan and Vandyk, 1, Finsbury Square, London, E.C.

PICCADILLY RECORDS, LTD.—Cap., £100. Manufacturers, exporters, importers and users of and dealers in machines and instruments for entertainment, scientific, commercial or other purposes, machines or apparatus for transmission or reception of telephonic or telegraphic communications and messages and the transmission by wireless apparatus or otherwise of pictures, diagrams, etc. Solicitors: Herbert Oppenheimer, Nathan and Vandyk, 1, Finsbury Square, London, E.C.2.

AMERICAN AND DOMINIONS UNBREAKABLE RECORDS, LTD.—Cap., £250 000. To acquire certain patents and rights for the U.S.A., Canada, New Zealand and Australia; to adopt agreements with the Irish Investment Trust, Ltd., and the Duophone and Unbreakable Record Co., Ltd., and to carry on business of manufacturers of or dealers in phonograph and gramophone records, gramophones, phonographs, amplifiers, loud speakers, instruments and automatic machines for recording or reproducing speech, music, or other sounds, dynamos, generators, accumulators, batteries, motors, springs, etc. Solicitors: Herbert Smith and Co., 62, London Wall, London, E.C.2. (Public co.)

# MUNICIPAL FINANCE.

## Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1927–8 of the 43 undertakings included in the following table and the 125 in the tables which appeared in our issues of August 17th and September 14th was £26 039 257. The gross profit on the year's working of the 168 undertakings was £12 261 312, and the aggregate sales of electricity amounted to 4 181 453 576 kWh, while 76 undertakings out of the total number have contributed an aggregate of £456 279 to the relief of rates. In many cases the costs include items of a capital nature, and net profits have been reduced as the result of reduction of charges for current. As it is desired to make these tables as complete as possible the Editor will be pleased to receive similar particulars of other municipal electricity undertakings.

| Authority. | Total Revenue. £ | Gross Profit. £ | Net Profit or deficit. £ | (a) Working Costs per kWh sold. | Total Cost per kWh (inc. capital charges). | Electricity sold (kWh). | Increase (+) or Decrease (−) in kWh sold. | Maximum Simultaneous Load in kW. | (h) Load Factor. | Radiators and Cookers Connected (total) in kW except where otherwise stated. | Other Domestic Appliances connected (total) kW. | Contributed in Aid of Rates. £ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (d) Aberdeen C.C. .. | 229 312 | 124 015 | (c) + 29 982 | 0·717d. | 1·401d. | 32 978 002 | + 2 820 349 | 15 100 | (f) 30·30 | (b) 13 384 | See footnote (b) | — |
| Accrington T.C. .. .. | 84 626 | 43 382 | + 9 651 | 0·557d. | 1·012d. | 17 803 433 | + 2 781 174 | 9 600 | 26·21 | — | — | — |
| Amble U.D.C. .. .. | 3 227 | 1 312 | + 490 | 3·700d. | 4·940d. | 132 970 | + 27 972 | 80 | 20·60 | — | — | 4 |
| Ashton-under-Lyne T.C. .. | 75 787 | 31 080 | (c) + 5 035 | 0·863d. | 1·200d. | 12 442 512 | + 3 136 639 | 6 217 | 22·80 | 3 580 | 4 402 | 700 |
| Barking U.D.C. .. .. | 35 074 | 8 607 | + 3 128 | 1·845d. | 2·269d. | 3 440 689 | + 753 028 | 1 584 | 23·83 | — | — | 835 |
| Bedford T.C. .. .. | 96 780 | 42 704 | + 1 617 | 0·853d. | 1·502d. | 15 198 879 | + 2 390 766 | 6 980 | 24·85 | (b) 8 532 | See footnote (b) | 1 380 |
| Bexhill T.C. .. .. | 35 029 | 10 069 | + 252 | 2·230d. | 3·150d. | 2 685 108 | + 529 182 | 1 917 | 15·99 | — | — | — |
| Bexley U.D.C. .. .. | 26 225 | 11 534 | + 2 550 | 1·372d. | 2·211d. | 2 570 420 | + 506 469 | 1 520 | 19·31 | 2 050 | 154 | 700 |
| Brighton T.C. .. .. | 249 493 | 91 954 | + 31 811 | 1·170d. | 1·700d. | 27 160 785 | + 3 625 640 | 17 200 | 24·00 | — | — | 15 100 |
| Cardiff C.C. .. .. | 264 775 | 151 750 | + 68 284 | 0·620d. | 1·230d. | 38 339 859 | + 4 820 166 | 17 303 | 25·22 | 19 778 | — | 11 474 |
| Cheltenham T.C. .. | 65 213 | 26 332 | + 7 406 | 1·380d. | 2·060d. | 6 070 521 | + 744 087 | 3 950 | 22·81 | (b) 8 762 | See footnote (b) | 1 756 |
| Clacton U.D.C. .. .. | 25 065 | 11 882 | + 1 124 | 1·852d. | 3·593d. | 1 521 075 | + 302 804 | 933 | 20·66 | (g) 3 015 | — | 500 |
| Colwyn Bay U.D.C. .. | 28 664 | 10 995 | + 3 247 | 2·353d. | 3·404d. | 1 801 607 | + 352 573 | 1 140 | 18·04 | (h) 450 | (h) 400 | — |
| Crewe T.C. .. .. | 29 249 | 6 863 | + 3 179 | 1·770d. | 2·860d. | 2 187 718 | + 181 935 | 1 553 | 16·08 | 700 | 99 | — |
| Darlington T.C. .. .. | 73 940 | 35 519 | + 4 213 | 0·467d. | 0·847d. | 19 748 332 | + 4 887 116 | 9 580 | 28·11 | (b) 5 972 | See footnote (b) | 3 500 |
| Dearne Dist. Elec. Bd. .. | 10 290 | 3 957 | + 479 | 1·180d. | 2·980d. | 482 746 | + 214 085 | 509 | 13·90 | 73 | 57 | — |
| Derby T.C. .. .. | 204 453 | 114 001 | + 36 327 | 0·630d. | 1·230d. | 31 309 187 | + 3 782 008 | 14 660 | 24·30 | 18 065 | 2 130 | 9 000 |
| Dublin C.C. .. .. | 276 275 | 124 222 | + 36 234 | 1·320d. | 1·970d. | 24 947 145 | + 2 917 778 | 10 456 | 17·26 | See footnote (i) | See footnote (i) | — |
| Ealing T.C. .. .. | 100 032 | 40 243 | + 12 236 | 2·980d. | 4·376d. | 4 814 646 | + 854 252 | 3 484 | 15·77 | — | — | — |
| Formby U.D.C. .. .. | 6 085 | 2 291 | + 634 | 1·902d. | 2·830d. | 294 020 | + 64 907 | 194 | 16·40 | (h) 50 | — | — |
| Hove T.C. .. .. | 74 744 | 35 727 | + 10 907 | 2·230d. | 3·590d. | 4 205 067 | + 461 981 | 3 015 | 15·88 | (b) 5 087 | See footnote (b) | 3 700 |
| King's Lynn T.C. .. | 29 025 | 11 456 | + 3 855 | 1·300d. | 2·210d. | 2 580 397 | + 661 139 | 1 590 | 18·50 | — | — | — |
| Kingston-on-Thames T.C. | 65 572 | 37 282 | + 11 031 | 1·706d. | 3·293d. | 3 974 685 | + 338 227 | 2 630 | 17·25 | — | — | 3 000 |
| (k) Kirkcaldy T.C. .. | 52 101 | 25 175 | + 5 841 | 0·759d. | 1·312d. | 8 396 186 | − 200 983 | 3 720 | 31·00 | (b) 3 359 | See footnote (b) | — |
| Lancaster T.C. .. .. | 41 655 | (m) 19 798 | + 5 053 | 1·060d. | 1·700d. | 4 605 825 | + 848 342 | 2 528 | 20·80 | (b) 736 | See footnote (b) | 1 500 |
| Leicester C.C. .. .. | 382 473 | 191 408 | (p) + 134 214 | 0·842d. | 1·221d. | 54 429 808 | (n) − 5 703 983 | 29 160 | 21·34 | — | — | (o) 17 515 |
| Lincoln C.C. .. .. | 98 675 | 48 628 | + 4 732 | 0·561d. | 1·152d. | 19 651 828 | + 2 308 912 | 9 150 | 24·45 | (q) 5 288 | See footnote (i) | — |
| Lowestoft T.C. .. .. | 48 221 | 16 610 | + 5 691 | 2·643d. | 3·556d. | 2 870 830 | + 167 535 | 2 032 | 16·13 | — | — | — |
| Maidenhead T.C. .. | 28 507 | 10 795 | + 6 442 | 2·261d. | 2·740d. | 1 879 988 | + 326 000 | 1 125 | 20·90 | See footnote (i) | See footnote (i) | 500 |
| Middlesbrough T.C. .. | 92 567 | 41 471 | + 20 571 | 1·178d. | 2·153d. | 10 209 265 | + 2 113 114 | 6 602 | 20·90 | — | — | 2 813 |
| Neath T.C. .. .. | 16 228 | 2 947 | + 1 029 | 4·239d. | 4·851d. | 752 005 | + 99 535 | 452 | 19·50 | (b) 633 | See footnote (b) | — |
| Norwich C.C. .. .. | 203 631 | 98 916 | + 38 184 | 0·895d. | 1·473d. | 26 145 993 | + 3 629 475 | 13 702 | 25·40 | 18 161 | — | — |
| Nottingham C.C. .. .. | 331 507 | 203 466 | + 22 750 | 0·820d. | 1·978d. | 37 453 208 | + 4 023 196 | 20 670 | 20·68 | — | — | — |
| Perth C.C. .. .. | 38 676 | 21 099 | − 1 750 | 1·254d. | 2·627d. | 3 383 298 | + 289 875 | 2 385 | 16·19 | — | — | — |
| Preston T.C. .. .. | 207 586 | 107 087 | + 17 565 | 0·555d. | 1·110d. | 38 276 214 | + 11 307 154 | 17 000 | 29·46 | — | — | — |
| St. Helens T.C. .. .. | 120 192 | 54 782 | + 20 652 | 0·520d. | 0·798d. | 29 930 540 | + 5 857 178 | 8 100 | 42·00 | (l) 18 490 | See footnote (l) | — |
| Shoreditch (London) B.C. | 174 175 | 86 665 | + 30 627 | 1·028d. | 1·745d. | 18 771 497 | + 1 701 082 | 12 251 | 21·25 | — | — | — |
| Southwark (London) B.C. | 73 998 | 29 022 | + 10 660 | 0·820d. | 0·825d. | 4 899 919 | + 550 674 | 3 530 | 15·54 | — | — | — |
| Stirling T.C. .. .. | 16 491 | 6 553 | − 1 665 | 1·779d. | 2·922d. | 1 340 540 | + 143 961 | 830 | 18·30 | — | — | — |
| Stoke-on-Trent C.C. .. | 198 944 | 104 977 | + 11 238 | 0·977d. | 1·935d. | 23 085 577 | + 5 020 796 | 10 908 | 24·09 | — | — | — |
| Todmorden T.C. .. | 30 428 | 8 249 | + 650 | 1·120d. | 1·614d. | 4 380 437 | + 842 318 | 2 360 | 24·17 | (b) 2 319 | See footnote (b) | — |
| Warrington T.C. .. | 133 771 | 54 283 | + 18 964 | 0·668d. | 0·992d. | 21 144 530 | + 2 224 700 | 9 600 | 25·00 | 2 817 | 1 097 | — |
| Whitby U.D.C. .. .. | 14 722 | 8 007 | + 2 553 | 1·330d. | 3·223d. | 723 462 | — | 510 | 23·00 | — | — | 618 |

(a) Usually include management, repairs and maintenance, rates and taxes and special charges. (b) Including other domestic electrical appliances. (c) After wiping off deficit of £4 608 at close of year ended March, 1927. (d) Year ended July, 1928. (e) Includes £19 000 carried to sinking fund and £4 600 contribution to capital. (f) Calculated on kWh generated. (g) All heating. (h) Approximate. (i) Not available. (k) Year ended May 15th, 1928. (l) Including other domestic appliances and motors. (m) Includes £1 043 capital expenditure out of revenue. (n) Compared with 15 months ended March, 1927. (o) After expenditure of £10 000 on hire purchase apparatus. (p) After placing £32 672 to reserves and expending £10 000 on hire purchase apparatus. (q) Cookers only; radiators not known.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BELL, Herbert, 10, Bath Street, Waterloo, electrical contractor. £16 3s. 3d. September 19th.

DARCH, Mr. B. P. (trading as WEYMOUTH AND PORTLAND ELECTRIC CO.), 43A, St. Thomas Street, Weymouth, electrical engineer. £21 9s. 6d. September 10th.

HOLAHAN AND CO., 20, Lune Grove, Blackpool, electrical engineers. £26 14s. 11d. September 14th.

J. D. WIRELESS CO., 195, Breck Road, Everton, electrical engineers. £13. September 11th.

JENNENS (J. R.), LTD., 3, Jennen's Row, Birmingham, wireless dealers. £18 11s. September 5th.

JONES, Owen E., 2, Blacks Road, Hammersmith Bridge Road, W., electrical contractor. £18 6s. 2d. September 20th.

MAWLITE ELECTRIC LAMP CO., LTD., 28, Belgrave Road, S.W., electrical merchants. £32 12s. September 18th.

ROCKALL AND CO., 7/8, Ham Yard, Great Windmill Street, W., electrical contractors. £21 10s. 2d. September 18th.

## Receiverships.

J. T. KEMP, LTD. C. Thompson, C.A., Commerce Chambers, Parliament Street, Nottingham, was appointed receiver on October 8th, 1928, under powers contained in debentures created September 23rd, 1927.

SMITH AND STURT, LTD. H. Brown, Incorporated Accountant, of 71, Temple Row, Birmingham, was appointed Receiver and Manager on October 5th, 1928, under powers contained in 1st debenture dated December 2nd, 1927.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

MUSSELBURGH AND DISTRICT ELECTRIC LIGHT AND TRACTION CO., LTD., London, E.C.—Reg. Oct. 9, series of £30 000 debs., present issue £7 000; general charge. *£74 800. June 30, 1927.

NELSON ELECTRIC CO., LTD., London, E.C.—Registered October 4th, £400 debentures balance of £1 000; general charge. *£4 600. December 31st, 1926.

PULVERMACHER (I. L.) AND CO., LTD., London, E.C., medical electricians, etc.—Reg. Oct. 9, £500 debs.; general charge. *Nil. Aug. 2, 1927.

RADIA ELECTRIC CO. (GLOUCESTER), LTD.—Registered October 2nd, series of £5 000 debentures present issue £10; general charge.

RHAYADER ELECTRIC LIGHT AND POWER CO., LTD.—Registered October 3rd, £675 debentures dated September 13th, 1928, balance of £1,000; general charge. *£1 000. September 27th, 1928.

### Satisfactions.

PULVERMACHER (I. L.) AND CO., London, E.C., medical electricians, etc.—Satisfaction reg. Oct. 4, £3 000, reg. Nov. 16, 1903.

RADIO SERVICE (LONDON), LTD.—Satisfaction registered October 3rd, £125, part of amount registered July 20th, 1927.

## London Gazette, etc.

### Reduction of Capital.

NORTH-WESTERN ANGLO-SWEDISH ELECTRIC WELDING CO., LTD., AND REDUCED. A petition presented to the High Court of Justice, on October 5th, for confirming the reduction of the capital from £30 000 to £15 000 by cancelling capital which has been lost or is unrepresented by available assets, is to be heard in the High Court of Justice before Mr. Justice Maugham on Tuesday, October 30th.

### Companies Winding-up Voluntarily.

KEMP (J. T.), LTD. By reason of its liabilities, October 8th. C. Thompson, Commerce Chambers, Parliament Street, Nottingham, appointed as liquidator.

YORKSHIRE IGNITION CO., LTD. By reason of its liabilities, October 12th. W. A. Wheatcroft, 11, Leopold Street, Sheffield, chartered accountant, appointed as liquidator. Meeting of creditors at liquidator's office, on Wednesday, October 31st, at 3 p.m. Claims by October 30th.

### Bankruptcy Notice.

GREEN (E.) AND CO., 13, Caledonian Road, Leeds, electric lamp dealers. A bankruptcy notice has been issued against this firm in Leeds County Court, at the instance of the British Thomson-Houston Co., Ltd.

### Bankruptcy Information.

BEESLEY, Harry Walter, High Street, Brackley, Northants, motor cycle and wireless engineer. First meeting, October 27th, 12 noon, 37, Cornmarket Street, Oxford. Public examination, November 14th, 11 a.m., Town Hall, Banbury.

CAVE, John, and BOWLER, Thomas William, trading as TAYLOR AND WYNNE, at back 180, Green Lane, Small Heath, Birmingham, electrical engineer. First meeting, October 26th, 11 a.m., Official Receiver's Office, 191, Corporation Street, Birmingham. Public examination, November 7th, 1928, 2.30 p.m., Court House, Corporation Street, Birmingham.

COHEN, George, 49, Newman Street, Oxford Street, London, electrical engineer. Receiving order, July 31st. Creditor's petition.

MEREDITH, Charles James, lately at the rear of Princes Road, Torquay, Devonshire, electrician. Receiving order, October 17th. Debtor's petition.

SHARPE, Henry Clifford, 4, Gordon Terrace, Dorchester, Dorset, wireless. engineer. Receiving order, October 19th. Creditor's petition.

### Partnerships Dissolved.

PERSEVERANCE ELECTRICAL CO. (Ann RUNCIMAN, Robert Davidson RUNCIMAN, and Albert RUNCIMAN), electrical engineers, Vecqueray Street, Coventry, as from June 30th, 1928, so far as concerns A. Runciman, who retired from the firm. The business will be carried on by A. Runciman and R. D. Runciman.

SWEETMAN AND ANSELL (Allen Powlett ANSELL and John SWEETMAN), electrical engineers, 3, Bell Street, Reigate. As from August 18th, 1928, by mutual consent. Debts received and paid by A. P. Ansell, who will continue the business under the style of A. Ansell.

THATCHAM ELECTRIC LIGHTING WORKS (Charles GUNTER, Junior, Arthur Henry BROWN, and Charles George BROWN, Junior), Thatcham. The business has been acquired by the Wessex Electricity Company as from July 1st, 1928.

## Bankruptcy Proceedings.

BLAIR, Edward Winnington, 49, Oakwood Road, Hampstead Garden Suburb, electrical engineer and contractor, lately trading as Blair and Son, 6, Queen's Parade, Brent Street, Hendon. The first meeting of creditors herein was held on October 19th at 29, Russell Square, London, W.C.1, when the matter was left in the hands of the Official Receiver as trustee of the estate. According to the statement of affairs there were liabilities of £264, against assets of £76, a deficiency of £188. Debtor attributed his failure to losses on contracts through under-estimating, and through work being rejected by the local council. It appeared that he commenced business at a shed at Willifield House, Willifield Way, in August, 1924, without capital, but in September of that year he received £200 under the will of his late father, which he put into the business. From November, 1924, to April, 1926, he entered into contracts to carry out the electrical installation and to supply all necessary material for about 160 houses at Beckenham on which he estimated he lost about £150. In April, 1926, debtor entered into a similar contract for the installation at 14 other houses on the same estate, and in order to avoid loss he used a cheaper quality of cable than previously, but on completion of the contract the Local Council refused to pass the work, and he lost about £100 on that contract. In January, 1927, debtor became the tenant of a shop at Hendon, but in May, 1928, his stock worth, about £15, was sold by the landlord under a distraint for rent. The only book of account produced was debtor's ledger. The debtor stated that he became aware of his position in January, 1926.

The following are creditors:—Markers Ward and Co., Ltd., London, £32; Neville Hines and Co., Ltd., Hendon, £25; Sun Electric Supply Co., Ltd., London, £40; Wenham Lighting Corporation, London, £33; Wholesale Electric Lamp Co., London, £76; General Electric Co., Ltd., London, £10; Sharles, F. F., London, £10.

JAWETT, Nathan, electric lamp dealer, lately 58, Bedford Street, London, E.1. The public examination of the debtor was held in the London Bankruptcy Court last week before Mr. Registrar Franke, the statement of affairs showing liabilities £86, and assets consisting of bad book debts of the face value of £128. The receiving order was made on the petition of the British Thomson-Houston and Co., Ltd., of Aldwych House, W.C., creditors for £68. Mr. Tindale Davis, counsel, appeared on their behalf and at the conclusion of the Official Receiver's questions he proceeded to examine the debtor further, especially with regard to the source of his supplies of lamps which infringed the patent of the petitioners. But the debtor refused to disclose this, and his Honour eventually adjourned the public examination and said that he would report the debtor's refusal to the Judge.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### October 2nd.

28 255 Siemens-Schuckertwerke A.G. Electric switches. (6/10/27, Germany.)
28 191 Soc. Electro-Metallurgique de Montricher. Stirring apparatus for electric furnaces. (7/2/28, France.)
28 215 A. Soulier. Electric tension regulators. (4/10/27, Belgium.)
28 162 H. F. C. Whitehead. Connectors for electric conductors, etc.

### October 3rd.

28 393, 28 394 T. E. Allibone. Vacuum electric discharge tubes.
28 417 J. L. Baird and Television, Ltd. Television apparatus, etc.
28 346 F. D. H. Bremner and English Electric Co., Ltd. Electric traction control systems.
28 285 S. O. Cowper-Coles. Insulating material.
28 286 S. O. Cowper-Coles. Protective metallic coatings for metals.
28 335 G. S. Davison. Electric lamps and horns.
28 363 Edison Swan Electric Co., Ltd., and W. E. Hankins. Electric fires.
28 418 Electrical Research Products, Inc. Electrical transmission systems. (21/10/27, U.S.)
28 406 C. E. Foster. Thermostats.
28 395 General Railway Signal Co. Railway control systems. (22/10/27, U.S.)
28 342 R. C. Graseby. Electrical reciprocating mechanism, etc.
28 326 J. L. Hills. Electrical pick up devices for gramophones.
28 351 T. S. Kemble. Contactors for electric controllers.
28 303 L. and L. C. King. Apparatus for use with telephone systems.
28 354 S. Loewe. Thermionic valves. (19/7/26, Germany.)
28 366 E. Maassen. Dynamo-electric machines.
28 390 A. North. Incandescent lamps.
28 297 F. Nutt and W. Park. Fire alarm.
28 300 A. Pordage. Automatic fire alarms.
28 330 F. G. L. Scott and A. W. Sharman. Apparatus for electromedical treatment.
28 332 A. F. Sykes. Recording microphones, etc.

### October 4th.

28 463 J. L. Baird and Television, Ltd. Television apparatus, etc.
28 561 J. L. Baird and Television, Ltd. Television apparatus, etc.
28 543 E. Beck. Timepiece with electric winding mechanism. (5/10/27, Switzerland.)
28 455 R. Brandt. Electrolytic revivification of ferro-cyanide of potassium.
28 565 British Thomson-Houston Co., Ltd. Alternating current amplifiers. (4/10/27, U.S.)
28 466 J. C. Chaston, J. P. Johns, and Standard Telephones and Cables, Ltd. Manufacture of magnetic cores.
28 474 R. C. Graseby. Synchronising electrical apparatus.
28 449 W. Holt. Thermionic valves, etc.
28 440 H. E. Potts (H. Plauson). Cathode ray tubes.
28 468 Standard Telephones and Cables, Ltd. Telephone systems. (4/10/27, U.S.)
28 480 L. Thurm. Electromechanical amplifier.
28 434 J. S. Williamson. Coin-operated switching device for wireless receiving sets, etc.
28 562 Wireless Pictures (1928), Ltd. (O. Fulton). Electrical transmission and reception of pictures, etc.

### October 5th.

28 678 Almeida Accumulators, Ltd., and L. A. Levy. Primary cells.
28 596 E. P. Artime. Electric lamps. (5/10/27, Spain.)
28 566 E. M. Austin and T. Cracknell. Electric lamp fitting.
28 573 O. Boden and Wolseley Motors (1927), Ltd. Method of mounting dynamos, etc., of motor vehicles.
28 661 S. von Bogdandy and L. Wamoscher. Mercury vapour lamp. (15/10/27, Germany.)
28 642 British Thomson-Houston Co., Ltd. Elastic fluid turbines. (5/10/27, U.S.)
28 588 Burnley Components, Ltd., and D. K. Ward. Thermal cut-outs for electrically heated receptacles.
28 627 Drake and Gorham, Ltd., O. Faber and P. A. Smith. Fittings for electric lighting, etc.
28 687 Electrical Research Products, Inc. Vacuum tube circuits. (7/3/28, U.S.)
28 679 Ferranti, Ltd., and W. Holmes. Electrical testing sets.
28 696 O. Fischer. Magneto-electric motor, etc.
28 641 H. Halperin and K. W. Miller. Bonding electric cable sheaths. (6/10/27, U.S.)
28 594 E. T. Lawson-Helme. Secondary battery terminals.
28 688 Igranic Electric Co., Ltd. Reproducer units for gramophones. (5/10/27, U.S.)

# METAL AND CHEMICAL PRICES.

Tuesday, October 23rd.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £69 0 0 | 1 0 0 | — |
| Electro Wirebars | ,, | £72 0 0 | 0 5 0 | — |
| H.C. Wires, basis | per lb. | 10 7/8 d. | — | — |
| Sheet | ,, | 10 7/8 d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1 1/8 d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8 1/2 d. | — | — |
| Sheet ,, | ,, | 9 1/4 d. | — | — |
| Wire ,, | ,, | 10 1/4 d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | | — |
| *Lead Pig*— | | | | |
| English | per ton | £23 10 0 | — | — |
| Foreign or Colonial | ,, | £22 2 6 | — | 2s. 6d. |
| *Tin*— | | | | |
| Ingot | per ton | £225 0 0 | £4 17 6 | — |
| Wire, basis | per lb. | 2s. 11d. | 1/4 d. | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 2 6 | 2s. 6d. | — |
| *Mercury* | per bottle | £23 0 0 | — | 10s. |

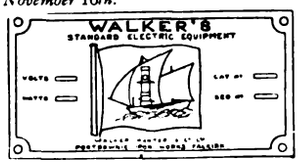
*Sulphur*—Flowers, Ton £12 0 0 Roll, ,, £10 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0
*Sodium Chlorate*—Per lb. 2 1/2 d.
*Sodium Bichromate*—Per lb. 3 1/4 d.
*Rubber*—Para fine, 11d ; plantation, 1st latex, 9 1/2 d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

# ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* Gee and Co., *Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, WC.2, from whom further information may be obtained.*

*Opposition to the registration of the following Trade Marks can be lodged up to November 10th.*




491 147. Class 18. Electric cooking and heating apparatus. Walker, Hunter and Co., Ltd., Portdownie Ironworks, Camelon, Falkirk, Stirlingshire ; ironfounders. May 5th, 1928. Registration of this Trade Mark shall give no right to the exclusive use of the word "Walker's" or the word "Standard."

Mycrome.—491 819. Class 13. Springs, being metal goods for electric switches, lamp holders, plug adaptors, and for the like of electrical fittings. The Mycromet Manufacturing Co., Clydesdale Street Works, Clydesdale Street, Oldham, Lancashire, engineers. May 25th, 1928. (By consent.)

Draco (sign).—493 984. Class 8. Apparatus and instruments for use in connection with wireless telegraphy and telephony and television, and parts thereof, but not including electric cables, and not including any goods of a like kind to electric cables. Drury Radio Co., Ltd., Drury Buildings, 23, Water Street, Liverpool, radio apparatus manufacturers and merchants. August 8th, 1928.

Vir (sign).—488 865. Class 13. Electric lamps (ordinary) and electric light fittings. Naamlooze Vennootschap "Vereenigde Industrieen Rotterdam" Voorheen Ph. Verhagen and Zoon (a joint stock company organised under the laws of Holland), Oude Dyk 149, Rotterdam, Holland, manufacturers. February 25th, 1928.

Stoflex.—494 840.—Class 40. Boxes or containers made of ebonite, being parts of electric batteries. J. Stone & Co., Ltd., Brass, Copper and Iron Works, Abinger Road, Deptford, London, S.E.14, engineers.—September 7th, 1928.

*Opposition to the registration of the following Trade Mark can be lodged up to November 17th.*

Vivaphone. 493 145. Class 8. Philosophical and scientific instruments, but not including tèlephone apparatus, and any goods of a like kind. Radofone (1928), Ltd., 22, Queen Street, London, E.C.4 ; manufacturers and distributors. July 9th, 1928. (To be Associated. Sect. 24.)

## LEAD MARKET REPORT.

The lead market last week was dull and according to James Forster and Co., prices scarcely varied throughout the week, values at the close being October £22 3s. 9d. November £22, December £21 18s. 9d., and January £21 17s. 6d. per ton.

# Coming Events.

### Friday, October 26th.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Mr. G. W. Tookey on "Legal Protection for Originality and Inventions." 7.30 *p.m.*

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture on "The Singing Arc," by Professor W. Cramp. 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre Students' Section).—Paper by Mr. L. B. Harmer on "Post Office Telephones and the Public." 7.15 *p.m.*

Scottish Electric Lighting Service Bureau.—Society of Arts Hall, Edinburgh. Lecture to the Edinburgh electrical trades on "Modern Factory Lighting." 7.30 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Institution, Savoy Place, Victoria Embankment, London. Opening address by Prof. S. P. Smith, on "Ignition Systems in Automobiles." 6.15 *p.m.*

### Saturday, October 27th.

Institution of Electrical Engineers (Students' Section of the North-Western Centre).—Visit to the Works of Messrs. A. V. Roe and Co., Ltd.

### Monday, October 29th.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Our Profession from a Manufacturer's Point of View." (Opened by the President.) 7 *p.m.*

Illuminating Engineering Society.—Electric Lighting Service Bureau, 4, Fountain Street, Manchester. Paper by Mr. J. L. H. Cooper, on "An Investigation of Electric Lighting in the Engineering Industry." 7 *p.m.*

### Tuesday, October 30th.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Institution of Electrical Engineers (North Midland Centre).—Hotel Metropole, King Street, Leeds. Address by the Chairman, Mr. F. S. G. Hinings. 7 *p.m.*

Electrical Association for Women.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture on "The Study of Personal Salesmanship," by Miss G. Burlton. 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Midland Hotel, Manchester. Address by the Chairman, Mr. J. Harcourt Williams. 7.30 *p.m.*

### Wednesday, October 31st.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

University of London.—King's College, Strand, London. Lecture III (Course of nine lectures), by Prof. E. Wilson, on "Electrical Science and Industry." 5.30 *p.m.*

Scottish Electric Lighting Service Bureau.—Royal Technical College, Glasgow. Lecture to the Royal Technical College Scientific Society, on "Industrial Lighting." 7.30 *p.m.*

Illuminating Engineering Society.—North-East Coast Lighting Service Bureau, Dial House, Northumberland Street, Newcastle. Paper by Mr. J. H. L. Cooper, on "An Investigation of Electric Lighting in the Engineering Industry." 7.15 *p.m.*

### Thursday, November 1st.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting, 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Illuminating Engineering Society.—Central Halls, 25, Bath Street, Glasgow. Paper by Mr. J. L. H. Cooper, on "An Investigation of Electric Lighting in the Engineering Industry." 7.30 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—Municipal College, Suffolk Street, Birmingham. Joint meeting with the Electrical Association for Women. Faraday lecture by Dr. S. Z. de Ferranti, F.R.S., on "Electricity in the Service of Man." 7 *p.m.*

### Friday, November 2nd.

Engineering and Scientific Club, Wolverhampton.—Lecture by Major S. J. Thompson on "The Making of a High Pressure Steam Boiler." 7 *p.m.*

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## A Hopeful Augury.

THOSE who have thought that the Institution of Electrical Engineers is too detached from everyday affairs, equally with those who deplore the departmentalisation of that body into special sections for different branches of electrical work, must all have received a shock on hearing or reading the Presidential Address of Lt.-Col. K. EDGCUMBE, who has just succeeded Mr. ARCHIBALD PAGE in the office of President. The first-named class will read into the President's words new hope of more active interests and participation in the things that so much concern its members individually, and the "diehards" will raise their hands in horror that they should have lived to hear the sacred precincts defiled by open and deliberate reference to manufacturing, wages, the unemployment problem, imports and exports; and such like things, which, they will argue, are no concern of the Institution of Electrical Engineers. We do not need to explain which of these categories we support when we congratulate Lt.-Col. EDGCUMBE on a most courageous departure. He has very rightly pointed out that the Institution can no longer confine itself to the rigidly technical aspects of electrical engineering, to the exclusion of economic and industrial considerations, and in the reconciliation of the two apparently irreconcilables—the technical aspect and the economic—the Institution can, if it will, play an important and yet a dignified part. Second to none in many respects, the Institution in the past has been at times slow to accommodate itself to changing circumstances. It allowed the meter engineers to add one more to the multitude of existing technical associations which might properly perform their functions under the parent body; now it has arranged to cater for the members of this specialist association in a "Meter and Instrument Section." In time, perhaps, it will deal similarly with another extra-mural organisation of recent inception. Be this as it may, it is certain that in the future no further technical associations should be formed while there is the slightest chance of getting the same work done under the direct aegis of the Institution. The "Corps of London Electrical Engineers," as Lt.-Col. EDGCUMBE has said, has always regarded the I.E.E. as its Alma Mater. So it should be regarded by every branch of the profession, however specialised. Last Friday's address will stand as a sign of the new progressiveness of the greatest, if not the senior, engineering institution in the land.

## I.E.E. Papers.

ONE matter which deserves early attention from the I.E.E. Council is the present system of reading and discussing papers. As is well known, the present practice is for certain papers to be read and discussed in London or one of the Centres, and then these same papers are sent on a grand tour of the Centres. When a paper has once been read and published in the "Journal," there should be no need to read it again, though it may at times be desirable to have it discussed in all the Centres. But, when this has been done, there is apparently no public record of points that have been raised during the paper's travels, and so the benefit of eliciting the views of a large proportion of the total membership is largely illusory. Moreover, the widespread repetition of a small number of papers inevitably crowds out a good deal of interesting matter that could otherwise be employed, and tends inferentially to develop a sort of inferiority complex in the Centres which are dependent on a London paper for meat for an evening's discussion.

## Factory Lighting Progress.

REPORTS received from all parts of the kingdom indicate quite clearly that the Factory and Workshop Lighting Campaign, devised by the E.L.M.A., is living up to the highest expectations of its originators. Although the effort does not touch the public in quite so spectacular a way as the previous national campaigns, aiming at home electrification, it is arousing a great deal of interest in the industrial circles to which it is directed, as witness the 2 010 inquiries for further information which, a week ago, had reached the Electrical Development Association in response to campaign circulars, and the large attendances at the twenty-nine lecture demonstrations which have already been held. Factory owners and executives in all parts of the country have not been slow to appreciate the increased efficiency and output, and the decreased accident risk consequent on the installation of properly designed lighting equipment, and arrangements have so far been made for well over ninety lecture demonstrations, many of which are being staged, by the co-operation of large manufacturers, in their natural surroundings in a modern works. While so much of the campaign work is being directed from headquarters and the various area organisations, there is still plenty of scope for individual effort without fear of overlapping. Before the campaign ends everybody in the industry who is interested

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in industrial lighting should personally interview at least one factory or workshop owner. As military similes go naturally with campaigning, we may say that while there is plenty of ammunition for all, real and lasting success depends as much upon the infantryman's rifle as upon the heavy artillery.

### An Important Merger.

THE financial columns of the daily Press this week have recorded the fact that the Metropolitan-Vickers Electrical Co., Ltd., has acquired the control of the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd. Though at the time of going to press we had not received official confirmation of the merger, the proposed consolidation of interests was foreshadowed in the speeches of Mr. H. C. LEVIS, chairman of the British Thomson-Houston Co., and Sir PHILIP A. M. NASH, chairman of the Metropolitan-Vickers Electrical Co., at their last general meetings, when it was pointed out that it was desirable that measures should be taken which would lead to closer co-operation between certain companies. We understand that steps are being taken to change the name of the Metropolitan-Vickers Electrical Co. to one more comprehensive, and, as might be expected, certain changes will be made in the board of directors, and the number increased so as to be representative of all the financial interests associated with the enterprise. The significance of this step will be all the more appreciated when it is realised that the value of the assets of the four companies is no less than £15 500 000, and, although details are not yet available, it is understood that the loose-coupled methods referred to by Lieut.-Col. KENELM EDGCUMBE, in his Presidential address before the I.E.E., will be employed, rather than the rigid combine methods, now regarded as unwieldy.

### In a Good Cause.

THERE now remains less than a fortnight before the annual festival dinner of the Electrical Trades' Benevolent Institution, and the same public-spirited collectors are going to the same friends for funds to enable the good work to be carried on. It is, in a way, comforting to know that certain wealthy people can always be relied upon for a sizeable donation, but many hundreds of possible subscribers are inevitably missed. There must be many well-disposed people connected with our industry who have never been asked to contribute their share, and if any of them read this note, we do hope they will send along whatever they can afford to assist some of the many deserving cases which come before the Council. Then we must not forget those who might some day need the ready help which is such a pleasant feature of E.T.B.I. benevolence. For an annual subscription of only 5s., anyone engaged in the electrical trade may become an associate of the Institution, and as such be entitled to assistance in case of need; truly a cheap form of insurance against the "rainy day" which so often comes to those who can least afford to face it. But whether they give for the joy of giving or for a more personal motive, we hope that those who have not yet been asked for a contribution or subscription will take this as a personal invitation to do their share.

### "Unfair Boosting" of Electricity.

FOR some time past representatives of the gas industry have been worried about the progress that electricity is making, and some of them have quite understandably thrown out broad hints as to the benefits to both gas and electricity interests that would follow some degree of co-operation between the two. However, as these attempts to reach the electrical lifebelt have not been rewarded with success, the policy—or rather, the method of operating it—has changed in favour of protests against what is called the "unfair boosting" of electricity by members of the Government." These protests, made whenever a Minister of the Crown refers to electricity, allege that the Government is taking sides and advertising one industry at the expense of another. Col. WILFRID ASHLEY, who is the latest scapegoat to be singled out for disapproval by the gas industry, is the Minister most directly concerned with the carrying out of the Government's national scheme of electrical interconnection, and if he cannot refer to the project about which he should know more than any of his colleagues what is he to talk about? The suggestion of injustice is, moreover, without foundation. If a butcher were to take advantage of a public position to reiterate the advice "Eat more Meat" one would feel natural sympathy for the fishmongers, as both meat and fish are of equal benefit to the majority of the population. There is no such analogy between electricity and gas. Electricity is the new and better source of light and power which comes logically to replace gas just as gas displaced the paraffin lamp and tallow candle. It can easily perform tasks which gas could never do, even with the combined boosting of the entire Cabinet, and its fuller use is urgently necessary if this country is to retain its position among the chief industrial nations of the world. When a Minister legitimately endeavours to speed up this very necessary electrification, he is not advertising one industry to the detriment of another, but is simply advocating the best method—a far different thing.

### Results of Interconnection.

ONE of the most notable features of the development of electrical service in the U.S.A. during the past five years is its rapid spread to small communities and villages. Information recently compiled by the National Electric Light Association shows that more than 4 000 towns and villages have been reached for the first time with electricity since 1923, an increase of 26 per cent. What is even more interesting is the fact that they are receiving the same high quality 24-hour service as was formerly enjoyed by only the large cities. Over there electric service is rapidly becoming universal. Every city and town in the United States with a population of 5 000 or more; 97 per cent. of communities with populations of from 1 000 to 5 000; over 50 per cent. of communities with between 250 and 1 000 populations; and 25 per cent. of all hamlets with less than 250 population are now reached by the lines of the light and power companies. An important contributing factor to this great spread of electric service is the rapid growth of interconnection, without which literally thousands of these communities would either be entirely without any service, or would at best, have it for only a few hours.

### The Supply Authority's Duty.

WE are glad to note the increasing support that is being given by municipal electrical engineers to installation contractors who have qualified for admission to the National Register of Electrical Installation Contractors. In its latest monthly "Report to Members," the Incorporated Municipal Electrical Association emphasises the utility of the National Register, and very rightly expresses the view that some guarantee as to the qualification of the contractors is essential if reliability in electricity supply is to be maintained and the public protected. It is further suggested that electricity supply undertakings must be cognisant that a proportion of the electrical installations carried out are not up to a satisfactory standard, either as regards material or workmanship, or both. We would add that it is, therefore, their duty to take steps to see that the work is done properly. Before the establishment of the National Register, an elaborate system of inspection would have been necessary; nowadays, possession of the certificate of the National Register can at least be used as an approximate measure of a contractor's ability, and the supply engineer has the definite guarantee that a contractor deviating from the appropriate standard can be penalised for his shortcomings. While, as we have remarked, the municipal undertakings generally are inclined to serve their own interests and those of their consumers by supporting registration, the tendency of some of the company undertakings to connect up almost anything that will increase their load, regardless of consequences, is still far too marked.

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# I.E.E. PRESIDENT'S ADDRESS.

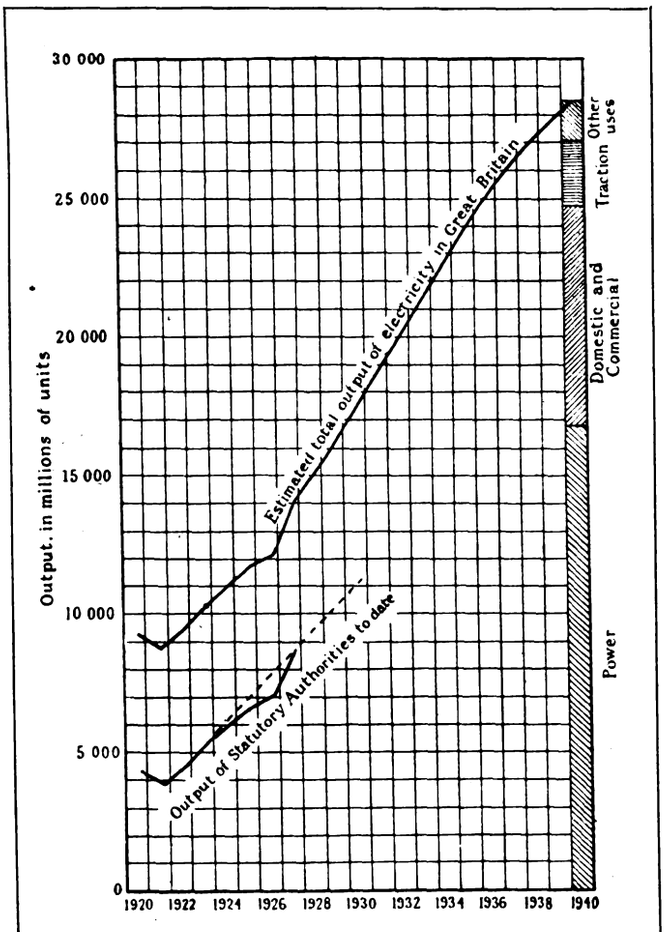
## Lt.-Col. Edgcumbe on Urgent Industrial Problems—Need for Increased Productivity—Developing the Home Market—Hopeful Future for the British Electrical Industry.

IN his presidential address to the Institution of Electrical Engineers on October 25th, Lt.-Col. K. Edgcumbe referred to the specialisation which had led some years ago to the formation of a Wireless Section, and now to the development of a Meter and Instrument Section to carry on the work of the Meter Engineers' Technical Association.

He did not think the Institution was doing quite enough for its members overseas, and possibly if some of the papers read at home could also be discussed abroad and the reports published in the "Journal," the interest of overseas members would be increased. On the other hand, members arriving from abroad did not make full use of the Institution, the secretary of which was ever ready to give information, introduction and so on. The Library and Common Room and the Lending Library were also of course at the disposal of all members. The Council would welcome suggestions designed to strengthen the ties binding the home body to its overseas members.

Referring to the splendid work of the London Electrical Engineers, R.E. (T.A.), a corps which since its formation had looked upon the Institution as its Alma Mater, Col. Edgcumbe said he was qualified to learn that a movement was on foot for the formation of one or more sections of the London Electrical Engineers to be manned by students of the Institution.

It was, he thought, now generally agreed that the Institution could not confine itself to the rigidly technical aspects of electrical engineering, to the exclusion of economic and industrial considerations. It was no use designing the best circuit breaker in the world if it was so expensive that no one would buy it. Engineering successes now required the reconciliation of the technical aspect with the economic. For a country to have a high standard of living it must have a high rate of production per individual. During the last 20 years the annual output per head had remained almost stationary, so it was hardly surprising that the standard of living still left so much to be desired.




**This chart, showing the estimated future electrical output in Great Britain, is one of several used by Lt.-Col. Edgcumbe to illustrate his Presidential Address, an abstract of which is given on this page.**

Two useful aids to increased productivity were placing more mechanical power at the disposal of each worker and research. The pooling by manufacturers of their resources and experience, not in gigantic and unwieldy combines, but by the loose-coupling of a number of specialist manufacturers to one another and to a co-ordinating central organisation was another. It might be said that the British manufacturer had gone as far in the direction of research, standardisation, co-operation, rationalisation, etc., as his limited home market would admit, and had but little to learn in this respect from other countries. But there often remained an awkward gap between his manufacturing costs and the price at which he must sell overseas—a gap which was only partially bridged by the superior, lasting and other good qualities of his manufacturers. On the other hand, unless he was in a position to obtain export orders, his output would suffer and his manufacturing costs would be still further increased.

There was only one way out of this *impasse*, and that was to sell at a lower price abroad than at home, thus maintaining an average price corresponding to the manufacturing cost. It might be thought that this would mean a higher price to the home consumer, but the opposite was the case.

In general, the manufacturing cost of an article could be regarded as made up of two parts, one proportional to the output and the other more or less constant for wide variations in the output. The relative values of these two factors differed greatly according to the industry, but, as a case in point, it could be assumed that, of the total cost of production in a certain department of works, 80 per cent. was proportional to the output and 20 per cent. fixed. Assuming the home demand to be 1 000 articles in a given time, and taking the cost of producing these 1 000 articles as £100 each, if the price obtainable overseas was only £80, the cost price was well above such a selling price, for all reasonable quantities.

If, however, the manufacturer decided to take his courage in both hands and to sell abroad at that price, not only was he able to do so, but he would also be in a position to reduce his home price by an appreciable amount, whilst still maintaining the requisite average price. For example, if he sold 500 articles abroad in addition to the 1 000 sold at home, he could reduce his home price by 5 per cent., whilst still selling abroad at £80.

There were people who looked upon such averaging as immoral. They were under the impression that unless home and overseas prices were exactly the same they were being swindled—quite ignoring the fact that increased sales afford a means (and often the only means short of lowering wages) whereby prices can be reduced.

Where price was the sole criterion, a point was easily reached at which the cost of competition became greater than the economy of competition. Such a point had been reached 20 years ago. Profits were reduced practically to zero, no decent salaries or wages could be paid, no research could be carried out; the spread of electrification was checked, modern machinery could not be installed, and capital could not be borrowed. To sell at or below cost was a nefarious practice which ought to be forbidden by law.

Dealing with the unemployment problem, Lt.-Col. Edgcumbe thought that the remedy, short of reducing wages, was to increase productivity to such an extent that the return per unit wage could be restored to the economic level, an effective way of doing this being to increase the total output so that more intensive methods of production could be employed. Some would maintain that over-production was itself at the root of unemployment and that, although possibly from the point of view of the community, increased production due to mechanisation and improved methods of manufacture might be all to the good, yet as regards the individual it must lead to unemployment. Experience in other countries failed to bear out this contention. In the United States, for example, the output per operative was said to have increased by 40 per cent.

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since 1914, and yet the number of operatives had increased concurrently by 20 per cent.

To him it would appear that under-production could be quite as much to blame as over-production. In fact, under-production, not necessarily per individual, but per hourly wage paid, might be wholly responsible for it. He did not regard unemployment as a sympton that commodities as a whole were being over-produced or under-produced, so much as that they were being produced in the wrong relative quantities from the point of view of consumption.

If this diagnosis was correct, the remedy was clearly either to reduce the output of some commodites or to increase the output of others—i.e., to level down or to level up. Although each method might be equally effective as regards employment, it must be remembered that levelling down production meant "short time," increased prices and, in fact, a lower standard of living all round. Levelling up, on the other hand, meant raising the standard of living. To remedy unemployment by levelling up production two things were necessary, a transference of operatives from the less active to the more active branches of industry, and concurrently a general increase in the country's trade.

## Absorption of Unemployed Operatives.

Was it possible, he asked, to secure this extra trade and so give the required initial stimulus? The answer must depend upon what additional output of commodities would be involved in the re-absorption of the present surplus of 800 000 operatives.

If we assumed an average wage of 45s. per week, the earnings of 800 000 would be about £90 million per annum. It might be said that at least 65 per cent. of the cost of any article went either directly or indirectly in wages, using the term in its broadest sense. Taking this figure, a wage bill of £90 million would correspond to a selling price of £140 million. If, therefore, the country's output of manufactured articles were increased by £140 million per annum, some 800 000 operatives could be re-absorbed and the unemployment problem would be practically solved.

The annual output of electrical energy represented a kind of "prosperity index," not only for the supply industry and to a lesser degree for the manufacturing industry, but for every branch of the profession.

Just as with the true barometer the endeavour was to predict the weather of the future by extrapolation from data relating to the past, so with the barometer of electrical output our chief interest was to use it as a means of looking into the future of our industry. Therefore, with a view to forecasting the course of our prosperity index during the next 10 or 12 years, he had secured the valuable assistance of Mr. Hugh Quigley, who had devoted so much study to the statistics of the electrical industry.

The curves shown in Fig. 1 were the result of these efforts. The lower curve showed the energy supplied by the statutory undertakings up to date, and the dotted straight line indicated what would be their future output if the annual increase continued as during the last few years. This rate of increase could be looked upon as a minimum, based as it was upon five years during which the industrial conditions of the country had been worse than any known to the present generation. But taking the facts as they stood, the output at the present time was increasing at the rate of about 10 per cent. per annum in the case of the statutory authorities, and probably at a slightly lower rate for the country as a whole.

The lower curve of Fig. 1 did not take into account the output of any private or non-statutory plants, but an estimate could be made of their output for 1924 from the census of production. Adding this figure, we obtained a known point on the upper or "total output" curve, of 10 400 million units for that year. After this no exact figures were available, and, from 1928 onwards, we launched out into pure speculation.

The approximate allocation of the 1924 output, as between different users, was: power, apart from traction, about 71 per cent., and lighting together with other domestic uses only about 10 per cent. The annual statistics, however, showed that the amount used for domestic purposes was increasing more rapidly than that used for power, so that the lighting load (domestic, commercial and industrial) together with the domestic power load, would seem to offer the greatest relative scope for expansion. It was, moreover, much less affected by periods of bad trade than is the power load.

The domestic field in this country was still largely untilled, the number of electrically-equipped houses representing about 20 per cent. of the total number. Although the number was at present increasing by about 25 per cent. each year, there was still plenty of room for expansion. If, every year, the number of houses built and the number of additional houses connected to the mains continued as during the last year or two, the number of electrically-equipped houses would, in 10 years' time, represent from 55 to 60 per cent. of the total. But it was not only, or even chiefly, to the number of houses connected to the mains that we should look—it was in the more extended use of electricity by each household that there was so much room for expansion.

The President then presented charts and data from which it was clear that this country has a great deal of leeway to make up in the electrification of industry, our comparative backwardness being ascribed largely to the highly developed state of this country's industry before the advent of electric power.

In spite of the fact that the degree of mechanisation in this country was in general less than in either Germany or the United States—and must presumably remain so, owing to the much smaller home market open to our manufacturers—it still seemed reasonable to anticipate an expansion, during the next 10 or 12 years, of well over 100 per cent. in the electrical power consumed by industry.

It was difficult to assess the future agricultural demand, but it was noteworthy that in Germany the total mechanical power used per acre was more than double ours, and that nearly 80 per cent. of this was electric. Hence there was clearly room for considerable expansion in this direction.

Much the same might be said of main-line electrification. In this country, in common with France and Germany, less than 2 per cent. of the whole mileage was at present electrified, so that there was an enormous potential demand for electric power—a demand which, in view of the manifest technical advantages of electricity, must sooner or later be met. The obstacles were financial, and not electrical, nor even economic.

All things considered, Col. Edgcumbe estimated that in 12 years' time the country should have a total output of 28 000 or 29 000 million units, or nearly 600 units per head of the population. This was indicated by the upper curve in Fig. 1, and the probable allocation of the 28 500 million units between the various users of electricity was indicated on the right of the curve.

In arriving at these conclusions, he had assumed, firstly that effective steps were taken to popularise and extend the use of electricity, secondly, that the national scheme fulfilled our expectations (he would not say the expectations of the man in the street), and, thirdly, that no awkward kinks were imposed upon the curve such as were caused by the industrial troubles of 1926.

We must not, however, for one moment imagine in looking at this curve, that we need only fold our hands and hope for the best. We must remember that the industry has a commodity to sell and that the livelihood of the vast majority of the 13 000 members of the Institution depended upon its being sold.

We could, he thought, regard the future with confidence. We had much to be thankful for. In these days of pessimistic utterances and depressing statistics, it was something to be connected with an industry which bade fair to double or even treble itself within the next 12 or 15 years.

But that was the purely material aspect. From a more altruistic point of view, not only did we control the most potent force for the advancement of civilisation that the world had ever known, but he firmly believed that electricity had come to the rescue of mankind just when the stress and strain of that very civilisation were threatening to overwhelm it.

## ILLUMINATION DESIGN COURSES.

The third lecture of the 18th Illumination Design Course, being conducted by the E.L.M.A. Lighting Service Bureau, was given on October 24th by Mr. J. L. H. Cooper on "Lighting in the Engineering Industries," Mr. Girdlestone being in the chair. The speaker demonstrated the importance of good lighting for all industries, and proceeded to describe characteristic installations and to explain the fundamentals involved in the lighting of various operations. Increase of production and the greater safety brought about by good lighting was emphasised. The lecture was illustrated by lantern slides giving views of typical industrial interiors and curves from tests actually taken under working conditions. The fourth lecture was given at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, on Wednesday, the subject being "Architectural Lighting," when the lecturer, Mr. R. W. Maitland, dealt with the general trend toward co-relating lighting with architecture.

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# LONGFORD POWER STATION

## New Base Load Station opened at Coventry

### Description of the Plant—

### Concrete Cooling Towers—Direct Coupling on Turbo Sets—Large Outdoor Transformers.

THE new Longford power station of the Coventry Corporation, opened by the Mayor of Coventry on Wednesday, is conveniently situated as regards coal, water and supplies, the site being bordered on the east by the Oxford Canal, on the west by the L.M.S. Railway, and on the south by the main Coventry-Nuneaton road. The sidings are connected with the railway, and give direct access to the coal storage, engine-room basement and transformer bays.

The contract for the entire station was awarded to the British Thomson-Houston Co., Ltd., Rugby, all the work being carried out to the specification and under the supervision of Mr. Geo. Tough, city electrical engineer and manager. The first section, containing two B.T.-H. high efficiency type 20 000 kW turbo alternators, is now in commission.

A 75-ton electric travelling crane spans the engine room, and all auxiliaries, with the exception of two of the boiler feed pumps, are electrically driven by B.T.-H. motors.

The overall dimensions of the engine-room are 160 ft. long by 100 ft. wide by 60 ft. high, and of the boiler house 130 ft. long by 90 ft. wide by 60 ft. high. At the southern end of the engine-room are situated offices for the executive staff, testing laboratory, battery room, store, bath-rooms and lavatory accommodation.

Coal is brought in either by canal or by rail, provision having been made for canal-borne coal to be unloaded and delivered direct to the bunkers or to an emergency store holding about 3 500 tons. All rail-borne coal, after passing over a weighbridge, is delivered to this storage by a rotary wagon tipper.

Canal-borne coal is unloaded by grabs operated by " Strachan and Henshaw " telphers. The grabs discharge into an automatic weighing-machine. " Bennis U-link " conveyers, travelling along an inclined gantry, take the coal to the bunkers or by means of chutes to the emergency store as desired. The coal in this storage is trimmed by means of an electrically driven travelling jib crane, which is used also to feed this coal to the main conveyers. The plant will handle canal-borne coal at the rate of 50 tons per hour to the bunkers and 25 tons to the storage simultaneously, or 50 tons per hour of rail-borne coal either to the bunkers or storage.

In the boiler-house are eight " Stirling Tri-Drum " rapid steaming boilers, each having a heating surface of 9 594 sq. ft., 50 per cent. of which directly faces the fire. Feedwater enters the economiser at approximately 200 deg. F., and leaves at about 300 deg. F. Steam is generated at 325 lb. per sq. in. gauge and superheated to a total temperature of 700 deg. F. " Hopkinson " boiler and economiser mountings are fitted throughout.

A complete boiler unit comprises boiler, superheater, superimposed " Green's Tri-Tube " economiser, two " Bennis " chain grate stokers, ten " Diamond " soot blowers, " Sirocco " induced draught fan and " Davidson " grit arrester.

A pair of " Bennis " chain grate stokers, with patent serrated dowelled chain grate links, is fitted to each boiler. These grates embody a number of new features, including improved air-sealing arrangements, and, to ensure efficient burning of the fuel, and also to regulate the amount of fuel required to be burnt for various boiler duties, the rear portions of the grates are provided with four pairs of regulating dampers, which form four cells, these regulating dampers being directly operated by means of levers situated at the sides of the furnace settings. Each grate is fitted with a " Lea " coal meter.

A complete installation for ash removal and disposal is provided, the ashes being discharged over the end of the chain grate stokers automatically, as they are produced, and passed direct into a " Bennis " submerged conveyor, which automatically quenches, conveys and discharges them into reinforced concrete ash storage bunkers outside. The ashes can be discharged from the bunkers either into road vehicles or into a patent " Breco " mono-cable aerial ropeway, which automatically distributes them on an ash dump.

Each boiler has an instrument panel with " Cambridge " temperature and draught indicators. Each unit has a " Bailey " air and steam flow meter, with which is included a flue gas indicating and recording meter.

Each of the main turbo-alternator sets consists of a B.T.-H. high-efficiency two-cylinder double-flow turbine, driving a main alternator, house-service alternator, main exciter and auxiliary exciter, the speed of the set being 3 000 revs. per min. The turbine has a total of 21 stages. The high-pressure cylinder, which is of the impulse type, is supported in such a manner that expansion of the casing due to temperature cannot affect the concentricity of the casing relative to the axis of the shaft, and, therefore, uneven wear of the shaft packings is eliminated. Nozzle control of steam admission by several valves to the high pressure casing is employed, because of the higher efficiency obtainable from this system of control as compared with those systems which use throttle governing, or two or three valves only to control groups of nozzles.

Although the governing properties of B.T.-H. turbines have always been of a high order, the system of governing applied to these turbines excels all previous designs in its sensitiveness of control.

The low-pressure casing is of the double-flow type, the blading system being designed to obtain the highest possible efficiency. The steam, when passing through the low-pressure element, flows during its expansion in opposite directions, and, therefore, any unbalance is taken care of.

The plant is designed for a vacuum of 28in. with inlet cooling water at 80 deg. F., under which conditions it is proportioned to deal with the exhaust steam from the turbine at its most economical load, viz, 80 per cent. of the maximum load, and when it is being bled for supplying the evaporators.

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Steam is led from the high-pressure casing to the low-pressure casing through "Aiton" flexible pipes, similar pipes being used for connecting with the under-floor type, combined emergency and stop valve. This is oil operated, and is automatically closed if the turbine speed rises 10 per cent. above normal, or if the pressure supply of oil to the turbine fails.

"Worthington Simpson" twin surface condensing plant is installed. Spring supports are provided to take the weight of the condenser, etc., off the turbine casing, and there are provided two 60 per cent. duty motor-driven circulating pumps, duplicate air ejectors of the steam jet type, each capable of maintaining full load conditions, and duplicate motor driven extraction pumps, each also of 100 per cent. duty.

## Feed-Heating Arrangements.

The feed-heating arrangement works on the "closed" system, and is designed to maintain a feed-water temperature of approximately 200 deg. F. at the inlet to the boiler feed pumps at all loads. The system consists of two-stage feed heating, the first stage being the low-pressure heater, which is so arranged that it can deal with either bled steam from the main turbine or the vapour from the evaporator, or a mixture of both. The heater has a surface of 750 sq. ft., which includes a drain cooler in the lower portion of the shell.

The second stage is the h.p. or feed-pump exhaust heater, with 330 sq. ft. surface, and utilises the exhaust steam from the "Weir" boiler pumps at a pressure of 3 lb. per sq. in. gauge.

The condensate from the extraction pumps, after passing through the ejector coolers, continues first through the l.p. heater, and, secondly, through the h.p. heater on to the boiler feed pump or to the surge tank, as required.

An evaporating plant is provided with each set capable of distilling 7 500 lb. per hour of raw water for making up losses that may occur in the system. The evaporator is of the vertical single effect type, the lower portion being the generating chamber, which contains the steam header, to which are bolted the steam heating coils, which are made of heavy copper tube arranged horizontally in spiral form to admit of easy expansion. The heating steam for the coils is bled from the main turbine, two tappings being provided from different stages.

The raw water supply to the evaporators is taken from the circulating water system. The distilled make-up in the form of vapour passes into the system via the l.p. heater, as already described, dissipating its heat to, and being condensed by, the feed water. The coil drainage from the evaporator is also led into the l.p. heater, and, together with the total condensate in the heater, is finally passed back to the extraction pump suction after being first cooled down in the drain cooler portion of the heater.

Surge and storage tanks are arranged on the turbine floor level, side by side with the evaporators. They are each of 3 000 gall. capacity, and are fitted with various cross-connections, starting connections, overflows, drains, etc., to provide for all contingencies, and the most interesting feature is the system of float controls—completely automatic in action—which govern the working of the evaporator and the supply of make up into the system.

The condensate meter is of the "Electroflo" type, the orifice plate and meter body being arranged at a point in the condensate piping between the outlet from the H.P. heater and the tee piece between the surge tank and boiler feed pump connections, whilst the recording instruments are mounted on the condensing apparatus gauge board on the turbine floor.

Circulating water is taken from the condensers to the cooling towers in 33 in. dia. steel pipes laid in a covered concrete trench, and after being cooled the water returns to the reinforced concrete main suction culvert. The circulating water system has been laid out for an ultimate capacity of 100 000 kW of plant, provision being made for connecting up future plant without affecting the running of existing plant. The pipe trench is about 10 ft. wide by 10 ft. deep, and the suction culvert, which is 850 ft. long, is 8 ft. wide by 10 ft. deep at the main part.

The necessary make-up is obtained from the canal, and is taken into the suction culvert at the end remote from the towers through a screen chamber and ball float valve.

An outlet from the system is provided by means of a 22 in. dia. pipe discharging over a spill-way into the canal. By this means the system can be emptied into the canal, and also, during frosty weather, warm water can be circulated, and freezing of the canal prevented.

The cooling towers, which are of reinforced concrete construction, are of hyperbolic shape, designed to ensure both stability and high cooling efficiency. Four towers have been erected, the normal capacity of each being 528 000 gall. per hour. The cooling effect, however, is efficient between the limits of a minimum hourly circulation of 300 000 gall. to a maximum of 1 250 000 gall, and under normal conditions the range of cooling is 17 deg. F.

It has already been mentioned that each turbo-alternator set comprises turbine, main alternator, house service alternator, main exciter and auxiliary exciter, all direct coupled and running at 3 000 revs. per min. The main alternator of each set is connected solid to a main transformer bank which feeds various sub-stations at 33 000 V, all switching being carried out at this voltage. The main alternator is wound for 6 600 V, three-phase, 50 cycles, and has sufficient capacity to provide magnetising current for its step-up transformers, and to maintain 18 750 kW at 80 per cent. power factor on the transmission lines. It is rated to give 25 300 kVA at 74 per cent. power factor, with a temperature rise not exceeding 80 deg. C. on the stator coils as measured by embedded temperature detectors, and 90 deg. C. on the rotor windings as measured by resistance. Fans are attached to the ends of the rotor, the machine being self-ventilated on a closed system in which the circulating air is cooled in B.T.-H. air coolers.

The auxiliary alternator is rated at 714 kVA, 70 per cent. power factor, 420 V, three-phase, 50 cycles, and is capable of supplying the boiler house and turbine auxiliaries. The main exciter is rated at 60 kW and excites the main alternator under all conditions of load, the excitation of the main exciter being derived from the auxiliary exciter, which has a rating of 13·5 kW. This auxiliary exciter is a shunt wound machine with a saturated magnetic circuit, and therefore operates at constant voltage. The only rheostat in the main alternator excitation circuit is that controlled by a "Tirrill" voltage regulator for maintaining constant the main busbar voltage; and by providing separate excitation for the main exciter, perfectly stable operation is ensured at all loads on the main alternator. The auxiliary exciter also excites the house service alternator, a hand-operated rheostat being included in the circuit in this instance, as a close voltage regulation is not necessary.

## Main Switchgear and Transformers.

Beneath the switchgear control gallery, which is on the west of the engine room, is installed all the main switchgear, and on the other side of the west wall are the two banks of three B.T.-H. single phase power transformers. These are of the "air-jet" self-cooled out-door type, and are the largest of this type so far installed in this country. The units are connected in delta on the low tension side and star on the high tension side, with a voltage ratio of 6 600/33 000 V. The full load output per bank is 23 475 kVA at 80 per cent. power factor. One oil conservator is provided for each bank, and a pressure relief pipe with glass diaphragm is fitted to each unit, so that should any excess pressure develop in the tank the diaphragm will break. There is also included a very full complement of valves for testing, treating and conditioning the oil; indicating and recording thermometers, etc.

A number of important features are incorporated in the design of the windings and core. The coils are circular, the h.t. winding being of the "continuous disc type" having no joints throughout the entire length, although of several turns per section, and the l.t. winding, which is inside the h.t. winding, is of the "helical" type with a number of conductors in parallel. The coil clamping structure for both windings is adjustable, so that uniform coil support and clamping, with a minimum distance between the supports for the winding, is obtained. This result is made possible by the use of a four-part distributed-type core, designed to ensure good oil circulation, facilitate cooling the core, and eliminate the possibility of hot spots.

The main 33 000 V switchgear is of the metal-clad electrically operated compound-filled type. It is of a duplicate busbar construction, and, in addition to the circuit equipments, is provided with bus section and bus coupling equipments, with provision for installing busbar reactances when extensions are made.

The fixed unit of each equipment consists of a circuit connection chamber supported by the top busbar chamber. The movable unit, which is mounted on rollers, and racked into or out of the service position by a hand operated screw mechanism, carries the oil immersed circuit breaker, and the

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instrument and protective transformers. Voltage transformers are mounted in a readily accessible position on top of the fixed units, primary cut-outs being accommodated in the transformer tanks.

Isolation of a voltage transformer and cut-outs can be accomplished without interruption of the main circuit, for when withdrawing the connectors, the initial break occurs on the transformer side, so that the magnetising current is broken under oil.

The main circuit breakers are designed for a rupturing capacity of 500 000 kVA at 33 000 V, and all three phases are enclosed in an insulated oil tank, phase separation being obtained by insulated metal phase barriers to eliminate risk of breakdown between phases. The pressure set up by the gases generated during breaker operation under a heavy fault is relieved by pebble-filled separating chambers and gas vents. Furthermore, the cast steel top plate of the breaker is of a deep box section, so that adequate space is provided for gas expansion, and thus the pressure rise in the breaker on rupturing a fault is largely restricted.

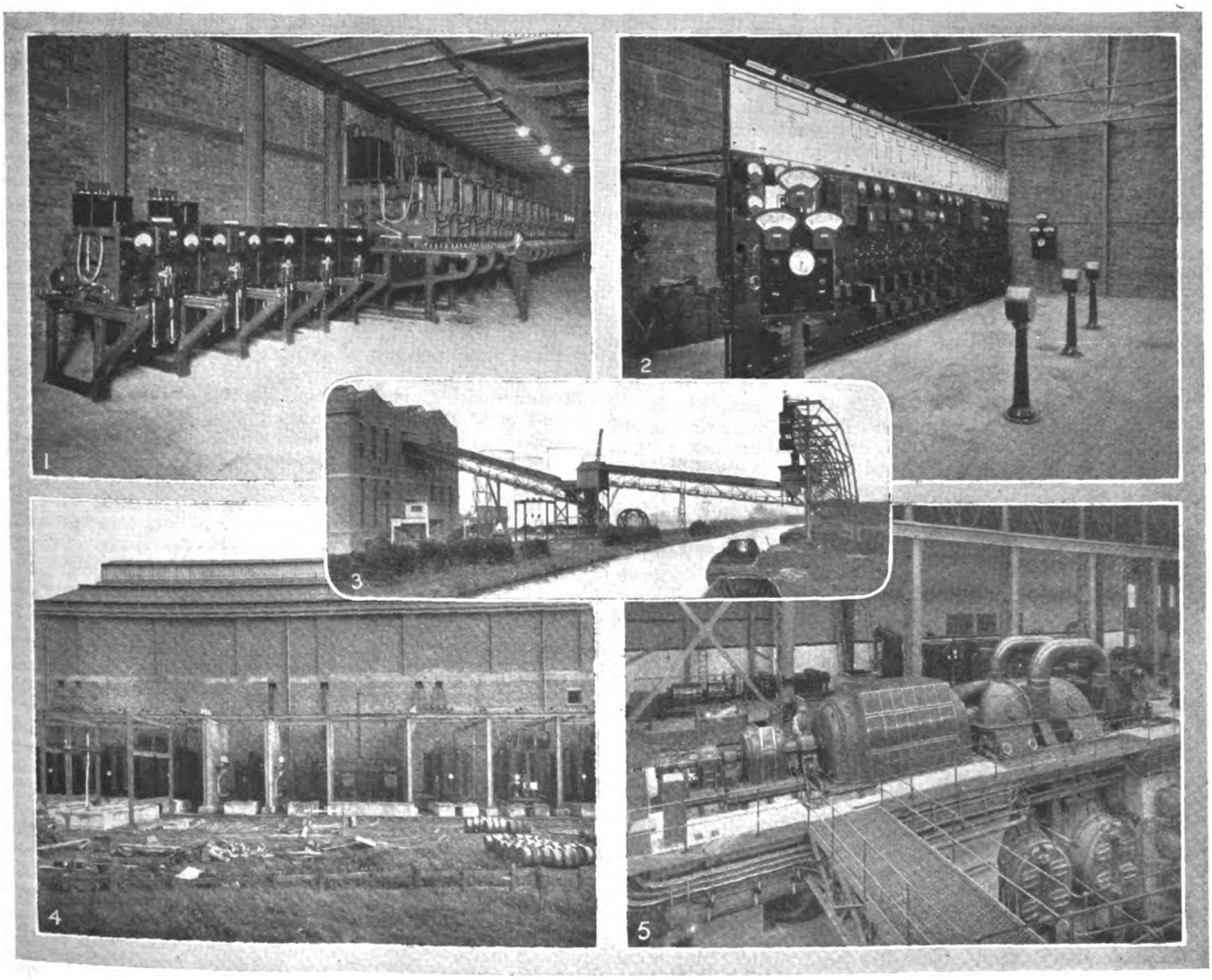
The control board is of black enamelled slate and has white enamelled slate indicating panels mounted above. Outlined in black on these indicating panels is a single line key diagram of the 33 000 V busbars and the various circuits controlled, automatic electrically operated indicators showing which circuit breakers are " open " and which are " closed."

The turbo-alternators are provided with the B.T.-H. system of circulating current protection, combined with field suppression switches, and standby definite time limit overload and leakage relays. They are thus protected against damage due to internal faults and sustained external faults. The house service transformers are similarly protected by the system of circulating current combined with standby overload protection, and the 33 000 V feeders have the B.T.-H. system of self-compensating pilot wire protection.

Alongside the 33 000 V switchgear is a bank of 6 600 V metal-clad compound-filled switchgear to control the 6 600 V side of two 3 000 kVA, 33 000 V, step-down transformers, and three outgoing feeders to the existing 6 600 V system. This switchgear is of single busbar construction, and the oil immersed circuit breakers are direct hand controlled.

A 420 V, three-phase, 50 cycle, black enamelled slate switchboard has been installed to control the station auxiliaries. An emergency house service alternator can be synchronised with the station transformers to facilitate starting up the station after both sets have been shut down.

The main contractors for the station were the British Thomson-Houston Co., Ltd., who supplied the turbo alternators, switchgear, transformers, auxiliary motors, and control gear, and the lamps and lighting fittings. The principal subcontractors include:—Wilson Lovatt and Sons, Ltd. (cooling towers); the Stirling Boiler Co., Ltd. (boiler plant); Edward Bennis and Co., Ltd. (stokers and coal and ash handling plant); Worthington Simpson, Ltd. (condensing plant, evaporators, tanks, etc.); Johnson and Phillips, Ltd., and Pirelli-General Cable Works, Ltd. (cables); Lee Beesley and Co. (lighting installation); Herbert Morris Ltd. (crane); Aiton and Co., Ltd., and Stewarts and Lloyds, Ltd. (pipework).




## *LONGFORD POWER STATION.*

*SUPPLEMENTING the general view on page 489, the accompanying pictures illustrate in greater detail the arrangement of Coventry Corporation's new power station, opened on Wednesday. The pictures show: (1) The 33 000 V, metal-clad, compound-filled switchgear, with the 6 600 V gear in the foreground; (2) the control board for the 33 000 V switchgear; (3) the coal handling plant; (4) the B.T.-H. self-cooled outdoor type transformers, including two three-phase banks, 6 600/33 000 V, and two house service transformers, 33 000/420 V; and (5) view from the electrical end of one of the two 20 000 kW B.T.-H. turbo-alternators which constitute the initial generating equipment.*

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# AMERICAN LETTER.

## Impressions of the Illumination Congress and the Visitors.

By FRANK C. WELLS, News Editor, "Electrical World."

NEW YORK, October 13th, 1928.

THE seventh meeting of the International Commission on Illumination, held at Saranac Inn in the Adirondack Mountains of northern New York, brought to a successful close the first International Illumination Congress, as it was called. This "congress" consisted of three parts—first, the trip of the foreign delegates and their immediate American hosts from New York, where the Europeans landed, to Boston, Philadelphia, Washington, Cleveland, Detroit, Chicago, Niagara Falls and Toronto; second, their attendance at the convention of the Illuminating Engineering Society in the Canadian city just named; third, the Saranac meeting.

In the cities visited they saw, in addition to what these places contained of most historial or industrial appeal, many things of especial interest to lighting ingineers, including the lamp works of the General Electric Co. in New Jersey and Ohio, the summer-playtime illuminations at Coney Island, many "great white ways" in business sections, and a special scheme for the illumination of Niagara Falls in their honour.

* * *

Both the Toronto and the Saranac convention proved abundantly worth while for what they revealed and foreshadowed of lighting progress, and perhaps the delegates, looking before and after, had as little reason as any to "sigh for what is not." None the less, it was frankly confessed that theory has outrun practice—that it is one thing to design good lighting methods and another thing to bring about the discardment of existing systems. There is added to human conservatism and inertia the item of expense—one which affects home owners, proprietors of public halls and places of assemblage, and even in some degree manufacturers, though much progress has been made in showing the last-named that good lighting is a fundamental economy rather than an extravagance. Where ceaseless building goes on, as in most American cities, and doubtless in many European ones, it is possible in new structures to start right, and every fine lighting installation achieved is an example and incentive to erectors of new buildings and owners of old ones alike.

* * *

One comment on the international aspects of the Saranac gathering put stress on the higher degree of earnestness and concentration that as a whole characterised the European attendants when contrasted with their American confrères. This was surely all to the credit of the visitors. It is not meant to imply that any American delegates were remiss, but only that some of those who took little or no personal part in the proceedings did not give the same visible evidence of determination to use the occasion for individual advancement in their art as did those from across the ocean. The difficulties of international interchange of thought were, of course, greater than the most skilful interpretation could entirely eliminate. Some of the European delegates—for instance, Dr. Halbertsma of the Netherlands and M. Payot of Switzerland—had the richly earned advantage of understanding several spoken languages besides their native tongue. Re-election of the efficient British president and secretary—Dr. Paterson and Dr. Walsh—was heartily endorsed, and the next meeting, to be held in England in 1931 or sooner, will be mentally noted down by some in this country as an opportunity that must not be missed.

* * *

Persistent and thorough digging by the Federal Trade Commission, as Government investigator, into the publicity activities of the utility companies has continued along the original lines, with the end of this phase of the inquiry now in sight. Further payments for speeches and articles by university professors—sometimes on what seems to have been an unusually liberal scale—make perhaps the most damaging testimony recently dragged to light.

In such arrangements there has been evident no moral obliquity—at the worst a nice question of propriety decided in favour of and not against those whose part it was to make the decision.

As the first part of the investigation ends, the electrical industry is left standing in the ring a little shaken and perturbed, but with no hurt that will not rapidly heal. If it weathers as successfully the inquest soon to begin into its financial operations and the whole holding-company situation, it will not need to worry about the immediate future. As to the remote future, that, like the past, is, in Daniel Webster's phrase, "secure."

* * *

National Electric Light Association divisional conventions for New York State, Pennsylvania, New England, the Great Lakes States and the Rocky Mountain Commonwealths took place in September, as well as conventions of the American Electrochemical Society, the American Electric Railway Association and the Western Section of the International Association of Electrical Inspectors, the last-named body having, despite its name, more than a sectional scope and influence in its own field. To the N.E.L.A. meetings it is customary for the new national president, the managing director and other national and headquarters officials to travel together and in rotation, and thus the proceedings at all o them bear a close family resemblance, despite the addition of local colour. Evidence that the industry is still prosperou. and optimistic abounded, and a calm resolution to resist unfai political attack and maintain the right to tell its story to the public and to oppose public ownership in proper ways wa everywhere manifested.

The American Electrochemical Society, assembling at Charleston, in West Virginia, took advantage of the location in that neighbourhood of a large number of process industrie such as salt works, fuel-gas, pure oil, brick and carbon manufacturers, to combine the study of scientific problems and the practical application of electrochemistry in industry. At this convention the gift of $25 000 from Dr. Edward Goodrich Acheson to establish a biennial prize of a gold medal and $1 000 in cash was announced. It is intended to make this award for a distinguished contribution to any of the branches of research or industry fostered by the American Electrochemical Society.

* * *

Amid the furies and the futilities of the political struggle now in its last phase, electrical power plays a part, though a comparatively small one, for the great voting public has its attention fixed on other things. Governor Smith has added his voice to the chorus of attack on the utility interests to which the federal investigation gave rise, and has again proclaimed his determination to permit the alienation of no public power sites. In that attitude he will, if elected President, approach the specific problems of Muscle Shoals and Boulder Dam.

Mr. Smith is always outspoken and frequently captivating, although his speeches do not invariably indicate a profound grasp of intricate questions. His Republican opponent, Secretary Hoover, has adopted the rôle of the "strong, silent man" that President Coolidge played so successfully. His utterances are few, and, as this is written, his promise to discuss public utilities in a campaign speech remains unfulfilled; but doubtless he will get around to discussion of that subject before November 6th.

# BOOK REVIEW.

**Elektrizität In Der Landwirtschaft.** By C. BUSCHKIEL. (Berlin and Leipzig: Walter de Gruyter and Co.) Pp. 171.

This is another Siemens handbook, and it may be said to deal with practically the whole of the products of Siemens and Halske and Siemens-Schuckert. It is written in six sections with an appendix at the end. The first section deals with prime movers, and includes hydro-electric installations, turbo-generators, engine-driven sets and a type of windmill; in this section are also included some details of transmission lines and specially designed transformers. The third section may be considered as complete in itself, since it deals with the construction of a.c. and d.c. motors and their application to agriculture. Among the many machines described and illustrated are fans for the smithy, vacuum cleaners in the stables, haircutting machines for horses, drills in the wheelwrights' shops, hose motor carts, tractors, ploughshares, reaping machines, etc. The next section deals with lighting units for agricultural buildings and a few domestic appliances such as hot plates, boilers, wash boilers and radiators. The next sections are a mixture of wiring systems, telephones, wireless apparatus, pumps, etc. The work is well produced on art paper, and the line drawings and half-tones reproduce very well. As a means of drawing attention to the products of the firms mentioned, the work is well adapted to its object.

CYRIL SYLVESTER.

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# THE INTERNATIONAL COMMISSION ON ILLUMINATION.

## Important Topics Discussed at the Seventh Plenary Session in America—An Instructive Tour—Problems in Street Lighting and Diffusing Glassware—British Work on Daylight Illumination.

By J. M. WALDRAM and G. H. WILSON.

IT is now four years since the last plenary session of the International Illumination Commission took place in Geneva. In 1927 a meeting of Technical Committees was held at Bellagio, Italy, but this year, at the invitation of the American National Committee, the seventh plenary session was held in the U.S.A. From September 22nd to 28th some sixty delegates from Europe and Asia attended the meeting at Saranac Inn in the Adirondack Mountains, after a tour of a number of cities, and attendance at the Convention of the Illuminating. Engineering Society in Toronto.

Mr. C. C. Paterson, who has been re-elected President of the International Commission on Illumination.

The office of President was filled by Mr. C. C. Paterson (Great Britain), who was elected at Bellagio last year; and Dr. J. W. T. Walsh continued to serve as general secretary. The British delegation included, besides the president and Mrs. Paterson and the secretary, Major J. W Buckley (Metropolitan-Vickers Electrical Co., Ltd.), Mr. W. E. Bush (E.L.M.A.), Mr. J. F. Colquhoun (Sheffield Corporation), Mr. P. Good (Institution of Electrical Engineers) and Mrs. Good, Dr. W. M. Hampton (Messrs. Chance Bros), Mr. J. M. Henshaw (British Thomson-Houston Co., Ltd.), Mr L. B. W. Jolley (G.E.C. Research Laboratories) and Mrs. Jolley, Prof. J. T. MacGregor Morris (Institution of Electrical Engineers), Mr. J. W. Eyde (G.E.C. Research Laboratories), Major G. H. Spittle (Railway Clearing House), Mr. E. J. Stewart (Glasgow Corporation), Mr. C. W. Sully (E.L.M.A.), Mr. J. R. Thomas (Edison Swan Electrical Co., Ltd.), Mr. J. M. Waldram (John Waldram and Son), Mr. R. Watson (Institution of Gas Engineers, leader of the British delegation), and Mr. G. H. Wilson (G.E.C. Research Laboratories).

Opportunity was taken by the American Committee, which, as the National Committee of the country in which the plenary session was being held, were responsible for the arrangements and acted as hosts, to allow the delegates to see some American cities before the meetings took place and to inspect a number of examples of lighting practice. A busy and instructive fortnight was spent in a very well-organised tour of eight cities, in each of which the delegates were entertained by the local electrical undertakings. The delegates were much indebted to their hosts for the care and forethought which characterised the arrangements.

In addition to places of historic interest or natural beauty the newer lighting installations visited proved particularly instructive. The street lighting systems in use in the United States employ decorative glassware to a considerable extent, and scarcely any exposed sources were visible in larger units. The use of such glass, however, involves a certain unavoidable loss of output. In general the mounting heights were lower than those in this country, but in the highest intensity installations such as State Street, Chicago, or Washington Avenue, Detroit, high posts of fine design, and ornamental units of very high power, produced an excellent and dignified installation.

The advertisement signs of America are proverbial, and the advantage of the letter signs of prodigious size, from the point of view of appearance by day, is questionable; but considerable advances have been made in the use of floodlighted posters. This system provides an advertising medium equally suited to either day or night conditions, and capable of far more artistic expression than the crudity of coloured lamps. Excellent Neon signs were also much in evidence. The floodlighting of the Capitol and of the Lincoln Memorial at Washington; the artificial daylight lighting of the Philadelphia Art Museum (described in a paper at Toronto); high intensity factory lighting at Cleveland and Detroit; and the demonstrations at Harrison, Lynn, and Nela Park were among the most interesting of the visits made.

The social activities of the Commission, a complete record of which would occupy many pages, were as successful as its technical achievements. Both at the Convention of the I.E.S. at Toronto and at the session at Saranac Inn there were many pleasant occasions which relieved the concentration of many official and more unofficial, discussions. The Commission was fortunate in having as its meeting place as beautiful and secluded a spot as Saranac Inn, to the selection of which a good deal of the success of the meeting can be attributed.

### Photometry and Standards.

Since its inception the I.C.I. has had under consideration the subjects of photometry and standards of candlepower, and in 1909 a unit was agreed between Great Britain, France, and the United States, which was defined in terms of certain standard electric lamps. No such lamp can constitute a fundamental standard, however, and experimental work has been carried out for some time in an attempt to obtain such a unit. At the Committee on Photometric Standards two papers by C. Müller and R. Frisch were presented on the unit proposed by Warburg and based on the direct measurement of radiation. The discussion showed that further work was necessary before thoroughly definite information on the subject could be supplied, but it was recommended that the thanks of the Commission be accorded to the French and German National Committees for their research work on black body radiation and a fundamental unit.

In addition to the problem of standards is that of the photometry of sources of different colours or temperatures. Modern developments in incandescent electric lamps have been in the direction of increased filament temperature, and photometry by comparison with low temperature standards has been difficult, and the probability of errors great.

Work is in progress at the various national laboratories with a view to establishing a satisfactory basis for stepping from one colour to another in the unit of candlepower. This

[An I.C.I. party leaving Saranac station. The group shows (left to right) Mr. and Mrs. P. Good, Dr. W. M. Hampton, Mrs. and Mr. L. B. W. Jolley, and Mr. J. M. Waldram.

work was noted with satisfaction by the Commission, and a desire was expressed for its continuation, along lines which eliminate empirical features by the calculation of relative luminosities, using spectro-photometric data and the visibility factors accepted by the International Commission in Geneva, 1924.

A British Report which was presented on the precision of commercial photometry of electric lamps clearly stated the need for care in electrical and all other measurements if a

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useful accuracy of the photometry was to result. This Report was accepted for inclusion in the Commission's transactions.

Although one of the main functions of the Commission is that of bringing about international agreement wherever possible, it rarely happens that it is called upon to draw up international specifications. Conditions governing standardisation are seldom the same in different countries, and in fact it is only equipment which is internationally used which is really suitable for international specification. Such specifications as are issued are generally national, and it is preferable that they should be so; but the Commission can do useful work in providing an international platform for the discussion of national specifications, with a view to mutual profit, and in order to ensure that they shall, as far as is practicable, treat the same subject along the same agreed lines; or in discussing and agreeing the possible basis for a national specification for certain equipment.

There are, of course, many subjects on which knowledge has not progressed sufficiently far to enable specifications to be drawn up at all; and on which different workers use different units and criteria, so that comparisons are rendered difficult. In such cases the Commission is able to discuss the problem and agree upon the manner in which quantities shall be expressed and which data shall be given, in order that all workers shall speak the same language about any given subject.

Several national specifications came up for discussion during the course of the meetings at Toronto and Saranac. Of the several British Standard Specifications which deal with illuminating equipment, those of street lighting and of diffusing glassware played a large part in the technical sessions dealing with those subjects. Two comprehensive American Specifications, for the testing of diffusing glassware and of floodlights, were presented at Toronto in Part III of the Lighting Service Manual, issued by the National Electric Light Association. Under the heading of "Automobile Headlights," the specification of the Illuminating Engineering Society of America was discussed, and the various national regulations concerning headlights were very extensively reviewed.

Dr. J. W. T. Walsh, honorary secretary of the International Commission on Illumination.

## Complex Problems.

It is remarkable that some of the most pressing problems, such as Street Lighting and Diffusing Glassware, in which specification is especially desirable, are precisely those whose peculiar complexity renders specification difficult. The Secretariat Report and the papers presented on the latter subject were sufficient to give an idea of the number of variables which enter the problem. The basic factors, such as the size, number, and material of the particles of a diffusing glass; the surface characteristics, the thickness and material of the matrix; and the shape of the piece of glassware are related by very complicated functions, only some of which have yet been determined; and it was agreed at the technical session to investigate the feasibility of the specification of the diffusing material (as distinct from the finished piece of glassware) by the distribution of reflected and transmitted flux or brightness when a plane specimen is illuminated normally. The American specification referred to above deals with the testing of actual samples of glassware, and goes thoroughly into the procedure for selecting and testing.

The need for a classification of lighting fittings, based upon the distribution of light from them, in order that there should be available national terminologies with equivalents in other languages which illuminating engineers could use, was felt at Bellagio. Owing to the various classifications at present in use in different countries, however, it was found impossible to obtain international agreement on any one basis. After the presentation of papers dealing with possible methods of classifying fittings by their light flux distribution, the discussion centred mainly round the next practical step that the Commission should take; and it was finally agreed that as a first step a questionnaire should be circulated to determine the various methods of classifying fittings and the terms at present in use. When this has been accomplished the next phase in the work of classification can be similarly attempted.

## Illumination of Interiors.

The most necessary part of the work of an illuminating engineer is the illumination of the buildings in which we live or work, either by natural or by artificial light; and much of the discussion at Toronto and at Saranac centred round this branch of the art.

The natural lighting of buildings is a subject to which a considerable amount of attention is being directed in both Europe and America; and is one which, if only in view of the large amount of time which every individual spends under it, is of no less importance than artificial lighting. The papers presented at Toronto dealing with this subject evoked a useful discussion. At the afternoon session of September 17th three papers were presented, by Dr. H. H. Higbie, Messrs. Randall and Martin, and by Dr. J. W. T. Walsh, describing various researches on the subject. At the conclusion of the discussion of the papers a number of questions was asked regarding European practice in regard to natural lighting, and details were given by several visiting delegates of the work in Great Britain and in Germany. It was admitted that the progress in Great Britain was, if anything, in advance of that in the United States.

The British National Committee acted as the Secretariat Committee in the subject of Daylight Illumination for the meetings at Saranac. In the Secretariat Report the various principles involved in the expression and measurement of daylight were discussed, a basis of international agreement on methods of expression was suggested, and a plan of future work for the Commission proposed. Four papers were presented on various phases of the work, by P. J. Waldram, J. G. West, H. Buckley and J. Macintyre, and Dr. H. Kimball. Questions regarding the method of expression of the daylight illumination in interiors as a ratio of the exterior illumination and the realisation of this method in practical measurement were raised, and after discussion a resolution was proposed by the British Committee and passed, to the effect that the value of daylight illumination at any point in an interior shall be expressed either by the horizontal illumination prevailing when the exterior illumination due to the unobstructed hemisphere of sky is 5 000 lux, or by the roof ratio, which is the ratio between the two values mentioned and explained above.

From the papers dealing with the artificial lighting of buildings, mention should be made especially of those describing installations with special features, of which the most prominent was probably the lighting of the Philadelphia Art Museum, described in a paper at Toronto by C. L. Bone and Ward Harrison. The delegates were privileged to see the Museum during the tour, and have nothing but praise for the manner in which artificial daylight has been made to replace natural daylight, so skilfully that it is difficult to believe that many of the galleries have actually no natural lighting at all. Directors of our art galleries would do well to follow the example of Philadelphia in the use of artificial daylight in the galleries, at least after dark, for their treasures cannot be enjoyed by many people, whose work finishes too late for them to visit the galleries during the day.

In several of the installations described, striking effects were obtained by the use of concealed floodlights illuminating coves, ceilings, or walls; a method which should commend itself to British designers. There was ample evidence, both in the discussions at Toronto and at Saranac, and in the buildings visited during the tour, of the considerable value of close co-operation between the architect and the illuminating engineer. Both the natural and the artificial lighting should be considered as parts of the design of a building at least as important as the sanitation or ventilation. Such co-operation is already taking place in some instances in England and on the Continent.

(*To be continued*)

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# THE SWAN CENTENARY.

## Story of the Inventor of the Incandescent Electric Lamp—The Foundation of a Great Industry—Swan's Early Work on Carbons—The Lamp of 1860—Stearn as a Collaborator—Some Other Achievements.

WEDNESDAY was the centenary of the birth of a man whose inventive genius was responsible for the creation of a great industry. The story of the life of Sir Joseph Wilson Swan, who was born on October 31st, 1828, is an inspiration to every Englishman and a source of patriotic pride.

To his pertinacity and courage in the face of a thousand difficulties and countless disappointments we owe the incandescent electric lamp, that means of illumination that has revolutionised lighting throughout the world, that has made much of our present civilisation possible.

The story goes back to 1845, when Joseph Swan joined his brother-in-law, John Mawson, a chemist of Newcastle-upon-Tyne.

Always of an inquiring turn of mind, the lad allowed no opportunity of acquiring knowledge to pass him by; and when W. E. Staite, the inventor of a regulating arc lamp, came to Sunderland to lecture young Swan was among the audience. He was intrigued with the small electric light Staite had produced by an electrically-heated wire of platino-iridium. The only means of generating electricity at that date was by means of the nitric acid battery, and Staite's efforts were accordingly restricted.

**Sir Joseph Swan, the inventor of the incandescent electric lamp, the centenary of whose birth was celebrated on Wednesday.**

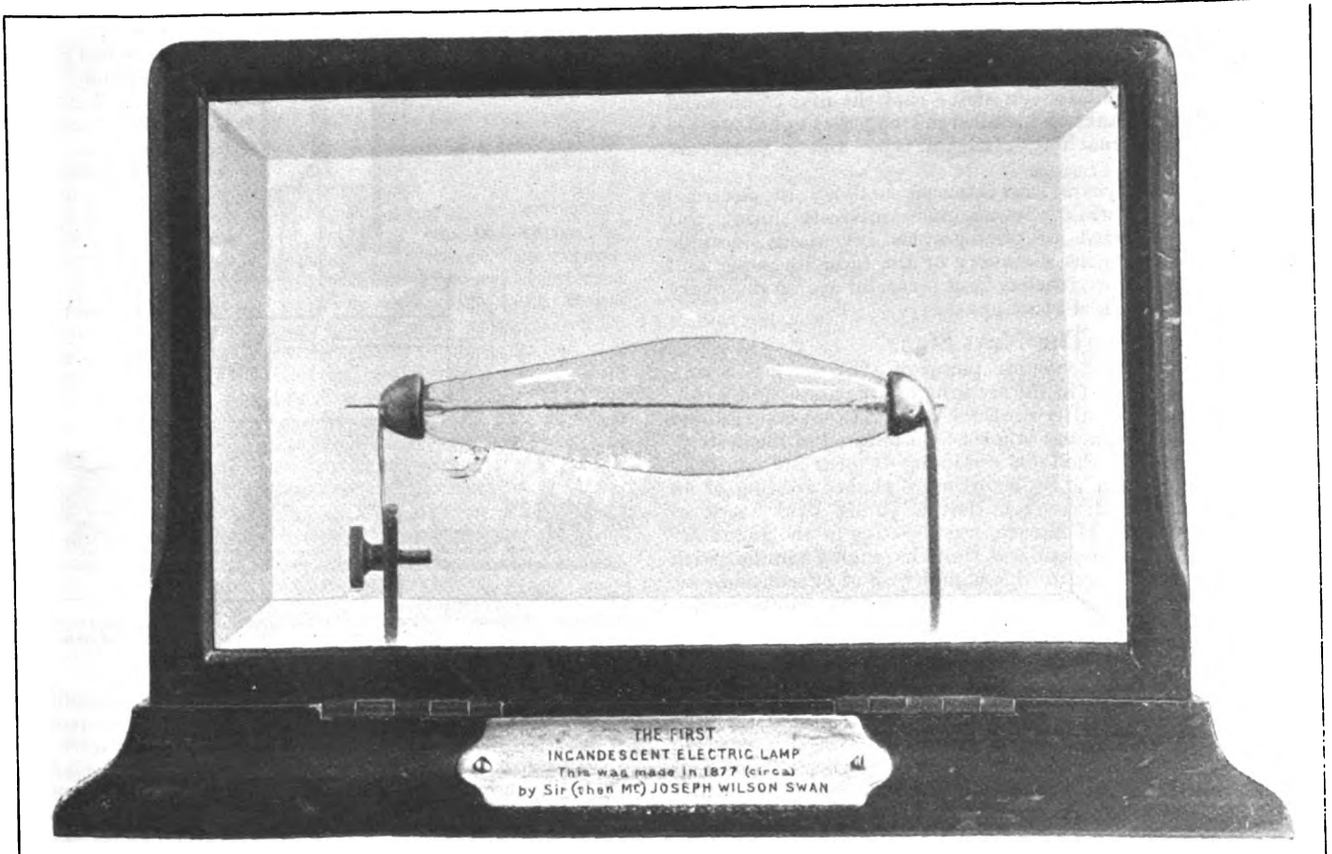
But the electric light, primitive and inefficient as it was, set the young chemist on a voyage of discovery which culminated in success more than thirty years later.

John Mawson, the Newcastle chemist, was the possessor of a chemical apparatus department, a very unusual adjunct to an early Victorian chemist's shop. In this department young Swan spent every possible hour, encouraged largely by John Mawson, who saw in the boy something of the genius that the years were to mature.

Swan was struck with the idea that the carbon conductor must be as thin as possible if a successful incandescent electric light were to be produced, and his first experiments were directed to the attainment of this object, by means of carbonised paper and carbonised cardboard.

A couple of years later he obtained a number of different kinds of paper and cardboard and cut them into strips. He packed them in a mass of powdered charcoal in a fireclay crucible, and then baked the vessel and its contents to a high temperature in a pottery kiln. Some of his strips were spiral, and both the strips and spirals came out of the kiln perfectly carbonised and very thin. This boy of 19 had discovered a new way of carbonising thin and flexible strips, and he believed that his battle was nearly won.

But there were many other problems to be solved before the effective incandescent electric lamp was evolved, and many a long year passed by before Swan made any further real progress. In 1860 Swan set about constructing a lamp, and one form he used was a glass bottle with a wide neck closed with an indiarubber stopper! He passed the conducting wires through the stopper and placed the carbon strip between




**This Swan lamp, which was publicly exhibited at Newcastle-upon-Tyne on December 18th, 1878, was the first practical incandescent lamp to be made. The carbon rod is seen held in position by two platinum wires.**

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their ends. Another improvisation consisted of a glass bell-jar inverted over a sole plate. He exhausted the air, so far as he could, from these containers by an ordinary air-pump and by means of a battery of 50 Collon's cells; he actually succeeded in rendering a carbon strip about ¼ in. broad incandescent.

**A late portrait of Sir Joseph Swan, who died in 1914 in his 86th year.**

The presence of a little air in the container, together with distortion of the carbon under the action of unequal heating, caused the contrivance to fail before it had given much service. But the principle was established, and it but awaited the advent of a sufficiently cheap supply of electricity to make the existence of an incandescent light a commercial possibility.

It was two years later—in 1862—that the first commercial electric lighting plant was installed in Dungeness lighthouse—a magneto electric machine, crude in type, and a Serrin arc lamp.

The next ten years saw immense activity in electrical engineering, and whilst Swan's main interests during this period were directed to photographic inventions, notable amongst which are his discovery of the bromide paper and the dry plate, he nevertheless kept a careful eye on discovery and invention in the electrical field.

## The Next Step.

Sprengel's mercury vacuum pump of 1865 marked a considerable step forward in the securing of a vacuum, and when, in 1875, Mr. Crookes (afterwards Sir William Crookes) exhibited his radio meter, Swan was immensely interested in the description of Crooke's method for obtaining so near an approach to a perfect vacuum. By a fortunate chance reading of an advertisement, he discovered that a young bank clerk of Birkenhead, Charles H. Stearn, was assisting in the manufacture of the radiometers, and was thus thoroughly familiar with the method used to secure this high degree of evacuation.

Swan got in touch with Stearn, and the two commenced a series of experiments to test the truth of Swan's idea that strips of carbonised paper made incandescent would be indefinitely durable if only they could be contained in a perfect vacuum.

The carbonised strips and spirals were mounted in glass bulbs, and the bulbs then evacuated to the highest possible degree. The contact between the ends of the carbon strip and the conducting wires between which it was held presented great difficulty, but this difficulty was overcome by discarding the carbon film and substituting for it carbon wires. These were fitted in small platinum—note the metal—sockets and "stayed put."

In the course of the experiments the vacuum rapidly deteriorated because air and other gases were evolved from the carbon as soon as it began to incandesce. This difficulty was overcome by producing as nearly perfect a vacuum as possible by exhausting the lamp bulb when the carbon was cold and then passing a strong current through it, making it brilliantly incandescent, whilst the process of exhaustion was continued at this high temperature.

This discovery solved the difficulty. The vacuum was not destroyed when the lamp was put into service, the carbon did not waste away, and the lamp was a success.

Think for a moment of what it meant to Joseph Swan. Thirty-three years after his first efforts, he saw his dream brought to reality. He had followed a will-o'-the-wisp and found it, not a figment of the imagination, but rather an idea so sound in its conception, so important in its consequences that it opened up a new vista, a new era in lighting and all that lighting means in the way of progress, technically, industrially and socially.

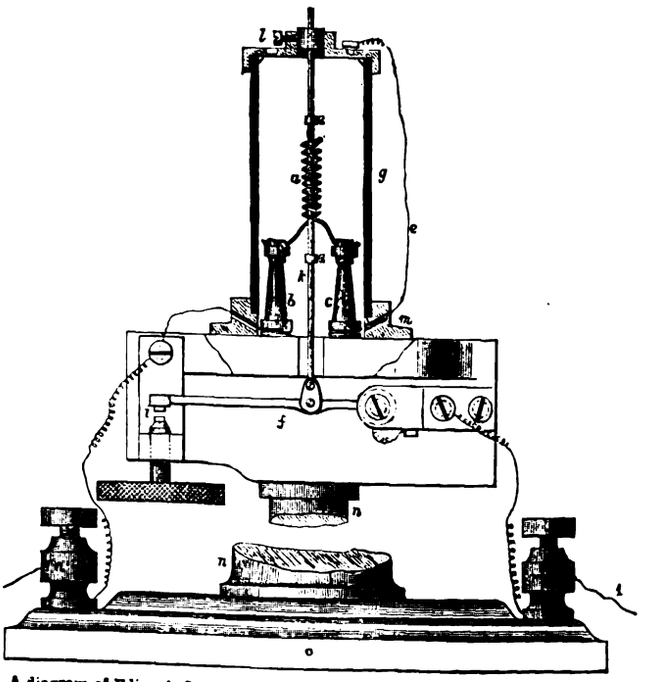
## Public Interest.

On December 18th, 1878, Swan demonstrated an incandescent carbon lamp before the Newcastle-upon-Tyne Chemical Society, and again on January 17th, 1879, the lamp was shown to a technical gathering.

In February of that year the audience of 700 which attended a lecture he delivered to the Literary and Philosophical Society of Newcastle, saw the new lamp in operation, and so great was the interest aroused that Gateshead insisted upon a similar lecture and exhibition. The Town Hall was taken for the occasion, and there on March 12th, 1879, some 500 gathered to see the new marvel.

Swan did not rest on his laurels. The manufacture of the lamp on a commercial basis was the next step, and a preliminary was the improvement of the carbon.

Swan discovered a new material in place of the paper thread or other porous body used as the carbon-forming substance. Treating cotton yarn of an open texture with sulphuric acid, he found that it became so agglutinated and compacted that it lost its fibrous condition. On drying it became hard like catgut and could be drawn down through dies to a wire of perfect roundness. This "parchmentised thread" was



**A diagram of Edison's first lamp showing the regulating device designed to prevent the melting of the platinum on reaching incandescence. (Reproduced from "The Electrician" of February 22nd, 1879.)**

patented by Swan in 1880 and it marked an immense advance in incandescent lamp design. In the same year he patented the special process of evacuation, allowing two years to pass by whilst his invention was being perfected.

On November 10th, 1879, Thomas Edison obtained a British patent covering, in the broadest terms, the invention of an incandescent electric lamp, possessing as its cardinal feature a glass container from which the air had been exhausted. This patent was granted nearly a year after Swan's successful

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demonstration of his lamp at Newcastle, and it was not till February 1880 that any Edison lamps were seen in England. The first six were on view in Victoria Street and were exhibited by a Mr. Johnson, Edison's commercial agent. Edison lamps were shown at the Paris Exhibition in September 1881 and at the Crystal Palace in 1882. The filaments were made from bamboo fibre—a method which disappeared in favour of the parchmentised thread which came into general use.

To turn for a moment to the position in America; on Sunday, December 21st, 1879, the "New York Herald's" first page announced Edison's lamp, just two months after its "birth" in his laboratory. "Scientists proclaimed it a fake. Nevertheless the price of gas stocks dropped, and stock in the Edison Electric Light Co. soared to $3 500 (£700) a share," we read in "The History of the Incandescent Lamp," by J. W. Howell and H. Schroeder, published in Schenectady, in 1927.

These dates are of academic interest only nowadays; for the legal determination of points of dispute between the Swan Company and the Edison Company in this country has passed into industrial history. But the dates are of keen interest to those of us who like to know the facts, and they reveal the position without bias.

The success which Joseph Swan obtained was almost instantaneous. A company was formed and as soon as he had equipped his own house with electric lamps, the inventor personally supervised the fitting of Swan lamps at Lord Armstrong's house at Craigside near Rothbury and the first commercial house to adopt the new form of illumination was that of James Coxon, the drapers of Newcastle-upon-Tyne.

By 1882, the Mansion House, London, the British Museum, the Royal Academy, and the Savoy Theatre, with many other large buildings, were illuminated by Swan Lamps. They were soon adopted for use at sea, and the s.s. "City of Richmond," of the Inman line was equipped by June of 1881.

The parchmentised cotton thread filament reigned supreme until the end of 1883 when Swan devised a new principle and method of filament manufacture—a method that founded another industry altogether, although Swan was indifferent to the subsequent use of the product he had named "artificial silk." In 1883—five years before Count de Chardonnet produced his artificial silk at Besancon-La-Mouilliere, Swan squirted cellulose under slight pressure through a small orifice and formed a continuous, homogeneous thread of indefinite length which was cut and shaped to the required length and carbonised in the usual way.

This invention was responsible for an enormous expansion in the production of low candle power lamps for higher voltages, and it has ever since continued to be the standard method of carbon filament manufacture.

Swan came to London in 1883 and at the Inventions Exhibition in 1885 he showed several small d'oyleys made from fine thread of squirted cellulose—the first artificial silk goods ever displayed.

He left his home at Bromley in 1893 and came to live in London itself. He was elected a Fellow of the Royal Society in 1894, and President of the Institution of Electrical Engineers in 1898. He was first President of the Faraday Society in 1904 and in the same year he received the honour of knighthood for conspicuous services to science. He received the decoration of the Legion of Honour as early as 1881.

Sir Joseph Swan died on May 27th, 1914, in his 86th year—full of honours, loved by all his associates, a man whose great genius was only equalled by his innate modesty.

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## "Hot Spot" Temperatures in Transformers.

[To the Editor.]

Sir,—Advertisements of a transformer manufacturer concerning "hot spot" temperatures in transformers have appeared in recent issues of The Electrician.

These advertisements commence with the statement that "Much has been written recently on 'hot spot' measurement and indication," and go on to state that certain transformers are designed without "hot spots"; that "'hot spot' indicators are an anomaly," and that "the ordinary thermometer provides adequate safeguard."

Since I have "written recently on 'hot spot' measurement and indication" in the "Journal" of the Institution of Electrical Engineers (August issue), I feel directly concerned.

The advertisements presumably refer only to oil-immersed transformers. The whole problem of cooling such transformers is to transfer the heat generated in the conductors and iron core of the transformer to the surrounding oil, and thence to the water or ambient air, whichever is the cooling medium. Heat cannot possibly flow from the windings to the oil unless the temperature of the windings at any point is higher than the temperature of the adjacent oil.

The temperature of the hottest part or parts of the windings, i.e, the "hottest spot" temperature, must always be higher than the temperature of the hottest oil. In this respect it does not matter how the temperature within the windings varies. The vague guarantee given in the advertisement is, therefore, irrelevant whatever its interpretation.

The essential point is that the maximum safe load the transformer will carry thermally is determined entirely by its "hottest spot" temperature. The temperature of the hottest oil under operating conditions is not a reliable guide, and will most often be positively misleading.

To say that any transformer can be built without a "hottest spot" is to show ignorance of the fundamental principles of heat flow and thermal transference. Moreover, if hottest spot temperature indicators were "an anomaly and unnecessary expense" their use would not have been recognised and legislated for in the proposed revision of the Standard Specification for Transformers of the American Institute of Electrical Engineers. Incidentally this same revision states that "loading apparatus on the basis of oil temperature alone as a guide is not recommended."

The true thermal rating of any transformer of good design under normal operating conditions is considerably greater than its British Standard Rating. The hottest spot temperature indicator in its more useful form, the safe load indicator, makes available this extra transformer capacity. The oil temperature is no guide in this respect.

A 500 kVA transformer, for example, if fitted with a safe load indicator, becomes in effect a 600-700 kVA transformer.

All these matters are explained fully in the Institution paper referred to above.—I am, etc.,

E. T. Norris.

Chorlton-cum-Hardy.

## Eddy Current Losses.

[To the Editor.]

Sir—The essay by Mr. R. M. V. Grant (The Electrician, Vol. CI, No. 2 617), "Supplementary Eddy Current Losses in Transformers," contains a mistake in the constant factor, which I beg to correct, as it is also contained in the end formulæ. On page 89 it has been overlooked that the dimensions $b$ and $h$ are in cm., but the specific resistance is in Ohm per mm. $^2/_m$. Therefore the resistance of the path per cm. is:—

$$\frac{\rho . 1}{b . dx} \cdot 10^{-4}$$

and the losses

$$\frac{(E_x - E_m)^2}{\rho} b . dx . 10^4$$

Then the end-formula on page 90 should be altered as follows:—

$$\left(\frac{0.4\pi^2}{\rho . 10^4}\right)^2 \left(\frac{f N b}{L}\right)^2 h^4 \frac{1}{9} \left(1 - \frac{1}{5u^2}\right)$$

This formula corresponds exactly with the one deriving by that of Vidmar found in his book, "Die Transformatoren" (Berlin, Springer, 1921), page 105.—I am, etc.,

H. Plattner.

Yokohama.

## Another Clerk Maxwell Poem.

[To the Editor.]

Sir,—As I have been travelling for some months far from civilisation, it is only recently that I have seen a copy of your April 27th issue containing the late Prof. Clerk Maxwell's playful poem, "Lectures to Women on Physical Science." The following amusing Clerk Maxwell effort

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which I discovered in a scrap book—and taken, I believe, from an early issue of THE ELECTRICIAN—may be of interest to your readers :—

ELECTRIC VALENTINE.

*Telegraph Clerk A to Telegraph Clerk B.*

" The tendrils of my soul are twined
With thine, tho' many a mile apart ;
And thine in close-coiled circuits wind
Around the magnet of my heart.

" Constant as Daniell, strong as Grove ;
Seething thro' all its depths, like Smee ;
My heart pours forth its tide of love,
And all its circuits close in thee.

" O tell me, when along the line
From my full heart the message flows,
What currents are induced in thine ?
One click from thee will end my woes."

Thro' many an Ohm the Weber flew,
And clicked this answer back to me—
" I am thy Farad staunch and true,
Charged to a Volt with love for thee."

The poem was signed $\frac{dp}{dt}$, and this apparently caused some mystification until someone suggested that in the thermo-dynamical equation $\frac{dp}{dt}$ = J. C. M. (James Clerk Maxwell).—I am, etc.,

P. BROWN.

Pernambuco.

## Shoddy Wiring and Registration.

[TO THE EDITOR.]

SIR,—Again you have a number of letters in your journal bearing on the above.

The illustrations of joints accompanying Mr. Seager's letter only confirm what I was emphasising in my article published in your columns in April last, when I also gave some " horrible" examples of joints and wiring. The fact that the National Register is acting when these cases are brought to light is very encouraging, because it will prove that the Register is doing some useful work, and is adopting the policy that is required, that is, to stamp out the " curbstoner " and incompetent contractor.

It is a duty of Registered Contractors to bring before the notice of the Register such glaring examples of " shoddy wiring " as have frequently been published in THE ELECTRICIAN, because these will prove, beyond any doubt whatever, not only to supply authorities, but to architects, consultants, and the public generally, that a quantity of electric wiring and installation work is being carried out by a class of so-called electricians and contractors that is a positive danger to life and property.

Fire insurance companies cannot afford to neglect much longer these damning illustrations of " fire raising " work, and they will before long insist on electrical work on " their risks " being carried out by competent firms.

Every batch of illustrations such as you have published this week is taking us one step nearer to compulsory registration, because the Home Office cannot afford to neglect much longer the fact that dangerous electrical installations exist by the thousand in this country, and are still being carried out by incompetent people.

Registration is growing rapidly, and firms are now beginning to realise that there is " something in it." The fact that quite a number of applicants have been rejected by the Register is ample proof that a lot of incompetent and unqualified firms are in existence to-day. This weeding-out process is getting keener and will have a great tendency to encourage the qualified contractor to enrol.

When the National Register has enrolled 90 per cent. of the qualified contractors who are capable of satisfying the Register's requirements, the time will not be far distant when the word will go forth that " only work that is executed by Registered Contractors will be accepted," and the Government, having been educated to the dangers existing, will make Registration compulsory for anyone desiring to carry on business as electrical contractors, and will deter the imposters by heavy fines and otherwise.

" Safety First " is being preached in many directions, and " safety first " must be at the very foundations of electrical jobs. These may cost a little more than they do to-day, but safety is worth purchasing at a reasonable price, and the competition that will always exist, even when compulsory registration is an accepted fact, will safeguard the buying public against extortionate or unreasonable prices.

I ask all readers of this journal to keep this matter of shoddy wiring alive, to constantly send examples that are found, and particulars, for publication, so that the contracting industry can be purged of the dangerous element, and in its turn lift up our industry in the eyes of the buying public as one consisting of reliable, honest and competent engineers and business men.—I am, etc.,

HARRY MOSS.

178, Manningham Lane,
Bradford.
October 29th.

## The "Red Seal" Idea.

[TO THE EDITOR.]

SIR,—One hears such good reports of the operation in Canada of the " Red Seal " plan of certifying that houses have been well wired and provided with a suitable number of outlets, that I venture to ask whether a similar plan could not be adopted in this country under the auspices of, say, the National Register of Electrical Installation Contractors. It may be too early yet for a move of this sort—and on this point, the views of other readers would be welcomed—but it seems to me that such a scheme would not only assist the public in deciding what is an electrically-equipped house, but would promote a better standard of wiring—which is what the National Register is trying to encourage—and would also materially assist the Electrical Association of Women in obtaining results from its Electrical Outlet Campaign.

While many people desire an installation to be put in as cheaply as possible consistent with good workmanship, we must not overlook the class which wants the best sort of job that installation contractors can devise. At present they do not know what they should ask for, but in the " Red Seal " plan they would know that their houses could be wired in strict accordance with a national specification designed to give the best possible electrical service.—I am, etc.,

" RED SEAL."

Bournemouth,
October 25th.

## METER ENGINEERS.

As was recently announced, the Council of the Institution of Electrical Engineers has set up a Meter and Instrument Section for the reading and discussion of papers on meters, instruments and cognate subjects. The Section will be conducted on the lines of the existing Wireless Section and will supersede the Meter Engineers' Technical Association, which, as the result of a ballot of its members, will be dissolved on December 31st, its work being continued by the Meter and Instrument Section. Members of the Association who are already members of the Institution and those subsequently elected into the Institution from the Association's membership will form the nucleus of the Section. In addition, members of any class of the Institution may apply for membership, and must satisfy the Committee which will be appointed by the Council to arrange the meetings of the Section that they are " actively engaged in the study, design, manufacture or use of instruments, meters or protective devices used in electrical engineering."

The first meeting will be held shortly, and due notice will be given in the technical Press.

Members who wish to belong to the Section should apply by letter to the Secretary of the Institution.

Let us all get together and do a little gentle boosting of British engineering.—*Sir Gilbert C. Lyle.*

* * *

We simply cannot afford to fall behind others in the application of pure research to industry.—*Sir Josiah Stamp.*

* * *

I want an all-electric house. At first I wanted it vaguely : then I wanted it wistfully ; Now I want it fiercely.—*Miss D. M. Peattie.*

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# NEWS IN BRIEF.

## Assisted Wiring out of Profits at Tynemouth—Electricity Supply to Weymouth Sanatorium—Police Telephone Boxes—Forthcoming Meetings of I.E.E. Sections—Reduction of Wages of Railway Electrical Employees.

SEAHAM Harbour U.D.C. has decided to instal electric boilers in new council houses.

Bradford Corporation invite applications for the post of deputy city electrical engineer.

Short wave wireless telephone signals, emanating from an air liner over England, were overheard in Cairo on Monday.

A novel service, by which subscribers are informed of the times of arrival of mail boats from England, is now being provided by the Guernsey States Telephone Department. The department has arranged for a special wireless receiving station to be installed, with a view to keeping in touch with incoming and outgoing vessels.

The Electricity Committee of Tynemouth Corporation has resolved, subject to the confirmation of the T.C., that application be made to the Electricity Commissioners for permission to use £15 000 from surplus revenue towards assisted wiring and other capital purposes.

The annual dinner of the Scottish Centre of the I.E.E. will be held on November 27th, at the Grosvenor Restaurant, Glasgow.

Southwark (London) Baths Committee recommends an expenditure of £180 to improve the electric lighting at the Lavington Street public hall.

Glasgow Tramways Committee has endorsed the recommendation of the sub-committee on works and stores to accept a German tender for trolley wire.

Fulham Electricity Committee recommends the purchase from the Synchronome Co., Ltd., of an electrical impulse clock to be fixed outside the new electricity showrooms. The cost will be £95.

Weymoutn Electricity Committee has obtained sanction for the use of overhead cables in connection with the supply of electricity to the borough sanatorium. The work is being undertaken, at schedule rates, by Johnson and Phillips, Ltd.

Two lectures, arranged by the Women's Engineering Society to be given at the Lyceum Club, Piccadilly, London, are "History of Factory Legislation in Great Britain," by Miss Rose E. Squire, with Miss M. Partridge in the chair, to-day (Friday), and "Modern Steam Plants," by Mr. Percy E. Rycroft, with Miss E. M. Kennedy in the chair, on December 5th.

In his recent presidential address to the Warwickshire and South Staffordshire branch of the Association of Mining Electrical Engineers, Mr. J. F. Hopley said the only available efficient power for portable plant at the coal face was electricity, and the rapid advance in the adoption of such plant placed added burdens upon the technical qualifications of the electrical engineer if these schemes were to be applied with the maximum of safety.

After opening an Exhibition of Light and Heat in Medicine, Surgery and Public Health, organised by the Actinic Press, Ltd., at the University of London, on Monday, Sir John Snell said engineers, and particularly the Electricity Commissioners and the Central Electricity Board, desired to see the advantages of electricity made available to every home. Every cottage hospital and clinic should be able to turn it on for medical and surgical purposes.

*AT the invitation of the General Electric Co., Ltd., several members of the Barnsley Electrical Contractors' Association, accompanied by a contingent from Sheffield, toured the Osram and Robertson Lamp Works, at Hammersmith, on October 11th. Subsequently a visit was paid to Magnet House, and later the party visited the Oxford Corner House for the dual purposes of refreshment and inspection of the unique system of lighting recently installed there.*

Salford Corporation Electricity Committee recommends acceptance of a tender, amounting to £310, for the erection of a sub-station in Langworthy Road, Pendleton.

The Provincial Government has announced that the West Kootenay Power and Light Co. will build a large hydro-electric plant on the Pend Oreille River in Southern British Columbia.

The Telephone Development Association has submitted to Mr. Baldwin suggestions for intensive telephone development as a means of creating widespread employment at no cost to the country. It is urged that what is needed is extensive construction of telephone plant and an intensive publicity campaign to ensure that the new plant shall become revenue earning without loss of time. Mr. Baldwin is giving consideration to the suggestions.

A further extension of the police telephone box system is contemplated at Swansea to assist in the policing of new suburbs without any great increase of the police force. It is understood that a similar system is to be adopted by Scotland Yard on the outskirts of London, as an assistance in dealing with motor bandits.

The subscription of Brighton Corporation to the British Electrical and Allied Industries Research Association is to be increased for this year from £21 to £50.

Visits arranged by the Students Section of the North-Western Centre of the I.E.E. include the works of Allied Newspapers, Ltd., and Olive and Partingtons, Ltd., Paper Mill. The dates are January 26th and February 19th, respectively.

The annual dinner of the South Midland Centre of the I.E.E. will be held at the Grand Hotel, Birmingham, on November 30th. The first joint meeting with the Electrical Association for Women was held yesterday (Thursday) at the Technical College, Suffolk Street, when Dr. S. Z. de Ferranti's address entitled, "Electricity in the Service of Man" was delivered.

A proposal by London County Council's Special Committee on Traffic to include in a Bill in Parliament provisions enabling the Council to enter into arrangements with the Underground Railways Group and others for a unified system of control of London passenger services, including the Council's tramways, was brought forward at Tuesday's meeting, and its discussion was postponed until next Tuesday.

The Industrial Court, having considered a claim by four railway companies that the wages of the staffs employed in railway electricity generating stations and sub-stations and on high tension cables should be reduced by 6s. a week, has decided that the weekly earnings of such workers shall be subject to the special deduction of 2½ per cent., to which other railway employees have already agreed.

Dr. W. J. O'Donovan, of the London Hospital, lecturing before the Royal Institute of Public Health, said: The danger of X-rays to professional radiographers has been proved, and safeguards are taken in all long-standing installations. A new phase of danger arises when manufacturers sell wholesale to dentists and proprietors of beauty-parlours, and even to boot shops, powerful X-ray apparatus for workers uninformed and insufficiently protected against the terrible after-effects.

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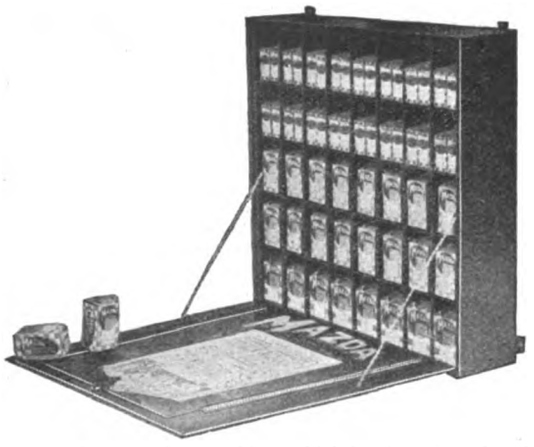
# ELECTRICAL WOMEN.

## Example of Interior Lighting shown to Yorkshire Members.

AT Queen's College last week, Lady Brooks presided over a large meeting of members of the Birmingham and Midlands branch of the Electrical Association for Women to launch the "Electrical Outlet Campaign." Miss C. Haslett explained the



*A NEW motor lamp cabinet which has been introduced by the British Thomson-Houston Co., Ltd. It is made of steel, finished in green enamel, and when stocked with Mazda lamps in their orange and blue cartons makes a most effective counter display.*

women's national specification and the scheme was favourably discussed. Mr. R. A. Chattock, city electrical engineer, was among those present.

On October 23rd, members visited the municipal washhouse in St. Georges Street, Hockley. Here they were able to observe women taking advantage of the facilities provided there for washing in the electric way. The Birmingham Baths Committee has provided washing machines, hydro-extractors, drying cabinets, power driven mangles and electric irons.

On October 24th, the Leeds and West Riding Branch of the Electrical Association for Women, paid a visit to the home of Mrs. W. B. Woodhouse, The Croft, Bramhope. After the electrically-cooked tea the party, consisting of some 60 ladies, assembled in the lounge, and for about twenty minutes listened to the views of Mrs. Woodhouse on "Interior House Lighting." A special point mentioned was the necessity of having plenty of "outlets" in each room, and the advantage of using standard lamps for interior lighting, Mrs. Woodhouse being a strong advocate of standard lamps. The lounge in Mrs. Woodhouse's residence is floodlighted, there being no fittings suspended from the ceiling. This floodlighting is arranged round a fairly deep moulding about 18 in. from the ceiling, and is, of course, invisible to the occupants of the room. A novel feature in connection with this floodlighting system is the fact that, whereas the usual method is to light up a white or cream frieze over a dark or patterned wall, Mrs. Woodhouse has reversed the order of things and lighted up her coloured paper frieze above plain cream walls, and the result is both pleasing and satisfactory. Flowers were very much in evidence in the lounge and a charming effect was obtained by lighting up each bowl or vase with a lamp of the same colour as the flowers. In the study, silk shades were very prominent and a further useful item was introduced in the form of a small table lamp of the "daylight" variety. An attractive method of lighting was shown in the dining room, where three silk shades, made in the shape of large "Aladdin" lamps, were placed on the deep moulding, one over the fireplace, one over the door, and the third directly opposite. These "lamps" were painted in colours, by hand, and together with a large silk fringed shade immediately over the dining table, gave a very pleasing effect. Hand-painted silk shades were also used on the landing. The visitors were invited to inspect the kitchen, and all were greatly interested in the electric washer, water heater, and various types of cooking apparatus. A point worth noticing in the kitchen was the electric oven, which, instead of standing on the floor in the customary way, had been raised on to a small table.

# PERSONAL.

MR. J. A. Sloane, late of Metro-Vick Supplies, Ltd., has joined the Manchester branch of the Hotpoint Electric Appliance Co., Ltd.

Mr. R. L. Horsfield, who was recently appointed tramways manager and engineer at Leeds, has formally resigned from his position at Cardiff.

Mr. J. L. Campbell, late of the Manchester branch of the Hotpoint Electric Appliance Co., Ltd., has joined the Manchester branch of the Credenda Conduits Co., Ltd.

In memory of Sir J. Williams Benn and Lady Benn, his father and mother, Sir Ernest Benn has presented a handsome pewter christening bowl to Oxted Congregational Church.

The marriage of Mr. George C. Kim, assistant electrical engineer to the Great Indian Peninsular Railway, and Miss Beatrice Ridley, was solemnised on October 20th, at St. Thomas' Cathedral, Bombay.

Sir Alexander and Lady Roger left London for Lisbon and Madrid last Friday, and expect to return early in the present month. Sir Alexander is visiting Spain and Portugal mainly on business in connection with the Anglo-Portuguese Telephone Co.

Mr. A. Baker, who for a quarter of a century, until recently, was chief engineer and general manager of Birmingham Tramways, was last week entertained at a complimentary dinner by the members of the Tramways Committee and chief officials of the Department. Mr. Baker was presented with an illuminated address and chiming grandfather clock.

Southwark Electricity Committee recommends promoting Mr. J. Smith, station superintendent, to the position of assistant electrical engineer at a salary of £485 per annum. Mr. G. Taylor, charge engineer, to the position of station superintendent, at a salary of £291; and Mr. D. Marshal, mains foreman, as assistant mains superintendent at a salary of £307.

In our issue of October 12th, page 406, there appeared a paragraph giving the names of new members who have been added to the Advisory Committee of the Parliamentary Secretary to the Department of Overseas Trade. It should be pointed out that though the names of Mr. W. L. Hichens and Sir George Sutton were given, both these gentlemen have been members for a number of years.

Nottingham Tramways Committee has recommended Mr. W. G. Marks to be tramways manager, in succession to Mr. J. Aldworth who is retiring. There were 33 applications for the post. Subject to the appointment being ratified by the Council, Mr. Marks will, it is expected, take up his duties early in the New Year. He now holds a similar appointment with the Chesterfield Transport Department.

Poplar Electricity Committee recommends basing the salary of Mr. J. H. Bowden, borough electrical engineer, on the Walker scale plus ten per cent., and that in view of the fact that he acts in an advisory capacity to other committees of the Council, he be paid an additional £100 a year in respect of such services. The General Purposes Committee reports in this connection that Mr. Bowden concurs in this proposal and desires to record appreciation of his attitude in the matter, as the recommendation will result in a decrease of the prospective salary which would have resulted if the previous scale had remained in force.

## Obituary.

MR. SAMUEL LEE, on October 19th, aged 58 years. He was chairman of Stirlings, Ltd., wireless specialists, of Kingston-on-Thames.

MR. W. J. THORROWGOOD, on October 18th, aged 66 years, He was signal and telegraph superintendent of the Southern Railway, and retired some months ago. He was responsible for the establishment of automatic telephony at Waterloo, Southampton and Eastleigh; the synchronisation of the clocks at Waterloo; the power operation at Charing Cross, Holborn Viaduct, Cannon Street and London Bridge, in addition to the installation of light signals at those places.

MR. A. T. SIMPSON, on October 24th, aged 86 years, a director of Worthington-Simpson, Ltd., and Babcock and Wilcox, Ltd. He practised as a consulting engineer for some time, but his work in this direction diminished as his energies became more absorbed in the Worthington-Simpson company, of which he became chairman, in succession to his father, Mr. James Simpson, a past president of the Institution of Civil Engineers. Mr. A. T. Simpson, in consequence of his advanced age, resigned the chairmanship of the company a few years ago but continued to occupy a seat on the board.

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# LEGAL INTELLIGENCE.

## An Echo of the General Strike—Appeal by Electricity Committee.

THE case of G. Scammell and Nephew, Ltd., against Atlee and others, which came before the Court of Appeal consisting of Lords Justices Scrutton, Greer and Sankey, on October 16th, was last week resumed and concluded, and judgment was reserved.

The appeal was from the verdict for £350 damages and judgment at the trial of the action brought against Major C. R. Atlee, and six other members of the Stepney Electricity Committee in the King's Bench Division by Messrs. G. Scammell and Nephew, Ltd., engineers, of Fashion Street, E., for alleged conspiracy during the General Strike of May, 1926, whereby the plaintiffs' supply of electric power was cut off. (See issue of THE ELECTRICIAN dated June 15th.)

### Hotel Installation Claim.

Before Judge Lindley at Tiverton County Court, last week, H. Pincott and Sons, electrical engineers, Tiverton, sued Robert Murray Nasau Molesworth, trading as the Palmerston Hotel, Tiverton, for £96 5s. 5d., goods sold and work done. There was a counterclaim for £250 damages for faulty workmanship.

Mr. Templeman, opening the case for the counterclaim, said Mr. Pincott installed electric light plant at the Palmerston Hotel in December, 1925. It proved to be inadequate, and the wiring was so defective that a fire might have been caused at any time. Told of the defects, Pincott accepted an order to increase the lights, and did not tell Mr. Molesworth that the dynamo would not charge the additional 14 cells. Mr. Molesworth had to spend £90 in getting the wiring put right. The engine had to be run 17 hours a day, and the moment it stopped the lights went out.

Mr. Pincott said he advised a larger plant, but Mr. Molesworth said he could not afford it, and took the risk of adding 14 cells to the original 50. When, at a subsequent period, he had to put in bells, he found on taking up a board that his installation had been tampered with, apparently to get additional lights, and the junctions had been covered with old cocoa tins.

Mr. A. J. Howard, borough electrical engineer of Taunton Corporation, said the whole trouble was due to incompetent supervision, and a contributory factor was that a 75 V battery was charged by a 50 V dynamo.

His Honour said Pincott warned Molesworth that a different dynamo was wanted for the larger battery, but the advice was not accepted. He found for plaintiff on the claim, and dismissed the counterclaim.

### Alleged Lamp Infringements.

The bankruptcy of Nathan Jawett, an electric lamp dealer, of 58, Bedford Street, E.1, came before Mr. Justice Astbury in Bankruptcy in the Chancery Division on October 22nd, on the hearing of an application to commit for contempt of Court. Mr. Tindale Davis, appearing on behalf of the British Thomson-Houston Co., Ltd., creditors in the bankruptcy, said that it appeared that the debtor had refused to answer certain questions put to him in the course of his public examination although directed by the Court to do so. He had infringed certain patents belonging to his clients, who were the petitioning creditors in the bankruptcy proceedings, and on the hearing of an interlocutory injunction to restrain him the debtor consented to treat the motion as the trial of the action, and consented to judgment. He paid nothing under the judgment, and the receiving order followed. During his public examination he was asked a series of questions regarding the source of the lamps which were the subject of the infringement, and he pretended, so it was now submitted, that he did not know. He was asked the question: Where did you get the lamps which you sold in the business? and refused to answer it.

Mr. Gallop, who represented the debtor, said that the claim of the petitioning creditors merely related to the costs of their action, and submitted that the question was not relevant to the bankruptcy proceedings.

Giving judgment, his Lordship said that the debtor had been carrying on an illicit business in infringed lamps. What the extent of his dealings were the Court did not at present know. There would be an order on the debtor to answer the question referred to in the report of the Registrar, and there would also be an order to commit the debtor, but such order would lie in the office until the adjourned public examination of the debtor took place.

### Marconi Action Postponed.

Mr. Justice Romer, in the Chancery Division on October 23rd, heard an application by Mr. Corsellis to take out of the term's list the action Marconi's Wireless Telegraph Co., Ltd., *v.* Economic Electric Lamp Co., on the ground that an important witness was in Austria. His Lordship granted the application on an undertaking that Mr. Justice Maugham was asked to take the case when he took the witness action list next term.

### Judge and Unregistered Trade Marks.

In the Chancery Division on October 16th, before Mr. Justice Clauson, Lissen, Ltd., moved for an injunction restraining Harley and Harley, of Shacklewell Lane, Dalston, from infringing their trade mark "Lissen," in connection with h.t. batteries.

Mr. Burrell, for the company, said that for some years they had made h.t. batteries under their trade mark and recently found that the defendants, consisting of Mr. Ernest Sidney Harley, had been selling similar batteries under the name "Lissen," together with the words "Appreciably improves loud-speaker tone," which differed only from the plaintiff company's slogan by substituting "appreciably" for "noticeably."

There was correspondence between the parties, said counsel, and in the end the defendant said he would fight the case, as he had been told that the plaintiff company had no right to the word "Lissen."

His lordship said in this case, where the trade mark was unregistered, all the plaintiff company could do was to obtain an injunction restraining passing-off.

"The defendant," said his lordship, "is perfectly entitled to use the word 'Lissen' provided he makes it clear that the goods bearing that label are not the goods of the plaintiff company."

Mr. Burrell said the difficulty about registering the word "Lissen" as a trade mark was that it formed part of the company's name.

Mr. Harley said that he had no intention of defrauding. The label on the goods was not his but was given to him to use on the batteries. He was willing to distinguish his goods from those of the plaintiff company.

His lordship granted an injunction restraining passing-off, and directed each party to pay their own costs.

### Alklum Electric Batteries.

Mr. Justice Maugham, in the Chancery Division on October 6th, decided a legal point raised in an arbitration between Worsnop and Co., Ltd., described as the vendors, and Louis de la Garde, the purchaser of the goodwill, patents, trade marks and registered designs relating to the vendors' business in the manufacture and sale of the Alklum electric batteries.

Mr. Swords, for the purchasers, said the point to be determined was the legal effect of questions of fact decided by the arbitrators. The arbitration arose out of an agreement of July 29th, 1926, between the parties relating to the sale of the business of the manufacture of the Alklum electric batteries. A clause in the agreement provided that "the agreement is subject to a condition that the tests which are now being carried out by or on behalf of the purchaser prove to his reasonable satisfaction that the Alklum electric batteries now being made by the vendors are capable of fulfilling the claim made by them." In counsel's submission for the interim finding of the arbitrators they had in fact held that there were no tests being carried out and the effect therefore was that it could not be proved to the satisfaction of the purchaser that the batteries were capable of fulfilling the claim made by them, and the whole contract was at an end as a result.

Mr. Hunt replied for the vendors.

Mr. Justice Maugham, giving his decision, said there was no evidence to show that the tests were being made; yet the vendors were entitled to rely on the agreement unless and until it was affirmatively established by the purchaser that the tests which were being carried out were unsatisfactory.

"I am therefore willing to answer the question of law," he continued, "by saying that on the finding of the arbitrators it is the opinion of the Court that the contract is not, by reason of the findings of the arbitrators, unenforceable against the purchaser.

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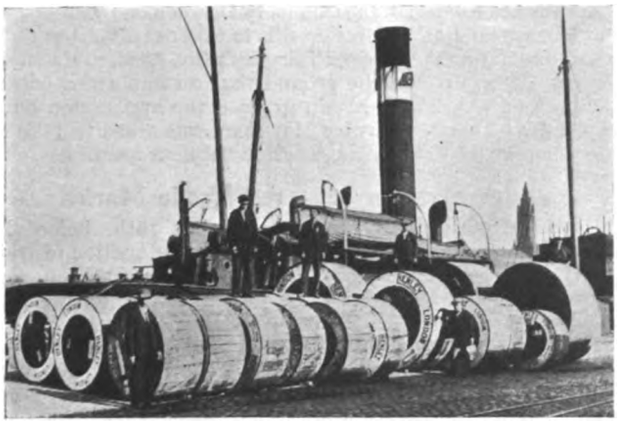
# BUSINESS ITEMS.

JOHN Cawley and Co. announce that they have been appointed sole agents for London on behalf of J. P. Hall and Co., Ltd., as from November 1st.



**The second consignment of Henley cable for the Lisburn Electrification Scheme referred to in the paragraph below.**

Robert Yuille and Sons, Ltd., electrical engineers, of Kilmarnock, have removed their offices and stores to 4 and 6, East George Street, and have opened new showroom premises.

The General Electric Co., Ltd., intend to display "Magnet" electric appliances and other of its manufactures at the Ironmongery, Hardware and Domestic Appliances Exhibition (allied with the Public Health Exhibition and Congress) which is to be held at the Royal Agricultural Hall, London, from November 19th to November 24th. The G.E.C. stand will be adjacent to the main entrance, and the centre section will be devoted to a varied display of domestic appliances, electric light fittings, lamps, etc. Two of the four corners will be set out and equipped to represent a modern kitchen and modern scullery, while the remaining two corners will be devoted to displays of fires and cleaners. Continuous demonstrations will be given with the various appliances exhibited.

The Alton Battery Co., Ltd., at present installing at the National Telephone Exchange, London, two batteries of over 10 000 Ah, has been awarded the contract for the battery plant required for the conversion of Manchester to the automatic telephone system. The Manchester batteries will also exceed 10 000 Ah capacity, but groups of plates in each cell and between individual cells will be inter-connected by the special system of bolted joints designed by the Post Office Engineering Department. The Manchester batteries will, we understand, be the largest in the world in which this method of group connection is used, the largest cells at present installed on this system being of 6 580 Ah capacity, which were also manufactured by the same company.

The electrical exhibition opened at Cradley on October 9th and promoted by the Shropshire Electric Power Co., was one of a series of thirty or more to be held in the company's area during the year. Similar events have been arranged for the towns of Banbury, Tewkesbury and Oldbury.

The whole of the 'bus and tram routes in Clayton U.D.C. area, Bradford, were lighted by electricity last week. This work was carried out by Mr. Harry Moss to the order of the Council, and to plans by J. W. Longley, consulting engineer. The fittings are all suspended from tramway poles, and the cable is of the multi-core pattern, run overhead on the poles.

The General Electric Co., Ltd., will exhibit an extensive range of heavy duty cooking apparatus at the Cookery and Food Exhibition which opens at Olympia on November 23rd. The exhibit will include various sizes of double oven ranges, a cabinet type roasting oven, a steaming oven, hot cupboards with carving wells and bain marie, fish frying outfits, a sandwich toaster, grillers, toasters, steckpots, etc.

The Brown Boveri organisation has lately received an order for a three-cylinder single-shaft turbo-generator, for an output of 36 000 kW at 3 000 revs. per min., required by the N. V. Provinciale Noordbrabant'sche Electriciteits Maatschappij (Holland), for the Geertruidenberg power station. The plant will consist of the turbine with three-phase alternator generating at 12 000 V and for a power factor of 0·8, surface condensing plant, distillation and preheating plant. The steam conditions will be about 450 lb./sq. in. gauge at about 750 deg. F.

The illustration given on this page shows the second consignment of Henley cable for the Lisburn Electrification Scheme being unloaded on the Belfast Quay—a total of 35 drums, representing a total gross weight of over 63 tons, and a total length of 8 183 yards. The first shipment in connection with this contract, which is being carried out by Henley's Telegraph Works for the Lisburn Electric Supply Co., Ltd., consisted of a total of 42 drums containing 10 535 yards of cable, the gross weight being over 81 tons. In connection with the overhead line portion of the contract, an additional consignment was made of 15 drums containing over 17 000 yards of 0·1 sq. in. (7/·136) high conductivity bare copper strand, the total gross weight of which was over 10 tons.

In connection with a shopping week held at Watford from October 20th to 27th, a successful electrical exhibition was given under the direction of the municipal electricity undertaking. All the latest ideas in labour-saving and electrical devices were on view in a specially-prepared house. There were comprehensive displays by the General Electric Co., Ltd., Metro Vick Supplies, Ltd., and the Hotpoint Electric Appliance Co., Ltd. Cooking demonstrations were given by the exhibitors and the corporation's hiring equipment was also on view. It was explained to our representative on the day before the close of the exhibition that the attendances had been good, the total at that time having reached 13 000. The house was outlined with electric light, as was also the local pond; floating on the latter was an electrically illuminated yacht. See page 509.

*AFTER 31 nights of brilliance, the Blackpool illuminations came to an end on October 22nd. It is estimated that the people present on the Promenade during the previous Saturday night numbered some 100 000, and this panoramic view shows the reason. Included in the photograph are the Pavilion, diving girl, bathing pool, gondola and the Promenade itself, the lighting for which was carried out with Osram colour-sprayed lamps in red, green and yellow.*

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# AN ELECTRICAL MERGER.

## Metropolitan-Vickers Electrical Co., Ltd., to Control a Group of Important Companies.

ACCORDING to the "Financial Times," the Metropolitan-Vickers Electrical Co., Ltd., has acquired the control of the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd., having purchased a large majority of the ordinary shares of the three last mentioned companies and also a large majority of the preference shares of Ferguson, Pailin, Ltd. The value of the assets of the four companies exceed £15 500 000. It is not intended that the activities of any of the four companies shall be curtailed, but that they shall actively co-operate, under the guidance of a central board, of which Mr. H. C. Levis, the present chairman of the British Thomson-Houston Co., Ltd., will be chairman, while Major-General Sir Philip A. M. Nash, the present chairman of the Metropolitan-Vickers Co., will become managing director. These gentlemen pointed out at the last ordinary general meetings of their respective companies that steps were being taken by them and by the Edison Swan Electric Co. and Ferguson, Pailin, Ltd., which would lead to close co-operation, the eliminating of unnecessary duplication of effort and expenditure, and the effecting of economies generally in various directions, such as research, engineering development, manufacturing processes and the purchase of material. Referring to the severe foreign competition in the home market, Sir Philip Nash pointed out that the situation called for co-operation in the electrical industry and submitted as a remedy the pooling of research and concentration of engineering development and manufacturing facilities together with the standardisation of product.

### Previous Changes.

The control of the Metropolitan-Vickers Electrical Co. was transferred to Great Britain in May, 1919, by the sale of the controlling interest then held by the Westinghouse Electric and Manufacturing Co. Vickers, Ltd., acquired control and subsequently disposed of its holding to the International General Electric Co. In February last Mr. Frank Dudley Docker regained control, and he stated, at the time, that it was his idea to bring about the closest possible association, short of amalgamation, between the biggest British firms, in order to meet competition and reduce the immense sums spent annually on research. The Metropolitan-Vickers Co. owns the patent rights of the Westinghouse Electric and Manufacturing Co. for Great Britain, and the Colonies outside North America.

The board of the Metropolitan-Vickers Electrical Co. consists of:—General Sir Philip A. M. Nash (chairman), Mr. B. D. F. Docker (deputy chairman), Mr. G. E. Bailey, Mr. Norman B. Dickson, Mr. J. S. Peck, Mr. Alex. Spencer, Lieut.-Col. M. Cradock, Mr. A. McKinstry, Sir E. Wyldbore Smith, Lord Wargrave and Major John Greg.

The British Thomson-Houston has works at Willesden and Rugby among other places. It supplied the electric motors and control apparatus for the District Railway, Central London, Bakerloo, and other tube railways besides all the train equipment and some of the locomotives for the electrified portion of the North-Eastern Railway and a number of other railways. The board of the British Thomson-Houston Co. consists of Mr. H. C. Levis (chairman), Mr. E. A. Baldwin, Lord Buxton, Mr. F. Fraser, Mr. J. Gray, Mr. W. C. Lusk (managing director), Mr. C. H. Minor, Mr. E. W. Rice, Mr. O. H. Smith, Mr. H. N. Sporborg, Mr. G. Swope, Mr. J. M. Woodward, Major-Gen. A. C. J. de Lotbiniere and Mr. J. L. Wilson.

Ferguson, Pailin, Ltd., have recently carried out considerable extensions of their works and have secured many important contracts, including one from the West Midland Joint Electricity Board for £120 000, one from Sydney City Council for £96 000, and one from Leeds Corporation Electricity Department—subject to confirmation by the Council—for switchgear for the new Kirkstall generating station amounting to £75 000.

The following information relates to the financial position of the companies concerned in the amalgamation:—

The assets of the Metropolitan-Vickers Co. at December last were £5 892 829, made up as follows:—

| | |
|---|---|
| Patents, goodwill, etc. | £75 000 |
| Works, machinery, plant, tools, etc. | 1 276 724 |
| Stock and work in progress | 2 266 106 |
| Debtors, etc. | 1 900 232 |
| Cash | 70 583 |
| Investments (at or under cost) | 304 184 |

The net profits for 1927 were £160 112 and a dividend at the rate of 6 per cent. was paid on the ordinary shares for the year. No dividend has yet been paid on the £25 000 deferred capital.

The assets of Ferguson, Pailin, Ltd., amount to £351 443, as set out below:

| | |
|---|---|
| Land and buildings | £76 842 |
| Plant, machinery, tools, etc. | 63 391 |
| Goodwill and patents | 5 922 |
| Debtors | 131 481 |
| Stocks, etc. | 43 589 |
| Cash | 1 080 |
| Sydney branch capital account | 25 414 |
| Toronto branch capital account | 3 967 |

Sir Philip A. M. Nash, who, it is stated, will be managing director of the new parent company.

In July, 1926, an offer was made to purchase the shares and no accounts have since been issued. For the 13 months ended December 31, 1927, the net profits were £28 752, and a dividend of 13 per cent. was paid.

The British Thomson-Houston Co's assets are valued at £8 049 427, the following being included in the items:

| | |
|---|---|
| Land, buildings, machinery, etc. (less depreciation) | £2 541 542 |
| Furniture, etc. | 63 139 |
| Shares and debentures in other companies | 516 353 |
| Government securities | 84 971 |
| Shares in affiliated companies | 989 402 |
| Apparatus, supplies, etc. | 1 238 637 |
| Debtors, etc. | 1 897 046 |
| Cash | 350 680 |
| Patents, goodwill, etc. | 220 452 |
| Dis., commission, etc., on Debenture issue | 147 205 |

The profits for 1927 were £462 444, before providing for interest charges. No dividend has been paid on the ordinary shares since 1925, when 6 per cent. was paid.

The Edison Swan Electric Co.'s assets are £1 219 967, of which the following are the details:—

| | |
|---|---|
| Patents, goodwill, etc. | £147 116 |
| Investments (cost) | 130 200 |
| Property | 177 184 |
| Fixtures, fittings, etc. | 17 784 |
| Motors | 6 601 |
| Plant and machinery (less depreciation) | 145 995 |
| Stocks, including work in progress | 243 762 |
| Debtors | 199 612 |
| Advance payments, etc. | 38 981 |
| Cash | 112 732 |

For each of the past four years, in addition to the full dividends on the preference shares, the company has paid a dividend on the ordinary shares of 10 per cent.

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# ELECTRICITY AS LABOUR SAVER.

## Minister of Transport on Domestic Electrical Development.

LT.-COL. Wilfrid Ashley, Minister of Transport, speaking at a luncheon following the opening by him of the New Cobden Bridge, at Southampton, last week, said he particularly wished to emphasise the desirability of extending the use of electricity in this country. Already work of considerable magnitude, amounting to about £2 000 000, had been carried out in the Glasgow area. He also referred to the progress made in the other areas, and added that a good deal more than half of the total area and about two-thirds of the population of the country had already been mapped out and arranged for by the Central Board.

They ought to be able to look to the captains of industry and the municipalities to extend the use of electricity in their businesses or in their municipal areas. But what they wanted to bring home—and it was very important to the women of the country—was the immense saving of labour which the use of electricity in the home must bring about. He was a little disappointed that in so many of the new houses being built electricity was used for lighting only, and houses were not wired for the use of vacuum cleaners, cooking, irons, and other apparatus which ought to be used.

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# ILLUMINATING ENGINEERS.

## Illuminating Engineering Society Meetings in Birmingham and Manchester.

THE Illuminating Engineering Society held its first meeting in Birmingham on October 22nd, when it was explained by the chairman, Mr. D. R. WILSON, that it was intended to hold similar meetings in various centres with the object of increasing provincial membership. A paper on industrial factory and workshop lighting was read by Mr. J. L. H. COOPER, based upon investigations made by him, chiefly in the Midlands. As this had already been published in the journal of the Society, interest was mainly centred upon the discussion.

### Measurement Difficulties.

This was opened by Professor Wm. CRAMP, who said the whole subject of industrial lighting was a very difficult one, for they were dealing not with mathematics alone but with psychological and physiological factors. Although a system of accurate measurement had been introduced into the science of lighting, which was meeting with considerable success, they were a long way yet from being able to say that such and such a system was best for any particular class of work. They were concerned not only with illuminating intensity and uniformity but also with the quality of light, and by this he meant the bands of wavelengths which should be used for any particular purpose. There had been no hint in Mr. Cooper's paper as to the quality of light from that point of view, and apparently Mr. Cooper would suggest 8 or 9 foot-candles as being satisfactory in many instances. But 8 or 9 foot-candles could be obtained with a light whose spectrum approximated to that of sunlight, and also with a light which was very far from that of sunlight. The cost of current was not, Professor Cramp felt sure, the main obstacle to efficient lighting. The question was more often a choice between new machine tools or an improved lighting installation. With the first the increase in output would be precise, but with regard to the second, doubt existed. Figures were needed which would demonstrate convincingly the advantages of efficient lighting, and if they could be produced they would help forward a very desirable campaign. Flexible systems of wiring for works were badly needed in this country.

Mr. L. E. BUCKELL said Mr. Cooper's paper convinced him of the necessity of electrical engineers doing more to educate factory owners in good lighting, particularly with regard to its importance in minimising accidents. He thought the supply authorities were not paying sufficient attention to good lighting.

Mr. R. A. CHATTOCK (city electrical engineer, Birmingham) who presided, assured the meeting that supply engineers were just as keen about lighting as they were about power load, and in Birmingham they had experts who were ready to advise factory and workshop owners how to get the best results.

Mr. Cooper, replying, said he felt there was a great future for daylight lamps in the engineering industry but he would not go so far as to recommend their general adoption on account of absorption.

The first meeting of the Society to be held in Manchester took place at the Manchester Lighting Service Bureau on Monday. Mr. P. P. WHEELWRIGHT, borough engineer, Blackburn, occupied the chair, and Mr. J. L. H. Cooper gave his paper entitled "Electric Lighting in the Engineering Industry." In the discussion which followed, Mr. J. S. Dow emphasised the importance of being able to back up one's statements with statistics, and of having actual facts to prove that better lighting conditions benefited both employer and the operative. In factory lighting the human element played an important part, one was not dealing with machines but with people who had to use them.

Mr. R. C. HAWKINS said that the difficulty lay not only with the employer, but in the attitude of the employees. At one mill where the worst possible abominations in the way of lights were used, it was explained that they had already fitted B.E.S.A. dispersive reflectors, but these were pulled down by the operatives who thought that they were too far away to be as good as the ordinary type. He had, on the other hand, come across an artificial silk weaving mill, where a constant illumination of 17 foot candles was maintained. There was a big future for artificial daylight in supplementing natural daylight all day long in the darker portions of mills and factories. Good lighting did not cost more than bad. In one mill they had a minimum illumination of a quarter of a foot candle and a maximum of 3 foot candles, and were using 6·6 kW. They then changed over to dispersive reflectors and had a constant illumination of 8 foot candles, and only used 6·7 kW.

Mr. J. ECK said that, to get over the prejudices of the employees in a certain works, they had installed a complete alternate system of lighting on modern lines. They then turned on the modern system for a few days, waited for complaints, and then went back to the old system. There were, of course, immediate requests to return to the new system.

Mr. W. BARRATT, of Rochdale, said that he had come across a mill at Bacup where artificial daylight had been tried and had proved so successful that it had been adopted exclusively.

Mr. Wheelwright said that to get a high standard of lighting in industry they would have to overcome the conservatism of the nation as a whole, and this could only be done by continual driving. The ideal modern building was one in which the amount of illumination never varied throughout the twenty-four hours of the day.

It is hoped to form a Manchester branch of the Society shortly.

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# FACTORY LIGHTING.

## Progress of the Campaign—Over 2000 Inquiries for Further Information.

INFORMATION gathered by the Electrical Development Association as to the progress being made by the Factory and Workshop Lighting Campaign, shows that the Association has received no less than 2 010 inquiries for further information on improved lighting. During the last month area sales conferences were held in London, Glasgow, Newcastle, Leeds, Manchester, Birmingham, Bristol, Cardiff, and Edinburgh, while during the period of the campaign 94 lecture-demonstrations to factory owners and executives have been or are being organised, 29 having already been held. Future dates of lectures and the towns where they are to be given are: To-day (Friday), Gloucester; November 5th, Hereford; November 6th, Croydon; November 7th, Birkenhead; November 9th, Trowbridge; November 10th, Newcastle; November 13th, Swansea; November 20th, Dundee; November 15th, Newcastle; November 19th, West Hartlepool; November 24th, Cardiff; November 20th, South Shields; November 23rd, Sunderland; and November 29th, Carlisle.

The Birmingham Electric Circle has arranged for lectures to be held in demonstration workshops and offices on each Thursday, commencing November 8th to December 6th, at which Mr. J. L. H. Cooper will lecture. Other lectures are to be given and arranged by manufacturers and others interested in the industry. A number of the largest manufacturing firms in the country have placed their works at the disposal of the campaign organisation for the purpose of holding lecture-demonstrations, and large audiences are anticipated. In addition to lectures to industrial consumers, efforts are being made to address various organisations connected with industry, such as branches of the Industrial Welfare Workers' Institute and Trade Unions, and also Technical Institutes, Associations and Engineering Societies.

A handbook (E.D.A. 735) containing full notes for a lecture on Industrial Lighting has recently been added to the series of E.D.A. Lecture Handbooks and can be obtained by lecturers on application.

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### ELECTRICAL APPRENTICESHIPS.

Considerable interest has been taken in the suggestions put forward by the Association of Supervising Electrical Engineers for an Apprenticeship Scheme for the electrical industry. The bodies interested in the scheme are giving the matter serious consideration, and letters of inquiry are being received from all parts of the country. We understand it is the intention to call a meeting of all organisations concerned with a view to the formation of a committee representative of all bodies affected, whose terms of reference will be to work on agreed principles. The final details of the meeting have not yet been settled, but it is hoped an agreeable date and time will be decided shortly in conjunction with the various organisations.

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The opening meeting for the 1928 session of the Kipling Society was held on October 16th. Sir Walter Lawrence was in the chair, and Mr. J. H. C. Brooking read a paper on "The Origin of the Kipling Society." The society, though less than two years old, has over 700 members, a number of whom are in the electrical industry.

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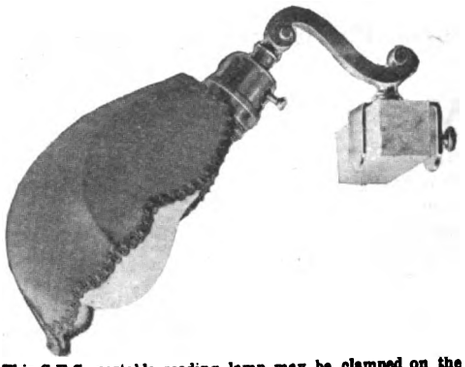
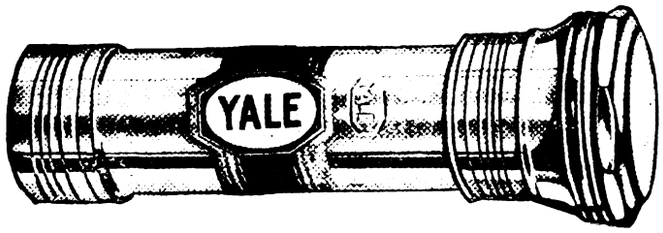
# ELECTRICAL GIFTS FOR CHRISTMAS WINDOW DISPLAY.

Lighting sets for decorating Christmas trees, tables or rooms are always a popular line. The set illustrated is made by the General Electric Co., Ltd.



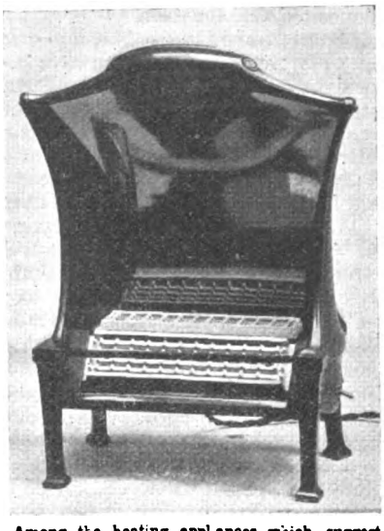
This G.E.C. portable reading lamp may be clamped on the back of an armchair, bedstead or other convenient position.




An electric torch has a variety of uses both in the home and elsewhere. To the motorist, the pedestrian, the schoolboy and others, a torch is a gift which is quickly put into service. The Yale is by the Sun Electrical Co., Ltd.

As companion to the vacuum cleaner the Electrolux electric floor polisher is both appropriate and useful.

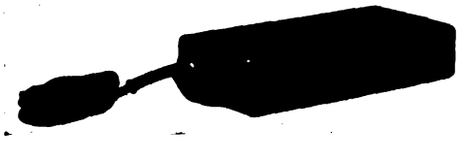
A gift for the table is always useful, and serves to remind one of the giver. The Sun Electrical Co., Ltd., has many such appliances from which to choose.



Among the heating appliances which suggest themselves is this attractive fire by the British Resistor Co., Ltd. Fires of the same make are available in a variety of designs and loadings.

Hair-dryers are invaluable to ladies, and should doubtless be included among the many electrical possibilities as gifts. The model shown is of G.E.C. manufacture.

This useful standard by Best and Lloyd, Ltd., is another suggestion towards the solution of Christmas gifts.



Another heater by the British Resistor Co., is an electric warmer for the motorist; it can also be used for bed warming. As can be seen, its dimensions make it easily portable, while its current consumption is quite reasonable.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BOLSOVER URBAN DISTRICT COUNCIL.—Supply and erection of about 50 wooden poles, cables, and other equipment, in connection with the lighting of Whaley village. Further particulars from Mr. T. B. Kenyon, Council Offices, Bolsover, near Chesterfield.

GLASGOW CORPORATION, November 7th.—Electric lighting, bell and fire alarm installations in several buildings at Mearnskirk Sanatorium, Newton Mearns, Renfrewshire. Specification, etc., from the office of Public Works, 64, Cochrane Street, Glasgow; deposit £5 5s.

STEPNEY (LONDON) GUARDIANS, November 7th.—Installation of new electric passenger lift at St. Peter's (Whitechapel) Hospital. Specifications from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1; deposit 10s. 6d.

LARNE (IRELAND) GUARDIANS, November 8th.—Electric light installation in extension of Fever Hospital. Specification may be seen at the offices of Mr. J. A. Hanna, Prudential Buildings, 3, Wellington Place, Belfast; Mr. W. Pleasance, 44, Wellington Place, Belfast, or Mr. T. Nelson, Clerk, Union Offices, Larne.

MANCHESTER WATERWORKS COMMITTEE, November 8th.—Supply and erection at Lostock Booster Station, near Bolton, of one 400 kW rotary converter, with transformer, switchgear, cables, etc. (contract No. 7); and four electrically-driven centrifugal pumps, to deliver 3 250 4 750 gallons per minute against a head of 40 90 ft., with switchgear, pipes, etc. Specications from the Waterworks Engineer, Town Hall, Manchester; deposit £2 2s. for each.

BRADFORD CORPORATION, November 10th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, porcelain insulators, controller contacts, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

CRAYFORD URBAN DISTRICT COUNCIL, November 12th.—Electric lighting and heating installation at Municipal Buildings. Particulars from the surveyor, Mr. Frank Leary; deposit £3 3s.

LONDON COUNTY COUNCIL, November 12th.—Four electrically-driven sewage pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc.; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1; deposit £5.

PORT OF BRISTOL AUTHORITY, November 12th.—Supply and installation of telephone and electric hooter signalling systems on the Eastern Arm Extension of the Royal Edward Dock, Avonmouth. Specification, etc., from Mr. Thos. A. Peace, Chief Engineer, Avonmouth Docks, Bristol. Deposit, £2, to the Acting Manager and Secretary, Docks Office, 19, Queen Square, Bristol.

MANCHESTER CORPORATION, November 13th.—Supply of trolley wire, tramway poles and tramway pole sleeves. Specifications, etc., from the Secretary, Corporation Tramways, 55, Piccadilly, Manchester.

ROCHDALE CORPORATION, November 13th.—Supply o single-phase prepayment meters for twelve months. Specifications from Mr. F. H. Rudd, Electricity Works, Dane Street, Rochdale.

STOKE-ON-TRENT CORPORATION, November 14th.—Overhead wiring and services to 64 new houses on Sutton Estate, Trent Vale. Specification, etc. (£2), from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent.

ROCHDALE CORPORATION, November 17th.—Supply and installation of 12 000 kVA, three-phase, 32 000/6 400 V transformer, with boosting transformers and necessary switchgear, at the power house, Dane Street, Rochdale. Specification, etc., from Mr. F. H. Rudd, engineer and manager, Electricity Department.

LONDON COUNTY COUNCIL, November 19th.—Supply of (1) about 5 590 tons of tramway track rails, guard rails and fishplates (Section A); about 150 tons of bolts and nuts (Section B); and about 450 tons of slot rails (Section C); and (2) about 1 025 tons of conductor tee rails. Specifications, etc., from General Manager, L.C.C. Tramways, Victoria Embankment, W.C.2; deposit £2 in each case (Nos. 1 and 2).

WEST RIDING EDUCATION COMMITTEE, November 20th.—Electric lighting installation at Bentley New Middle School. Specifications, etc., from the Education Department, County Hall, Wakefield.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E., P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

INDIA STORE DEPARTMENT, November 2nd.—Supply of 10 000 yards of 40-wire composite cable. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, November 2nd.—Supply of three 75 kW oil engine alternator sets, with water cooling plant, tanks, switchboard, cables, etc. Form of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

DUBLIN CORPORATION, November 3rd.—Supply of (1) electric cookers; and (2) meter boards, house service fuses and automatic cut-outs. Specifications (5s. for each) from City Electrical Engineer, Fleet Street, Dublin.

IRISH FREE STATE ELECTRICITY SUPPLY BOARD, November 5th.—Supply and erection of switchgear and two transformers, each 5 000 kVA (38 000/10 000 V) for the Shannon transformer station at Milltown, Co. Dublin. Specification, etc., from Mr. P. J. Dempsey, secretary, Electricity Supply Board, 60-62, Upper Mount Street, Dublin; deposit £5.

DUBLIN PORT AND DOCKS BOARD, November 6th.—Twelve months' supply of stores, including electrical supplies. Forms of tender from the Secretary, Westmoreland Street, Dublin.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—November 6th.—Automatic telephone switching equipment (schedule C. 353). (Reference B.X. 4 638.)

EGYPTIAN STATE RAILWAYS, November 8th.—Supply of 5 000 metres of cable. Further particulars from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference E.S.R. 7 778.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Supply of 22 000 V armoured type switchgear. (Reference B.X. 4 763.)

PORT ELIZABETH MUNICIPALITY, November 8th.—Steel lattice towers, with cross arms, insulators, etc. (Reference A.X. 6 897.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Supply of automatic telephone exchange, for Durban. (Reference B.X. 4 736.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 8th.—Electrically-driven overhead cranes (tender No. 1 317.) (Reference A.X. 6 815.)

GREAT NORTHERN RAILWAY (IRELAND), November 13th.—Six or 12 months' supply of stores, including electric fittings, lamps, cable and wire, etc. Forms of tender, No. 11 (1s.), from the Secretary, Amiens Street Station, Dublin.

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

LOURENCO MARQUES LOCAL GOVERNMENT, November 24th.*—Supply of materials and stores for Posts and Telegraphs Department, including g.i., copper and bronze wires, iron posts, insulators, galvanometers, relays, buzzers, switchboards, telephones, voltmeters, batteries, etc. Conditions of tender, with further particulars (in Portuguese), can be seen until to-morrow (November 3rd) at the Department of Overseas Trade, from whom a translation can be obtained (maximum cost, £2).

EGYPTIAN STATE RAILWAYS, November 27th.—Supply of two transformers, 1 050 metres of armoured cable, five switch pillars, two l.t. switchboard panels and 30 metres l.t. cable.

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Particulars from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference E.S.R. 7 826.)

EGYPTIAN STATE RAILWAYS, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500). Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264 3/34.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 4th.—Supply of submarine telephone and telegraph cable, or supply and installation of the cable. (Schedule C.379). (Reference B.X. 4 818.)

EGYPTIAN STATE RAILWAYS, December 5th.—Supply of 30 tons of h.d. copper live wire. Particulars from the Chief Inspecting Engineer, 41. Tothill Street, London, S.W.1. (Reference E.S.R. 7 830.)

MELBOURNE CITY COUNCIL, December 5th.—Supply of insulated, fire-resisting cable (Specification No. 962.) (Reference B.X. 4 822.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 6th.—Supply of five four-wheeled electrically driven traversers and one five-ton hand crane. (Tender No. 1 344). (Reference A.X. 7 023.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 6th.—Supply of 5-ton Diesel electric caterpillar crane (contract 1 350.) (Reference A.X. 7 015.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of instrument cords (schedule C. 374). (Reference B.X. 4 811.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of telephone generators (schedule C. 375). (Reference B.X. 4 812.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of 7-ton electrical overhead travelling crane (tender No. 1 347). (Reference A.X. 6 989.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of one electrically-driven, geared, maximum service, double housing planing machine (tender No. 1 356). (Reference A.X. 7 064.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/68.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically-operated deep dredger, for Yallourn Brown Coal Works (specification 28/94). Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of motor generating sets (schedule C. 377). (Reference B.X. 4 810.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of lamps, lamp caps and lamp sockets. (Schedule C.378). (Reference B.X. 4 819.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, December 20th.*—Supply of telegraph materials, including 30 600 tubular arms (4, 8 and 12-wire), 50 000 galvanised clipstalks; 180 000 insulators, 600 000 nails; 24 ft. iron poles (to specification 57A and drawing No. 609); 2 000 upper tubes, 2 000 bases, 2 000 screw rings and 2 000 lightning rods for same; parallel poles for farmer's lines (to specification No. 1 240 and drawing C.E. 134A); 5 000 upper tubes, 50 000 bases, and 50 000 wedges for same; 30 000 suspension rings, 80 000 spindles; 2 500 rolls of tape and 12 000 lb. of stranded steel wire. (Tender No. 134.) Schedule, specifications, etc., can be seen at the Department of Overseas Trade.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd.—Supply of 15 715 electric meters and spares.

## Tenders Accepted.

ARMAGH COUNTY INFIRMARY.—Schall and Sons, supply of X-ray apparatus, £671.

GALWAY HOMES ASSISTANCE COMMITTEE.—T. Ruane, supply and installation of electric motor, £83.

DUNDALK URBAN DISTRICT COUNCIL.—Premier Accumulator Co., Ltd., repair of storage battery.

BOSTON GUARDIANS.—G. H. Burton, electric light installation at the infirmary and chapel, £64 7s. 6d.

EPSOM URBAN DISTRICT COUNCIL.—English Electric Co., Ltd., insulating mat for foundations of power station extensions, £800.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., electric lighting installations at Rasford House and Hartnoll House, Islington, £1 023.

*THE stand of Metro-Vick Supplies, Ltd., at the Manchester Wireless Exhibition. The exhibit was attractively arranged with complete receivers for mains and battery operation, components and valves. The furnishing of the stand was considerably enhanced by the two lighting fittings which may be seen, while the "Metrovication" sign resulted in many additional inquiries.*

BRADFORD CORPORATION.—London and South East European Co., Ltd., provision of smoke consuming apparatus for a chimney at the power station, £350. (Recommended.)

SWINDON CORPORATION.—Premier Accumulator Co., Ltd., supply and erection of storage battery; G. and J. Weir, supply and erection of three turbine-driven boiler feed pumps.

STOKE-ON-TRENT CORPORATION.—Twelve months' supply of electric lamps: Robinson and Hands; Blackburn, Starling and Co.; Welsbach Light Co., Ltd.; J. V. Brittain and Co., Ltd., and Barnett and Soans.

GRIMSBY CORPORATION.—Electricars, Ltd., supply of electric low-loading vehicle, £495; Greenwich Cable Works, Ltd. (£4 318 6s. 8d.) and Messrs. Johnson and Phillips, Ltd. (£4 569), supply of cables. (All recommended.)

ROTHERHAM CORPORATION.—Supply of cables: Hogan and Wardrop, Ltd., £5 029, and Callender's Cable and Construction, Co., Ltd., £275. Ibbotson Bros., electric light installation at Thorpe Hesley school, £124 10s.; Lilleker Bros., Ltd., electric light installation at Thornhill school, £142 6s. (All recommended.)

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., one 10-way feeder pillar )with switches and fuses), for 0.25 sq. in. cable, £207 13s. 3d.; seven four-way pillars (fuses only), for 0.25 sq. in. cable, £46 4s. 9d. each; and two pillars (fuses only) for 0.15 sq. in. cable, £39 3s. 6d. each (less 2½ per cent. discount). (Recommended.) Also tendered: Siemens Bros. and Co., Ltd., £196, £42, £29 (2 per cent. discount). British Insulated Cables, Ltd., £198 10s., £58 5s., £52. Union Cable Co., Ltd., £225 (no switches), £50, £45. W. T. Glover and Co., Ltd., £113 7s. 6d. (no switches), £54, £47. Enfield Cable Co., Ltd., £211 5s. 6d., £46 4s. 9d., £39 3s. 6d. (2½ per cent. discount). General Electric Co., £203, £97, £73. W. Lucy and Co., £180, £33, £33. Johnson and Phillips, Ltd., seven four-way pillars (fuses only) for 0.25 sq. in. cable, £67 10s. each; two pillars (fuses only) for 0.15 sq. in. cable, £51 10s. each. General Electric Co., Ltd., supply of one 1 500 A feeder panel, £157 (recommended). Also tendered: British Thomson-Houston Co., Ltd., £130; Enfield Cable Works, Ltd., £145. Hewittic Electric Co., Ltd., supply and erection of three 300 kVA transformers, £682; General Electric Co., Ltd., supply and erection of three 11 000 V h.t. truck cubicles, £922, and supply and erection of lt. a.c. switchgear, £1 364. (All recommended). W. T. Henley's Telegraph Works Co., Ltd., supply of kiosk, £110, less 2½ per cent.; Hewittic Electric Co., Ltd., one 300 kVA transformer, £217 10s., and l.t. a.c. switchgear, £367.

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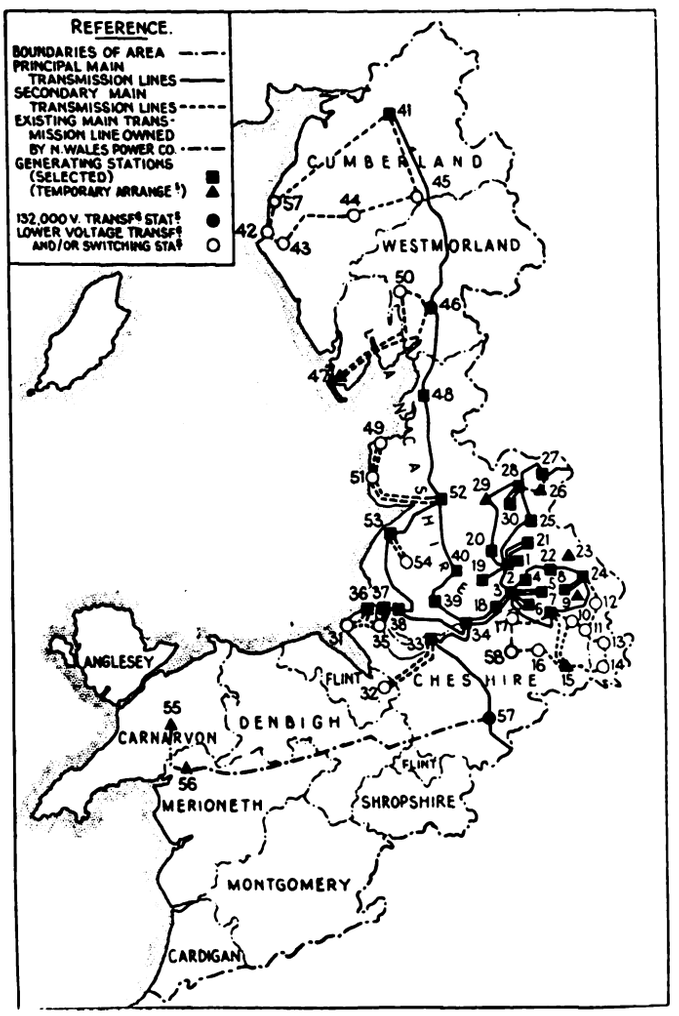
# ELECTRICITY SUPPLY.

## Map of North Western Electricity Area—Supply Commenced at Romsey—Proposed Extension of Scarborough Supply—Ilford's New Plant—Hackney's Saving on Electric Street Lighting—Opening of Wallasey Extension.

LOANS of £20 000 for mains, and £10 000 for sub-stations are sought by Bury (Lancs) T.C.

Torquay T.C. has applied for a further loan of £7,500 for transformers and switchgear for the primary sub-station at Sidbury.




**Illustrating the North West England and North Wales Area Electricity Scheme, as adopted by the Central Board, and of which full details were given in "The Electrician" last week. The existing selected stations are : (30) Accrington (Accrington Corp.) ; (3) Agecroft (Salford Corp.); (8) Ashton-under-Lyne (Ashton-under-Lyne Corp.) ; (10) Atherton (South Lancashire Tramways Co.) ; (24) Barton and Stuart Street (Manchester Corp.) ; (20) Bolton (Bolton Corp.) ; (21) Bury (Bury Corp.) ; (22) Chadderton (Oldham Corp.) ; (18) Hartshead (Stalybridge, Hyde, Mossley and Dukinfield Tramways and Elec. Bd.) ; (22) Kearsley ; (28) Padiham ; (1) Radcliffe (Lancashire E. P. Co.) ; (48) Lancaster (Lancaster Corp.) ; (38) Lister Drive (Liverpool Corp.) ; (27) Nelson (Nelson Corp.) ; (33) Percival Lane (Mersey P. Co., Ltd.) ; (25) Rawtenstall (Rawtenstall Corp.) ; (52) Ribble (Preston Corp.) ; (39) St. Helens (St. Helens Corp.) ; (53) Southport (Southport Corp.) ; (7) Stockport (Stockport Corp.) ; (6) Trafford (Stretford U.D.C.) ; (36) Wallasey (Wallasey Corp.) ; (34) Warrington (Warrington Corp.) ; (40) Wigan (Wigan Corp.) ; (41) Willowholme (Carlisle Corp.).**

The electricity supply in Romsey (Hants), provided by the West Hampshire Electricity Co., has been switched on. A three days' electrical exhibition is being held to signalise the new departure.

Stoke-on-Trent Electricity Committee has arranged to provide electricity for trial electric furnaces on the premises of Taylor, Tunnicliff and Co., Ltd., and Harrison and Son (Hanley), Ltd., at 1d. per kWh.

Brighton Electricity Committee is to seek sanction for a loan of £8 267 for lighting improvements in London Road, Dyke Road, and Lewes Road, and to increase, by direct labour, the feeders in the vicinity of the Aquarium, at a cost of £2 750.

Scarborough Electricity Committee reports that at interviews with officials in London the Committee has been urged to provide electricity for all the districts for which the Corporation has a Fringe Order. The cost would be from £40 000 to £50 000.

Eastbourne Electricity Committee has arranged to give special terms to the Lightfoot Refrigeration Co. in respect of electric motors which are to replace gas engine plant on the premises of the Eastbourne Ice and Cold Storage Co. The cost to the Electricity Department is estimated at £946.

At Carnarvon Chamber of Commerce last week a resolution was moved to recommend the T.C. to take over the local electricity supply undertaking of the National Electric Construction Co., upon the expiration of the company's lease. Discussion on the matter was adjourned to the next meeting.

Ilford Electricity Committee is to invite tenders for an additional 1 000 kW converter for the Grove Road sub-station.—The Committee has made application for a loan of £50 000 for mains and service.—The Corporation is seeking an Order to supply a further area in Epping rural district.

The borough treasurer has reported to Hackney (London) Borough Council upon the cost of street lighting in the borough, the whole of which has been converted from gas to electric. In 1923-4, the last year prior to the commencement of the conversion, the cost was £19 053. In the year ended March 31st, 1928, the cost was £15 290, or £15 604, after making certain adjustments, including £276 paid to the Gas Light and Coke Co. The saving as a result of conversion is, therefore, £3 449. Without taking into consideration the Unemployment Grants Committee's grant of £2 521 per annum, there is still an advantage in favour of conversion to electricity of £928.

At Wallasey Corporation's generating station at Poulton, which has been recognised by the Central Electricity Board as a selected station, an extension, costing £150 000, was formally opened last Friday in the presence of three members of the Board, Mrs. J. M'Millan, the Mayoress, performing the opening ceremony. The new plant includes a 12 500 kW turbo-generator. Ald. Hughes, chairman of the Electricity Committee, said that when he first joined the committee in 1912 they generated 3 500 000 kWh per year, whereas it was last year 34 750 000 kWh, while the number of consumers had increased from 3 464 to 11 731. The committee hoped in the near future to introduce several schemes which would popularise electricity in the smaller houses. The position of the undertaking was due in a large measure to the skill and energy of their engineer, Mr. Hawkins.

Glasgow Corporation Electricity Committee recommends the following works in connection with the standardisation of frequency : Extensions of mains : Govan Destructor works to Linthouse sub-station, £4 711 ; Drumpyne to Linthouse, £2 906, and Maxwell Park to Fleurs Avenue sub-station, £2 341 ; alterations to feeder cable at Govan sub-station, £493 ; alterations of 6 500 V cables at Linthouse, £220 ; sectioning off Port Dundas and Springburn main distribution groups, £270 ; 20 000 V switchgear at Govan, Linthouse and destructor works sub-stations, £2 833 ; 6 500 V switchgear at Linthouse, Stephens, Drumoyne, Fleurs Avenue and Maxwell Park sub-stations, £1 515 ; double tier switchgear for Langside sub-station, £2 217 ; rotary converters, Govan area ; Metropolitan-Vickers Electrical Co., Ltd., £23 146 5s. 6d. ; English Electric Co., Ltd., £8 083 11s. 6d. ; Electric Construction Co., Ltd., £7 668 ; General Electric Co., Ltd., £3 131 ; Crompton Parkinson, Ltd., £1 156.

On Friday last Mr. F. Gordon Tucker held an inquiry on behalf of the Minister of Transport into the application of the Boston and District Electric Supply Co., Ltd., for compulsory wayleaves over certain lands in connection with the Boston-Holbeach transmission line. The objectors were Mr. W. Bettinson, Mr. Thomas Major, and Mr. George Major. In the case of Mr. Thomas Major, the difficulty was overcome and settled. In the case of Mr. George Major, only four poles, over a 73-acre steam-cultivated field, remained in dispute. It was contended that a large span or underground cable should be adopted, but in this case and in that of Mr. Bettinson no definite agreement resulted. Mr. Tucker visited the lands of the objectors, a partial agreement being reached in the case of Mr. Bettinson, but no definite agreement in the case of Mr. G. Major. The Minister will announce his decision in due course.

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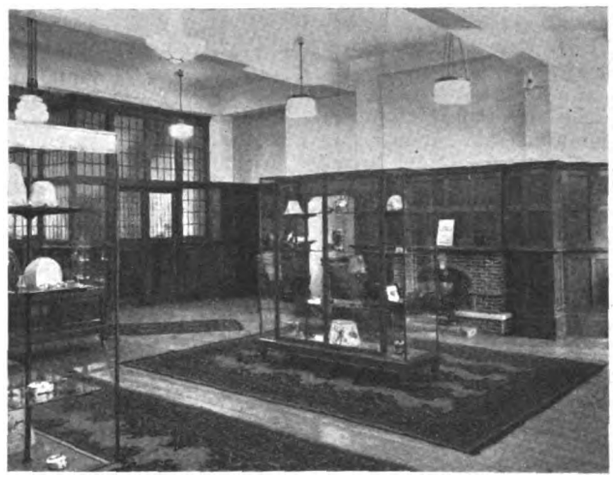
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Mr. W. J. Thorrowgood, whose death is announced on page 500. He was, until his retirement, Signal and Telegraph Superintendent of the Southern Railway, and designed the four-aspect colour light signals at many of London's railway termini.

There concluded last week, at Watford, a very successful electrical exhibition held by the Corporation Electricity Department in connection with a local shopping week. A large house, the opening ceremony of which is seen above, served as the exhibition building, and demonstrations of electric cooking were given throughout the week. The exterior of the house, and the local pond, with a yacht in sail, were outlined in electric light, while the town itself was also specially illuminated. Further details, together with the names of the exhibitors, will be found on page 502.



The new central offices and showrooms of Fulham Electricity Department, in Walham Green Broadway, were officially opened by the Mayor, Ald. W. J. Waldron, on October 24th. The requirements of over 14 000 consumers will be controlled from these new offices, while demonstrations and explanations are given in the showrooms to anyone desiring further information. The left-hand picture shows the large and airy electric kitchen, where cookers, etc., in operation are exhibited, while the right-hand picture shows the main showroom.

Grimsby Electricity Committee is to provide a supply to Tetney Village at a cost of £3 300.

Portland Electricity Committee seeks sanction for a loan of £10 000 for works in connection with the electricity scheme.

Mr. W. Redman, electrical engineer to Shipley U.D.C. has been instructed to extend the cable to give supplies to applicants at Windhill.

The Ministry of Transport has sanctioned the proposal of Torquay Electricity Committee to erect overhead lines in the rural and urban districts of Newton Abbot.

Barnstaple T.C. has received sanction to loans of £1 000 for mains and services, £300 for meters, £18 273 for mains, £2 191 for switchgear, £3 230 for generating plant, and £284 for a battery.

Bradford Electricity Committee is to change over the system in the Barkerend Road and Leeds Road districts to a.c. at a cost of £9 000. The Committee is to seek sanction for a further loan of £20 000 for mains extensions.

Stoke Newington (London) Electricity Committee is to extend its mains at a cost of £1 326. The Committee is to undertake further free wiring installations, at a cost of £575, and estimated to yield an annual revenue of £23.

Subject to borrowing powers being obtained, Chester Corporation intends to carry out the mains extensions outlined in the Special Order obtained last year, mainly in Tarvin and Tarporley. The cost of the scheme will be £20 000.

The Ascot and District Electricity Co. desire to instal an overhead service at West Chobham, which would have the effect of reducing the cost of installation to residences in that area. Chertsey R.D.C. has decided to raise no objection to the proposal.

Kington U.D.C. has received from Hereford City Council a communication stating that Mr. J. H. Langston, of Kington, has intimated his intention to apply for an Order to supply electricity to Kington, and for the revocation of the Order held by Hereford Corporation for the district.

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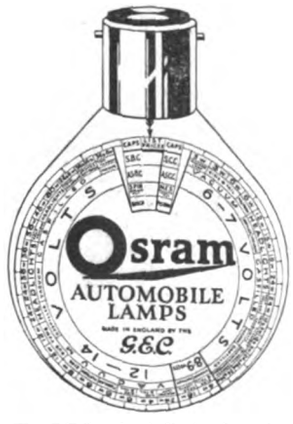
# TRADE PUBLICATIONS.

THE Edison Swan Electric Co., Ltd., has just issued new literature for the home construction 1929 R.C. Threesome Circuits. Wiring diagrams, lists of components, valves to use, and details as to operation are all given.

The multitude of types and sizes of automobile lamps has at times caused a good deal of confusion as to the correct price of each. To overcome this the General Electric Co., Ltd., has designed an interesting form of rotatable price indicator which goes a long way towards removing the bugbear, especially at "all night" garages, where there is a frequent demand for lamps at hours when the regular staff is not available, and the attendant on duty has usually but little knowledge of current lamp prices. The automobile lamp price indicator shows at a glance the price of any type of Osram automobile lamp, no matter what the voltage, wattage, or type of cap may be; and thus the price is instantly available for lamps suitable for all British, American, or Continental makes of cars. To arrive at the price of any given type of lamp it is only necessary to rotate the centre disc until the particular type of lamp required registers with the indicating arrow shown at the top of the chart. The price will then appear automatically in the slotted opening. The indicator is shaped after the style of a giant automobile lamp. Of handsome appearance, it can be attached to wall, counter, or showcase, so that it can be consulted at all times without trouble or delay. As a showcard it is attractive, while as a guide to prices it will be found of inestimable benefit to buyer and seller alike.



The G.E.C. price indicator for automobile lamps.

B.E.N. Patents, Ltd., have published a new catalogue of their equipment.

A complete list of new valves and their prices has been published by the Marconiphone Co., Ltd.

The Wholesale Fittings Co., Ltd., has issued Supplement No. 216 dealing with dry batteries, flash lamps and accessories.

"Induced Draught and Flue Dust Arresting" is the title given to a new publication by the James Keith and Blackman Co., Ltd.

A new catalogue of electric lighting accessories and fittings, telephones, bells, motors, etc., has been issued by Falk, Stadelmann and Co., Ltd.

Volta, Ltd., has published a new leaflet devoted to the Volta V electric vacuum cleaner. A special leaflet dealing with the SM II industrial cleaner has also been issued.

The current issue of "The Relay Recorder," published by the Relay Automatic Telephone Co., Ltd., contains a list of some recent contracts, and includes a short description of the installation of the Sarawak Oilfields Co., Ltd., at Miri.

### N.E. COAST LIGHTING SERVICE BUREAU.

For the purpose of the Factory Lighting Campaign, Mr. E. S. Evans has taken over the duties of Technical Engineer for the North Midland Area in addition to the North East Coast area. During September meetings of all the principal circles were called, at which he gave details of the campaign, and a short lecture on "The Principles of Modern Factory Lighting." These included Leeds, Sheffield, Halifax, Harrogate, Doncaster, Bingley, Carlisle, West Hartlepool, South Shields, Wakefield, Hull, Bridlington, Sunderland, Berwick, Whitley Bay, North Shields, Newcastle-on-Tyne, Redcar, Rotherham, York, and Huddersfield. In all areas, the circle Committees decided to support the campaign, and to arrange lectures and demonstrations to factory owners at the earliest opportunity.

A lecture on Wednesday was combined with a meeting of the Illuminating Engineering Society at Newcastle, at which Mr. J. L.H. Cooper gave his paper entitled "Lighting in the Engineering Industries." Sir Charles Parsons took the chair, and Sir Thomas Oliver and Professor Thornton opened the discussion. A considerable interest is still being shown by individual visitors to the Bureau, the numbers for which during the past two months average ten per day.

# LIGHT MEASUREMENT.

NOW that it is being recognised that correct illumination is an essential to commercial efficiency the need is arising for an instrument which will register the standard of illumination on any particular spot, and it is interesting to note that Philips Lamps, Ltd., have introduced a novel meter which gives measurements in the unit commonly employed, viz., foot candles. The instrument is of simple construction, using a lamp operated by two 4½ V flash lamp batteries, run in series; this is placed under an accurately graded scale and lights up when a small button is pressed. The meter is then placed on the locality it is desired to measure and the illumination in foot candles can be read on the scale. The lamp referred to is controlled by a resistance lamp which automatically regulates the current flowing through the main lamp, thus ensuring that the latter gives constant illumination to the scale and obviating the danger of obtaining fallacious readings owing to poor batteries. In addition, another lamp is placed in the circuit as a pilot device and upon pressing the test button, this should glow red; if no glow appears, it denotes that the batteries are too low to give accurate readings. The scale of the meter is capable of giving readings from 0·1—40 foot-candles. By the use of a small lever near the press button it is possible to reduce the light emitted by the lamp to one-tenth. The illumination indicated on the scale must then be multiplied by 0·1 in order to obtain the true value. In this way readings in the neighbourhood of from 0·1 to 4·0 foot candles are facilitated. Since the throwing over of the lever in order to obtain a reduction of one-tenth of the value on the scale is only a mechanical limitation of the light emitted by the lamp, the colour of the light itself is not altered, so that the reading of small intensities is equally as simple as the measuring of higher ones.

Philips Lamps, Ltd., have also constructed a range of large capacity rectifiers of various outputs. including a type which, by means of a tapping switch, permits of variation of the charging rate to any number of cells from 3 to 30 at a maximum of 6 A. An additional output regulator is also provided in the form of a sliding resistance which permits of a close adjustment of the charging rate. A moving coil precision ammeter is incorporated for checking the rate of charging. The rectifier can be turned on or off at will without disconnecting the accumulators on charge, by means of a rotary double pole switch, while the current consumption of the charger when fully loaded is 700 W. The output circuit is suitably fused and to comply with the requirements of electricity undertakings, an earthing terminal is provided.

## THE INDIVIDUALIST BOOKSHOP.

### Opening Meeting of the Winter Session—Views on Socialism at First Luncheon.

THE eighteenth Individualist Luncheon, and first of the winter session, was held on October 24th, at the First Avenue Hotel, London, with the Rt. Hon. the Viscount Leverhulme in the Chair, and the Right Hon. Sir Robert Horne as the principal speaker.

SIR ROBERT HORNE said he believed in the necessity for individuals working out their own salvation and conducting their own affairs without outside interference. At present the attack on Individualism and Capitalism was in its crudest form. It was comparatively simple to point out the wrongs and ascribe them to the system under which one lived, but at the same time one had also evidence of the fiasco brought about by Socialism. He quoted Russia as an example of the results of Socialist administration, as being sufficient to show that there was nothing to be gained by working along these lines. Referring to the recent gathering of the Socialist Party, Sir Robert spoke of the suggestion by Mr. Snowden, contrary to all Socialist tenets, of encouragement to capital investment, followed somewhat inconsistently by the statement that he, as a Socialist Chancellor of the Exchequer, intended to tax with much more severity accumulated savings and high incomes. Though necessary, such taxation should be restricted within the narrowest possible limits, for they are, in the main, the source of future employment in this country.

For the opening "Tea-time Talk" on November 5th Sir Ernest Benn will speak on "The Case for the Consumer." The following week Sir Hugh Bell will give his views on the recent Economic Conference at Prague, while another speaker in November will be Mr. P. A. Molteno, on the subject of "America." Meetings will be held every Monday at five p.m. at 84, Charing Cross Road.

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# COMPANY NEWS.

## Slump in Electrical Securities—Power Companies' Increases of Capital—Drake and Gorham's Busy Year—Electrical Manufacturers' Combine—Agricultural and General Engineers' Meeting—Dividends and Reports—New Companies.

THE recent activity in share markets turned to liquidation at the beginning of the week, and a number of electrical descriptions are marked down to lower quotations. Marconi's Wireless shares have lost half-a-crown, and Eastern Telegraph stock 3 points. Lighting shares have been weak, City of London ordinary, at under 32s., being 1s. 3d. lower, and Metropolitan nearly 2s. at 45s. Thomson-Houston 7 per cent. deb. are 3 points down, and Callender's and Siemens shares 1s. 3d. Metropolitan-Vickers ord. rose to 36s. 3d.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1928 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| | **% Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*c*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord... | 31/10½ | 33/1½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 42/- | 43/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. | 26/6 | 27/- | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 45/- | 46/10½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, ,, Elec. Sup. Ord. .. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P... .. | 23/-* | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B. Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 38/- | 38/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk... | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb... .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb... | 77½* | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk... | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb... | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. "A" Deb. .. | 97½ | 90½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 65 | 65 | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 79 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 26/- | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 83/9 | 83/9 | 86/3 | 26/6 |
| 6 | ,, ,, 6% C.P... | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb | 103* | 106 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 83/9* | 85/- | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P... .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 26/3 | 26/3 | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf | 19/- | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/- | 26/6 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord... .. .. | 42/- | 42/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 36/3 | 34/4½ | 37/- | 13/1 |
| 8 | ,, ,, ,, 8% C.P. (£2) | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/9 | 30/- | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25/- | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 256½ | 259½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 69½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 26 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 29 | 29 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½* | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 73/9 | 76/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 55/6 | 55/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7 7/8d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.

* Ex dividend. ‡ Including 1s. bonus.

RIVER PLATE ELECTRICITY CO., LTD.—Intm. div. of 3 p.c., less tax (same rate as last year), on ord. shs. is now payable.

CORWEN ELECTRIC LIGHT CO., LTD.—A div. of 10 p.c., tax free, has been declared, and £50 has been placed to sinkg. fd.

URBAN ELECTRIC SUPPLY CO., LTD.—Intm. div. at rate of 6 p.c. p.a., less tax (same rate as last year) is payable on ord. shs.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Ord. sh. transfer books are closed until Nov. 14, inclusive, preparatory to paymt. of intm. div. of 3 p.c., less tax, on Nov. 15.

CROMPTON PARKINSON, LTD.—Designatn. of co's. shs. has been altered. Pref. shs. are now described as 8 p.c. cum. pref. shs.; pfd. ord. shs. as 6 p.c. cum. 2nd. pref. shs.; and dfd. ord. shs. as ord. shs.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—An extraordinary mtg. will be held at Leeds on Nov. 6 to consider resolutn. for increase of cap. by the creatn. of 500 000 additional £1 shs., to rank *pari passu* with shs. of the original cap. of £1 000 000.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—An extraordinary gen. mtg. will be held on Nov. 16 to consider a resolutn. to create 500 000 new £1 shs., to be called B ord. shs. and to rank *pari passu* with existg. 500 000 B ord. shs.

EVER READY CO. (GREAT BRITAIN), LTD.—For half-year ended Sept. 30, 1928, intm. div. has been declared at rate of 10 p.c. p.a. on pref. shs., and 10 p.c. actual on ord. shs., both payable on Nov. 30. Transfer books will be closed from Nov. 23 to 30, inclusive.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The committee of the Marconi Irish shareholders' Association, on October 22nd, passed a resolution that the committee had under consideration a reply from the board, dealing with the division of shares in the proposed merger company, and also a fairly full statement giving clear indications of proposals. Both were deemed very satisfactory, and the committee was of opinion that the 10s. shareholders would find that they had been fairly treated when the proposals had been circulated by the merger company.

EVERLITE, LTD.—Subscribers for pref. shs. in Metropole Gramophone Co., Ltd., are invited to subscribe for 195 000 1s. ord. shs. of Everlite, Ltd. The co. has been incorporated to acquire and develop an inventn. relating to a novel, simple and economical method of generatg. electricity by the medium of a hermetically sealed wet battery, the discovery of Dr. Alfred Schmid, professor of physico-chemistry in the University of Basle. In the applicatn. of the inventn. to lamps and similar articles advantages claimed are that the light generated remains constant throughout the life of the charge, and that refills can be easily and safely transported and stored. The closing date for applicatns. has been extended to November 8th.

ELECTRICAL MANUFACTURERS' COMBINE.—With a view to securing closer co-operation and reduced costs, and consequent reduction of selling prices, a combination has been carried out embracing the Metropolitan-Vickers Electrical Co., Ltd., the British-Thomson Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd., the Metropolitan-Vickers Co. having acquired a large majority of the ordinary shares of the other companies and also a large majority of the preference shares of Ferguson, Pailin, Ltd. Steps are being taken to change the name of the Metropolitan-Vickers Co., of which Mr. H. C. Lewis will be chairman and Sir Philip Nash managing director. It is stated that the existing companies will retain their separate identity, and purchasers will receive the same attention as in the past. Further details will be found on page 503.

UNITED ELECTRIC TRAMWAYS CO. OF CARACAS, LTD.—Rpt. for year ended June 30th, 1928, states that due to competition by omnibuses, net rev. was only £4 947, compared with £24 598 in 1926–27. Blce. fwd. was £40 906, but directors do not recommend div., but propose to carry fwd the blce. available (£45 854). Gross receipts, Bs.2 471 903 show a decrease of Bs.481 539, while exes. at Bs.1 907 643 increased by Bs.130 088, leavg. net receipts Bs.474 260, a decrease of Bs.611 627. Increase in exes. of £5 152 is mainly due to ncreased cost of maintenance of older cars and heavier

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expenditure on permanent way. Local company, after setting aside Bs.50 000 to res. and renewal fds. and paying a div. amtg. to Bs.166 710 (at exchange of 25.25, equal to £6 602), carries fwd. same amt. as last year. An expert who was sent to Caracas reported that there was a large passenger movemt. which could not be adequately dealt with by tramway and that omnibuses had become a necessity. He advised that co. should participate in omnibus traffic, and, acting on this advice, directors, through the local co., have bought up several lines of omnibuses and will add to the number of vehicles as the traffic demands.

## Company Meetings.

DRAKE AND GORHAM, LTD.—Mr. B. M. Drake, presiding at the meeting on Tuesday, said as the profit for the past year was only £40 more than for 1927 and as the turnover was more than twice the amount of their capital, it showed that they were maintaining the policy of working at a small percentage of profit. Now that the superiority of electric light was universally admitted, their concern was to educate the public as to the risks which they incurred in accepting the lowest price regardless of the competence of the contractor or the quality of the materials used. This country was making a bold experiment in standardising for alternating current supply a voltage or pressure twice as great as other nations had considered safe to adopt, and alternating current was much more dangerous than direct current at the same voltage. Unless, therefore, skilled workmen under qualified supervision were employed, and special safeguards were adopted, the number of fatalities that have already occurred was bound to increase. He would have preferred to see the use of alternating current limited to the conveyance of power from the super-stations to the town, the final distribution to the consumer being direct current, which permitted of the economical use of storage batteries, the only real safeguard against sudden extinction. He ventured to prophesy that in course of time the banks and large premises, where sudden extinction was serious, would demand such a service. The chairman then gave a list of numerous contracts completed or being carried out by the company, which included Lloyds Bank new head offices (2 363 lights, 59 heating and 300 vacuum cleaner points, lifts, and pumps; total, 1 300 kW); about 3 000 lights wired for Fixed Price Light Co. at Poplar; and cabling for about 2 500 H.P. of motors at Michelin Tyre Co.'s new works. The turnover in London work, he said, had doubled, and the reception of their Metesco switch fuse for 6 600 and 12 500 V was most gratifying. The report and accounts were adopted.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—Mr. G. E. Rowland, presiding at the meeting last week, said their associated companies had increased their manufacturing profit during the past year by £40 862, and, by economies, they had increased their net profit by £47 664 to £148 379. After deducting depreciation, taxation and dividends a net balance of £53 945 remained, an increase of £40 635. Taking the group as a whole, there was, after paying £38 246 for interest, an appreciation of assets of £20 255 as a result of the year's working. He was asked to remove some misapprehensions that still existed as to that concern, and which had prejudiced them at home and abroad. A.G.E., Ltd., was not a vertical combine, but a holding company, controlling a group of 14 firms, with an average existence of 100 years, supplying almost entirely the mechanical equipment a farmer required, and on its engineering side, a great range of products. The Chairman then gave details of assets acquired in 1919, amounting to £2 187 409, which, he said, included nothing for goodwill, and further assets acquired in 1920, amounting to £2 887 444. Their sales, which until the coal strike in 1926 had substantially progressed, had now almost overcome the setback they then received. With the further steps they were taking, that concern should be able shortly to obtain the 10 per cent. additional turnover required to reach a satisfactory profit-earning stage. He had been asked to express an opinion as to the method of dealing with the arrears of cumulative interest on their preference shares. The profitable employment of their buildings and plants to 75 per cent. of their capacity, as should be the case before long, would, as already shown, justify their revaluation on a basis more commensurate with their actual value. Were they so employed and valued they would to-day stand at over £2 500 000, against the greatly depreciated figure of £1 554 947 at which they actually stood at March 31st last in the company's books. When the board were satisfied that the concern had reached the stage that regular and annual profits could be relied upon, he proposed suggesting to them that their assets be revalued on a profit-earning basis, and the capital restored to nearer its original figure. The surplus thus disclosed could be utilised in discharge of the arrears of interest which would be then due. Davey Paxman reported that they had been very successful in obtaining orders for their cold-starting vertical oil engines with Blackstone's spring injection and their own patent exhaust valve gear. They had recently successfully installed for the Ashford District Council one of their eight-cylinder engines of 935 B.H.P. when running at 300 revs. per min., coupled to a 600 kW three-phase alternator. This, he believed, was the largest airless injection engine installed in this country. Howard's reported increasing sales of their abattoir machinery, and the demands for their petrol locomotives continued to expand. The Bull a.c. and d.c. motors were also commanding very satisfactory and increasing sales. The report and accounts were adopted.

## New Companies.

ELECTRO-THERMAL CO. (Inc. in Ohio, U.S.A.).—British address, 3, Lower John Street, London, W.1.

CYLINDRICITY, LTD.—Cap., £1 000. Welders and repairers of metal and machinery, etc. Reg. office: 83, Cannon Street, London, E.C.4.

CAERSWS ELECTRIC SUPPLY CO., LTD.—Cap., £2 300.—Electric light company. Reg. office: The Laurels, Caersws, Montgomeryshire. (Public co.)

EARLSDON RADIO SUPPLIES, LTD.—Cap., £500. Manufacturers, factors and selling agents of radio and electrical articles, etc. Reg. office: 25, William Street, Newark-on-Trent.

ELECTRIC STORE, LTD.—Cap., £1 000. Manufacturers and factors of electrical goods, wireless receivers and instruments, etc. Reg. Office: 6, Southchurch Road, Southend-on-Sea.

ELECTRICAL AUTOMATICS, LTD.—Cap., £500. Makers of and dealers in automatic and other machines, electrical or otherwise, etc. Solicitor: H. J. Shepard, 40, Chancery Lane, London, W.C.2.

REGAL RADIO, LTD.—Cap., £300. Electrical and wireless engineers, manufacturers of and dealers in and repairers of wireless and radio apparatus, etc. Solicitors: J. M. Hawkins, 44, Bedford Row, London, W.C.

## METAL AND CHEMICAL PRICES.

TUESDAY, October 30th.

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected .. | per ton | £71 5 0 | 2 5 0 | — |
| Electro Wirebars | ,, | £74 7 0 | 2 5 0 | — |
| H.C. Wires, basis | per lb. | 10¼d. | 1/16d. | — |
| Sheet .. .. | ,, | 10½d. | 1/16d. | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis .. .. | per lb. | 1s. 1½d. | 1/16d. | — |
| *Brass* 60/40— | | | | |
| Rod, basis .. | per lb. | 8½d. | — | — |
| Sheet ,, .. | ,, | 9⅞d. | — | — |
| Wire ,, .. | ,, | 10¼d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8.S.W.G. .. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English .. .. | per ton | £23 10 0 | — | — |
| Foreign or Colonial | ,, | £22 2 6 | — | — |
| *Tin*— | | | | |
| Ingot .. .. | per ton | £223 5 0 | — | £1 15 0 |
| Wire, basis .. | per lb. | 2s. 11d. | — | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* .. .. | ,, | £24 0 0 | — | 2s. 6d. |
| *Mercury* .. .. | per bottle | £23 2 6 | 2s. 6d. | — |
| *Sulphur*—Flowers, per ton | | £12 0 0 | — | — |
| ,, Roll | ,, | £10 15 0 | — | — |
| *Copper Sulphate* | ,, | £25 to £25 10 0 | — | — |
| *Boric Acid* (Crystals) | ,, | £30 0 0 | — | — |
| *Sulphuric Acid*— (Pyrites, 168°) | ,, | £6 15 0 | — | — |
| *Sodium Chlorate* | per lb. | 2¾d. | — | — |
| *Sodium Bichromate* | ,, | 3½d. | — | — |

*Rubber*—Para fine, 11d.; plantation, 1st latex, 8 11/16d.

∴ The metal prices are supplied by British Insulated Cables, Ltd.

### LEAD MARKET REPORT.

With regard to the lead market, James Forster and Co., state that last week was dull and uninteresting, prices scarcely varying from day to day. The highest prices touched were on Monday, when October sold at £22 5s. and January at £21 17s. 6d.

In New York, where quiet conditions prevailed, the price was unchanged at 6.50 cents per lb.

Closing prices on October 26th were £22 2s. 6d. for October, £22 for November, £21 17s. 6d. for December, and £21 15s. for January, 1s. 3d. to 2s. 6d. per ton lower on the week.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALLCOCK, H. E., Kenneth Road, Thundersley, wireless dealer. £12 12s. 9d. September 11th.

ARTHUR, H., 16, Cheetham Street, Rochdale, wireless engineer. £18 8s. September 20th.

AYLIFFE, V. A., 2, Kingsway Avenue, Levenshulme, Manchester, electrical engineer. £12 15s. September 13th.

BISHOP, E. C., Church Street, Welshpool, radio dealer, £19 15s. 5d. September 19th.

CROOK, Robert, Hammonds Yard, King Street, Huddersfield, wireless dealer. £28 3s. September 15th.

DIAMOND, M. (trading as R. DIAMOND), 73, Bell Street, Hightown, Manchester, wireless dealer. £10 1s. 9d. September 20.

ELECT RADIO, LTD., 25, Westbourne Grove, W. £16 7s. 7d. September 19th.

FLOWER, John, 412, Camden Road, N.W., electrical factor. £10 6s. 4d. September 21st.

HATHERLEY, Thomas G. (trading as MIDLAND BATTERY SERVICE CO.), Fryer Street, Wolverhampton, electrical engineer. £14 12s. 8d. September 27th.

HOWARD, J., 10, Hudson Road, Sunderland, electrical dealer. £19 2s. 1d. September 12th.

ROBINSON, George W., 11-14, Portsea Mews, Portsea Place, W., electrical engineer. £16 10s. September 24.

RYALL, Alf., 69, Boundary Road, Hove, wireless dealer. £15 0s. 10d. September 14th.

SWORD AND CO., 20, Withington Road, Whalley Range, electricians. £11 14s. 6d. September 24th.

## Deed of Arrangement.

WILSHAW, George Marshall, and SHARPE, George, trading at 320, Padiham Road, Burnley, as WILSHAW AND SHARPE, electrical engineers. Dated October 22nd, filed October 26th. Trustee, F. Clarkson, Hargreaves Street, Burnley, accountant. Liabilities unsecured, £772; assets, less secured claims, £386.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

RIGBY, Thos., LTD., electrical contractors, Leeds. In pursuance of the provisions of the Companies (Consolidation) Act, a meeting of the creditors of the above was held recently at the Hotel Metropole, King Street, Leeds. Mr. S. Croudson, the liquidator, submitted a statement of affairs which showed ranking liabilities of £1 551, made up as follows: trade creditors, £316; cash creditors, £1 178; and bankers, £57. After allowing £39 for preferential claims, the net assets were £313, or a deficiency of £1 237. The assets consisted of fixtures and fittings £106, valued at £50; stock £189, expected to produce £125; book debts £196, valued at £176; and cash in hand £1. It was reported that the company was registered in December, 1920, to acquire the business of an electrical contractor which had been carried on by Mr. Thos. Rigby since 1897. The nominal capital of the company was £1,000, of which £853 had been allotted. Shares to the value of £301 were issued for cash, and 552 shares of £1 each were allotted to the vendor. The trading figures showed that in the first year the turnover was £1 865 and it gradually increased until in 1925 it was £2 790. Since that time, however, the sales had declined and during the 54 weeks to October 10th last were only £1 446 The gross profit had ranged from 12 per cent. to 18 per cent., but in each year there had been a small net loss on the trading. A resolution was passed confirming the voluntary liquidation of the company with Mr. Croudson as liquidator.

## London Gazette, etc.

### Winding-up Petition.

T. L. KAY AND CO., LTD. A creditor's petition for winding-up has been presented by J. Dyson and Co., Ltd., 5 and 7, Godwin Street, Bradford, manufacturers of electrical and radio equipment, and is to be heard at the Law Courts, Clifford Street, York, on November 27th.

### Company Winding-up Voluntarily.

KINGSMILL ART METAL AND ELECTRICAL CO., LTD. By reason of its liabilities, October 16th. W. H. Dunn, Chartered Accountant, 57, Lodge Road, Croydon, appointed voluntary liquidator.

### Bankruptcy Information.

ANGERS, Arthur, trading as A. ANGERS AND CO., 19, Bristol Road, Wavertree, Liverpool, electrical engineer. Receiving order, October 24th. Creditor's petition.

CHARLEY, Henry Victor (trading as DINAS POWIS ELECTRICAL SUPPLY CO.), Station Road, Dinas Powis, Glamorgan, electrical engineer. Receiving order, October 18th. Creditor's petition.

COHEN, George, 49, Newman Street, Oxford Street, London, electrical engineer. First meeting, November 2nd, 11 a.m., and public examination, December 5th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

MEREDITH, Charles James, 36, Union Street, lately at the rear of Princes Road, Torquay, Devonshire, electrician. Public examination, November 14th, 11 a.m., The Castle, Exeter.

SOUTHWOOD, Thomas Southwood Smith, Pound Farm, Whyke Road, Chichester, Sussex, electrical engineer. Receiving order, October 24th. Debtor's petition. First meeting, November 8th, 11.30 a.m., Official Receiver's Offices, 12A, Marlborough Place, Brighton. Public examination, November 21st, 11 a.m., Court House, Church Street, Brighton.

SPRAGUE, Frederick Charles, 44, Victoria Avenue, Mumbles, Swansea, electrician. Receiving order, October 25th. Creditor's petition.

WARMINGTON, H. R., 26, Stackpool Road, Southville, Bristol, electrical engineer and contractor. Receiving order, October 25th. Creditor's petition.

WESTNUTT, John Victor, High Street North, Dunstable, electrical engineer. Receiving order, October 27th. Debtor's petition.

### Notice of Dividend.

EDWARDS, Arthur Mansell, 111B, High Street, Blackwood, Monmouth, electrical engineer, trading as MANSELL EDWARDS AND CO. First and final dividend, 10¾d. per £, payable November 2nd, Official Receiver's Office, 34, Park Place, Cardiff.

### Notices of Intended Dividends.

COOPER, Arthur Coath, 1A, Sherwood Street, Scarborough, electrical engineer. Last day for receiving proofs, November 10th. Trustee, D. S. Mackay, 48, Westborough, Scarborough, Official Receiver.

LACEY, Walter Thomas, 10, George Street, Bath, electrical engineer and contractor. Last day for receiving proofs, November 9th. Trustee, H. Ashton, 26, Baldwin Street, Bristol, Official Receiver.

## Bankruptcy Proceedings.

CAVE, John and BOWLER, Thomas William, trading as TAYLOR AND WYNNE, Back 180, Green Lane, Small Heath, Birmingham, electrical engineers. A deficiency of £471 was shown in the statement of affairs presented at the first meeting of creditors held on October 26th at the Official Receiver's Office, 191, Corporation Street, Birmingham. It appeared that the debtor Cave commenced business on his own account in December, 1921, with a capital of £5. He was joined in partnership in 1923 by the debtor Bowler. The latter's liabilities amount to £2 11s. 6d. and his assets to £25 8s. 2d., leaving a surplus of £22 16s. 8d. to be transferred to the joint estate. This debtor deposited with the partnership bankers a policy on his life for £500 dated 1920, and the value of such security was £124 4s. in respect of which there would be a surplus of £6 11s. 4d. The case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate.

JACOBS, Raymond John, late of 30D, Gt. Sutton Street, London, E.C. Formerly a factor of electrical accessories, the debtor has more recently carried on business as a wholesale dealer in wireless accessories. He was adjudicated bankrupt in December, 1926, and in the London Bankruptcy Court last week he applied to Mr. Registrar Francke for his order of discharge. The Official Receiver said that he estimated the total of the unsecured indebtedness at £8 549, and the assets, valued by the debtor at £35, had realised that sum. No dividend had been, or could be, paid. In June, 1907, the debtor began business in partnership with another person as factors of electrical accessories in King William Street, under the style of W. and R. Jacobs, with a joint capital of £1 000, provided equally. In 1915 they removed to 94, Leonard Street, E.C. In that year they sold the business to W. A. and R. J. Jacobs, Ltd., of which the debtor acted as joint managing director, latterly at a remuneration of £1 500 a year until the voluntary liquidation of the company in September, 1920. He afterwards carried on business as a metal stamper in Batches Street, and in August, 1922, with £200, found by a relative, he began business as a wholesale dealer in wireless accessories at Imperial Buildings, Oxford Road, Manchester. This business he carried on until April, 1924, and he afterwards acted as managing director of Brijane, Ltd., until October, 1926. The debtor attributed his insolvency to the failure of W. A. and R. J. Jacobs, Ltd., and to his liability under a guarantee given by him on its behalf. The Official Receiver opposed the application on several statutory grounds, and His Honour suspended the discharge for two years.

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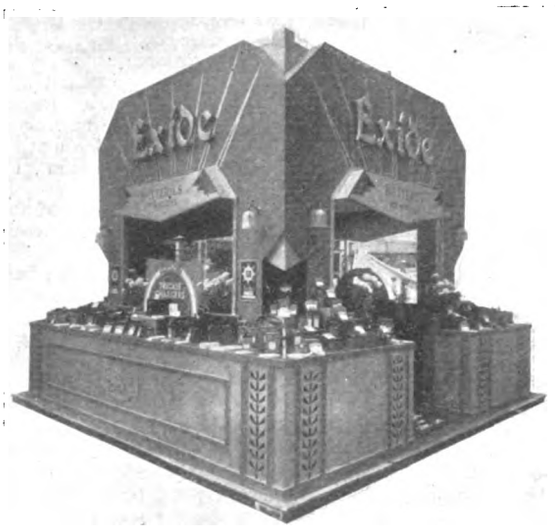
# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Applications for Patents.

### October 5th.

28 643 INTERNATIONAL GENERAL ELECTRIC Co., INC. Oil switches. 6/10/27, Germany.)
28 644 INTERNATIONAL GENERAL ELECTRIC Co., INC. Electric relays. 6/10/27, Germany.)
28 691 E. T. LYNDON-JONES. Aerials.
28 671 J. K. KAHALOEHN. Electric switches.




*THE Exide battery stand at the Manchester Wireless Exhibition. In the centre of the stand, entered by doorways at either side, was a large display of graduated columns, whilst on the outside at the other two sides was a background display in colours of the new Exide trickle charger.*

28 630 S. LOEWE. Multiple valve. (19/7/26, Germany.)
28 685 S. G. NEWPORT. Electric switches.
28 605 H. H. PARMENTER, R. F. STRATTON and W. D. TREND. Illuminated advertising signs, etc.
28 579 L. H. PEARSON. Apparatus for electrical transmission of sound from gramophone records.
28 575 H. B. PRENTICE. Distribution board for electric supply systems, etc.
28 586 D. S. B. SHANNON. Telephonic loud speakers.
28 664 SIEMENS-SCHUCKERTWERKE A.G. Cascade transformers. (11/10/27, Germany.)
28 665 SIEMENS-SCHUCKERTWERKE A.G. Electric switchgear. (29/10/27, Germany.)
28 666 SIEMENS-SCHUCKERTWERKE A.G. Electric switchgear. (7/11/27, Germany.)
28 663 SIEMENS AND HALSKE A.G. Electromagnetic relays. (6/10/27, Germany.)
28 567 H. G. TAYLOR. Standards for carrying overhead wires, etc.

### October 6th.

28 709 I. R. A. B. BRADLEY and A. W. HESTER. Plug for electric batteries, etc.
28 785 C. R. COOK. Electric terminals, etc.
28 710 H. LLOYD. Electric fuses.
28 727 LOEWE-RADIO GES. Electric sound boxes. (7/10/27, Germany.)
28 777 R. L. MANSI. Electrical supply systems, etc.
28 762 C. R. NICHOLS and S. H. WILLISTON. Method of electrical prospecting.
28 771 SIEMENS AND HALSKE A.G. Transmission of picture telegrams. (20/7/26, Germany.)
28 772 SIEMENS AND HALSKE A.G. Picture telegraphy. (20/7/26. Germany.)

### October 8th.

28 923 ASSOCIATED TELEPHONE AND TELEGRAPH Co. Telephone systems. (12/11/27, U.S.)
28 906 R. H. BARBOUR, AND ELECTRICAL APPARATUS Co., LTD. Electricity meters.
28 920 T. E. BEACHAM. Electric control for valves, etc.
28 876 J. H. BEAUMONT (UTILITIES SERVICE, INC.). Electric supply systems.
28 896 BRITISH ELECTRICAL REPRODUCTION Co., LTD. Supporting devices.
28 865 BRITISH THOMSON-HOUSTON Co., LTD. Apparatus for interconversion of sound and electrical impulses. (8/10/27, U.S.)
28 805 T. R. CHRISTOPHER. Connectors for electric cables, etc.
28 809, 28 864 S. O. COWPER-COLES. Electrodeposition of metals.
28 816 G. D. COLLIER. Television apparatus.
28 879 A. A. J. CROWNE. Electric discharge devices.
28 922 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Wireless receiving arrangements.
28 904 C. S. FRANKLIN, L. J. GOLDING AND J. G. ROBB. Thermionic valves.
28 867 H. HUNTER. Diaphragms for wireless telephones, etc.
28 811 A. E. JONES. Light sensitive cells.
28 910 S. H. MUFFETT. Electrical heating devices for motor vehicles, etc.
28 847 B. A. QUINT. Earthing electrodes for wireless apparatus.
28 908 RHEINISCH WESTFALISCHES ELEKTRIZITATSWERK A.G. Protecting device for current distributing plants. (7/10/27, Germany.)
28 848 W. SCHWEITZER. Electromagnetic switch.
28 841 WESTINGHOUSE ELECTRIC AND MANUFACTURING Co. Radio transmitting systems. (8/10/27, U.S.)

### October 9th.

28 993 ASSOCIATED TELEPHONE AND TELEGRAPH Co. Impulse senders for telephones, etc.
28 994 AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., C. GILLINGS AND J. McGAVIN. Telephone systems.
29 061 BRITISH ELECTRIC PARI-MUTUAL, LTD. Totalisators.
29 004 BRITISH THOMSON-HOUSTON Co., LTD. Induction motors. (11/10/27 U.S.)
29 006 BRITISH THOMSON-HOUSTON Co., LTD., and R. D. GIVEN. Systems of electric control.

# ELECTRICAL TRADE MARKS.

*This list has been specially compiled for us from official sources by* GEE AND Co., *Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C. 2, from whom further information may be obtained.*

ROSS BATTERIES (sign). 490 582. Class 8. Electric batteries (not for medical purposes). "Diamco" Aktiengesellschaft für Gluhlicht (a joint stock company organised under the laws of Germany), Gubenerstrasse 47, Berlin O.34, Germany; manufacturers. April 19th, 1928. Registration of this Trade Mark shall give no right to the exclusive use of the devices of electric batteries, of the device of a seal, or of the word "Ross."

EURADIO. 493 612. Class 8. Photometric appliances for use in measuring the intensity of ultra-violet rays. Clayton Conyers Morrell, Hamilton House, High Road, Broxbourne, Hertfordshire; medical practitioner. July 26th, 1928.

MEGOSTAT. 493 616. Instruments and apparatus for use in wireless telephony and telegraphy. Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4; electrical engineers. July 26th, 1928.

FLAMBEAULUX. 493 177. Class 13. Electric lamps (ordinary). British Electric Lamps, Ltd., Spencer Lamp Works, Spencer Hill Road, Wimbledon, London, S.W.19; manufacturers. July 10th, 1928.

TRIDELTA. 493 909. Class 16. Porcelain electrical insulators and parts thereof. Hermsdorf-Schomburg-Isolatoren Gesellschaft Mit Beschrankter Haftung (a joint stock company organised under the laws of Germany), Hermsdorf-in-Thuringen, Germany; manufacturers. August 8th, 1928. Address for service in the United Kingdom is, c/o Dicker, Pollak and Mercer, 20 to 23, Holborn, London, E.C.1.

TRIANGULAR SIGN. 493 910. Class 16. Porcelain electrical insulators and parts thereof. Hermsdorf-Schomburg-Isolatoren Gesellschaft Mit Beschrankter Haftung, Hermsdorf-in-Thuringen, Germany; manufacturers. August 8th, 1928.

DREMOPHOT. 494 540. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Drem Products Corp., 152, West 42nd Street, New York; manufacturers. August 28th, 1928. (To be associated. Sect. 24.)

# Coming Events.

### Friday, November 2nd.

ENGINEERING AND SCIENTIFIC CLUB, WOLVERHAMPTON.—Lecture by Major S. J. Thompson on "The Making of a High Pressure Steam Boiler." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (EAST MIDLAND SUB-CENTRE) COLLEGE, LOUGHBOROUGH.—Chairman's address by Mr. J. F. Driver. 6.45 *p.m.*

WOMEN'S ENGINEERING SOCIETY.—Lyceum Club, 138, Piccadilly, London. Lecture by Miss Rose E. Squire on "History of Factory Legislation in Great Britain." 6.15 *p.m.*

### Monday, November 5th.

ROYAL INSTITUTION OF GREAT BRITAIN.—21, Albemarle Street, London. General meeting. 5 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (MERSEY AND NORTH WALES—LIVERPOOL—CENTRE.)—The University, Liverpool. Paper by Mr. W. T. Townend on "Some Considerations of the Economics of Electric Power Production." 7 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—Mount Florida, Glasgow. Lecture before the Kinning Park Co-operative Women's Guild, on "Home Lighting." 7.30 *p.m.*

### Tuesday, November 6th.

ELECTRICAL CONTRACTORS' ASSOCIATION. (BOURNEMOUTH BRANCH.)—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION. (DERBY BRANCH.)—Ordinary meeting. 5 *p.m.*

ILLUMINATING ENGINEERING SOCIETY.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Address by Mr. C. C. Paterson, dealing with the International Illumination Congress in the United States; Reports by the Committees on "Progress in Gas and Electric Lighting." 7 *p.m.*

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—Junior Institution of Engineers, 39, Victoria Street, Westminster. Lecture by Mr. A. Peter Thurston on "The Law of Patents." 7.15 *p.m.*

### Wednesday, November 7th.

ELECTRICAL CONTRACTORS' ASSOCIATION. (BATH SUB-BRANCH.)—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION. (CARDIFF BRANCH.)—Ordinary meeting. 2.30 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN. (MANCHESTER DISTRICT BRANCH.)—Visit to Metropolitan Vickers Electrical Co's. cooking demonstration and domestic apparatus, Trafford Park. 2.30 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture on "The Electricity Supply Act, 1926," by Mr. E. E. Hoadley. 3 *p.m.*

UNIVERSITY OF LONDON.—King's College, Strand. Course of nine public lectures on "The Indebtedness of Industry to Pure Science." Lecture IV, by Dr. F. A. P. Aveling, on "The Human Factor." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (WIRELESS SECTION.)—Institution, Savoy Place, Victoria Embankment, London. Inaugural address by Commander J. A. Slee. 6 *p.m.*

INSTITUTION OF HEATING AND VENTILATING ENGINEERS.—Caxton Hall, Caxton Street, Broadway, Westminster. Paper by Mr. G. A. Cottell on "Heating and Domestic Installations—the Insurance Point of View." 7 *p.m.*

ELECTRICAL SOCIETY OF GLASGOW.—30, Gordon Street, Glasgow. Paper by Mr. J. H. Crossley on "Industrial Heating." 7.30 *p.m.*

### Thursday, November 8th.

ELECTRICAL CONTRACTORS' ASSOCIATION. (NOTTINGHAM BRANCH.)—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION. (EAST YORKS BRANCH.)—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Victoria Embankment, London. Paper by Mr. W. B. Woodhouse on "Overhead Electric Lines." (To be illustrated by a cinematograph film.)

INSTITUTION OF ELECTRICAL ENGINEERS. (STUDENTS' SECTION OF THE NORTH WESTERN CENTRE.)—Engineers' Club, Albert Square, Manchester. Joint Debate with the Institution of Mechanical Engineers (Graduates' Section). 7.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (DUNDEE SUB-CENTRE).—University College, Dundee. Paper by Mr. J. S. Lilly, "Notes on Installation and Maintenance Risks." 7.30 *p.m.*

### Friday, November 9th.

FARADAY SOCIETY.—Lecture Theatre of the Royal Institution, Albemarle Street, London. Twenty-fifth anniversary of the foundation of the Society. First Spiers Memorial Lecture by Sir Oliver Lodge, F.R.S., on "Some Debatable Problems in Physics." 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (LONDON STUDENTS' SECTION.)—Institution, Savoy Place, Victoria Embankment, London. Discussion on "Loud Speakers," to be opened by Mr. T. M. C. Lance. 7 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Annual general meeting. 7.30 *p.m.*

### Saturday, November 10th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—South Wales Institute of Engineers, Park Place, Cardiff. Paper by Mr. S. B. Haslam on "Modern Methods of Firing Steam Boilers." 6 *p.m.*

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.—Visit to Messrs. Barclay, Curle and Co., Ltd., North British Engine Works, Whiteinch, Glasgow. 3 *p.m.*

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Electrification of Railways.

THE progress of railway electrification in this country is revealed in the report of the Railway Electrification Committee (1927), details of which are given elsewhere in this issue. During the past seven years up to March last, 445 miles of single track railway had been electrified on the d.c. system, of which no less than 408 miles were on the Southern Railway. By March of next year there will be 1 500 miles of single track electrified railway, of which, following the change-over on the Central Section of the Southern Railway from the overhead to the third rail system, only 19 miles will be run by a.c. With regard to the future the Committee recommends the general adoption of d.c. systems, and since, as is pointed out above, only nineteen miles of a.c. track will be in use by next year, there is little doubt as to confirmation of the recommendation. With regard to protective clauses for preventing fusion or injurious electrolytic action on pipes, etc., the Committee points out that the problem on the railways with their own right-of-way is quite different from that on tramways with tracks laid in the public streets. It is true that railways operate with higher voltage drops in the track rails than tramways, but this in itself does not necessarily result in higher leakage current, as the important factor of resistance between the track rails and earth must be taken into consideration. Tramway rails are buried in the road surface, and their resistance to earth is low, whereas railway rails are laid on sleepers resting on ballast, and have very much higher resistance to earth. It is to be remembered also that railway companies themselves frequently have extensive pipe and cable systems laid in the neighbourhood of the tracks, and usually in positions where they are much more likely to be subject to damage by electrolysis than the pipes and cables of other parties. Water pipes feeding water troughs or water cranes, and gas pipes for filling the reservoirs on the trains, must of necessity be close on to the track and are frequently under it. These observations are of interest, for the Post Office has alleged that several cases of electrolysis to, and interference with, Post Office cables by stray currents had come to their notice in the vicinity of recently electrified lines, though no trouble had been experienced from earlier electrifications. Briefly recapitulating the remaining conclusions and recommendations, the Committee suggests that the maximum standards at sub-station busbars should be a higher voltage of 1 500; with the lower voltage at 750—provided that a company may apply for approval to use a voltage of 3 000 in special conditions; for the higher voltage it recommends overhead collection with uninsulated return by the running rails; while for the lower voltage, third rail collection with uninsulated return by the running rails is recommended.

## E.D.A. Publicity.

WE are glad to see the new E.D.A. programme of correlated advertising activity designed to form the basis of a continuous general selling and publicity policy for the whole industry. We and some of our contemporaries have for years been impressing upon readers the necessity for basing public sales efforts on the calendar; in other words, to push electric heating in the autumn, electrical Christmas presents in December, and so on. Now the E.D.A. has devised a comprehensive plan to cover all these seasonal activities in such a way that the trade as a whole can spend as it were with one voice. By this means it is hoped to build up in the public mind the idea that "Electricity can do it." There will be a regular advertising campaign in the public newspapers, and this will be reinforced by such other activities as posters, window layout instructions and free window displays for members, "sales help" handbooks, drafts of suitable sales letters and layouts and blocks for local newspaper advertising, to say nothing of the cinema films, lantern slides and lectures which will be available for use by members of the industry. Booklets totalling 102 in number, dealing in a variety of interesting ways with lighting, heating and cooking, spring cleaning, washing and ironing, fans, refrigerators, etc., are also in readiness. The campaign certainly gives to all a chance to reap benefit from the national effort, and by "tying-in" with the special sales drives of the manufacturers will command wide support.

## Electric Ore and Oil Divining.

THE divining rod and many other prospecting methods of the past have now been largely replaced by electricity, and about forty Swedish civil engineers and geologists with working crews are at present in different parts of the world to locate magnetic ore and oil deposits by means of a Swedish invention, the electric prospector. The apparatus was invented by HANS LUNDBERG, and KARL SUNDBERG, who were awarded the gold medal of the Royal Swedish Academy of Engineering Science for their invention. Their first achievement was a prospecting campaign in certain districts in northern Sweden, by means of which deposits of copper ore were located in the Bjurfors district,

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and the rich ore finds of Boliden were also found in this way. The method of detection is based on the fact that certain ores offer less resistance to an electric current than ordinary species of rock. An electric current is conducted through the ground, and by measuring the resistance the prospectors obtain sufficient information to enable them to form an opinion as to where the ore is most likely to be found. Using the same equipment, and applying his knowledge to similar experiments with fluids occurring in the ground, Mr. Sundberg has managed to work out a prospecting method for finding oil, which has proved to yield good results, and one of America's leading mineral oil concerns has, we understand, contracted for an extensive prospecting campaign in various parts of the United States, which is now being carried on by a number of Swedish engineers.

## A Pointless Threat.

DURING the week-end some of the popular newspapers have made a good deal of fuss about a proposal to broadcast from certain places on the Continent a complete British programme of music and other entertainment designed to compete with the radio fare provided by the B.B.C. In our innocence we thought that the B.B.C. had for years experienced competition from Continental stations; so we are unable to understand why a "British" programme, broadcast from the other side of the Channel, should materially affect the position. One of the newspapers, however, finds pleasure in the new proposal because there will be no fees to pay. Actually, of course, if every licensed listener in England totally ignored the B.B.C. programmes, the Corporation's revenue would still be secure because the listeners would still have to buy a licence. But if some kind friend can provide programmes of a sufficiently high standard the British Broadcasting Corporation would have a good excuse to do nothing more than collect their dues from the Post Office. Other points of interest lie in the question of wavelength and the views of the Geneva Authorities. Again how does the new scheme propose to deal with the ever-present problem of fading.

## American Broadcasting.

DISCUSSING the broadcasting position referred to in the previous note, a Sunday paper said that "in the United States where better organisation, individual effort, and keener imagination have governed the field, broadcasting has become part and parcel of the daily life of the people." Part and parcel of the life of the people it certainly is; they can never escape the blatant blare of the advertiser on the air, and the individual effort and keen imagination only help to make the Americans long for a broadcasting system as free from the defects of super-showmanship and unwanted advertising as that which is provided by the B.B.C. in this country.

## Municipal Management at Newport.

NEWPORT (Mon.) Corporation has called in a chartered accountant to advise on reorganisation and economy in administering its affairs. The adviser makes certain statements regarding the present administration of certain departments, the accuracy of which the heads of the departments concerned will probably dispute, and as Newport is already in the peculiar position of having both a general manager of the Electricity Department and a borough electrical engineer—the latter being also tramways engineer—the development of the situation may give rise to some interesting expressions of opinion. The keynote of the proposals is the reduction of labour or of the pay therefor, while another suggested step towards economy is the appointment of a general manager to control all the spending departments. "But for the large amount of capital involved," says the expert, "I should have recommended the complete scrapping of the tramway system, and probably . . . the omnibus system." Many of the suggestions, such as the necessity for cutting down overtime, maintaining strict control of undertakings, reducing the number of reports to councillors, and reduction of remuneration in the treasurer's department, seem fairly obvious. With regard to the Electricity Department, it is stated that the general staff is larger than is necessary, that the supervision is not satisfactory, and that both in that Department and the Tramways Department there is a surplus of labour which would automatically disappear if the whole were merged under one control. It will be interesting to learn how this disappearance would result from the proposed centralisation, and to hear the views of Mr. N. J. YOUNG, the general manager, and Mr. NICHOLS MOORE, the borough electrical engineer, as to the charge of unsatisfactory supervision of the Electricity Department.

## Illuminating Engineering in the Provinces.

DURING recent years there have been many useful discussions in London on various aspects of factory lighting, and it has often struck us in the past that, with the exception of the E.L.M.A. Lighting Service Bureaux, relatively little attention has been devoted to this subject in the chief provincial centres, where, after all, large manufacturing establishments are mainly congregated. We therefore note with interest the series of meetings which have just taken place in Birmingham, Manchester, Newcastle and Glasgow under the auspices of the Illuminating Engineering Society. These meetings were intended to serve a double purpose—to stimulate interest in industrial lighting and to make the work of the Illuminating Engineering Society better known. At each of the centres named a brief address was delivered by a leading member of the Illuminating Engineering Society who went up from London for the purpose, and this address was followed by the reading of Mr. J. L. H. COOPER'S paper entitled "An Investigation of Electric Lighting in the Engineering Industry." We understand that there was a good attendance at each of the meetings, and we hope that the success of this departure will encourage the Society to make further efforts to maintain interest in illumination at leading provincial centres. The E.L.M.A. Lighting Service Bureaux have done excellent pioneer work in this direction, and we are glad to learn that their educational activities are to be reinforced by the Illuminating Engineering Society.

## A Battery Problem.

AN interesting point is raised by Mr. H. N. GRESLEY chief mechanical engineer of the L.N.E.R., in the current issue of the company's magazine, to the effect that a difficulty arising in the use of electric light in trains is in the fact that in the case of carriages which have to stand in sidings for many months of the year, being required only for the summer services, the batteries are apt to deteriorate. There is, according to Mr. Gresley, need for a new and improved type of battery for electrically lighted coaches. With our present understanding of the position we do not see why the batteries should suffer in this way, in that we see no reason, at the moment, why they should be housed in the coaches at all. Assuming that provision was made for them on the locomotive, the chances of their remaining idle for months on end would be remote, while the alteration of position need have no appreciable effect upon the lighting system. Another point raised in the same article is a regret that there has been no notable development in the heating of coaches. Owing to the introduction of longer trains it happens that in cold weather the carriages farthest from the locomotive are, with present methods, sometimes inadequately heated. Increase in steam pressure only results in heating the front coaches more and tends to burst the pipes. Experiments are now being made by the L.N.E.R. to remedy this by using electricity as the heating agent, and, with the heavy forms of tubular and panel heaters available, the problem of arriving at a satisfactory solution should present little difficulty.

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# THE SOUND RANGERS.

## Being Memories of a Little-known Technical Unit at the Front—Some Applications of Electricity in the Great War—Importance of the Hot-wire Microphone.

By G. E. MOORE, A.M.I.E.E.

WHEN the enemy guns ceased fire ten years ago, many alert eyes and instruments which had shown so much merciless interest in their operations at once lost their *raison d'être*. Though a great deal of the military machine continued to function after a fashion, the " mob " which specialised in locating the guns became peculiarly purposeless. It included a select company that operated by " sound ranging " along the battle front. Of its work nothing was advertised during the war, and since the great conflict ended merely occasional inklings have reached the public. Sir William Bragg recently referred to the sound rangers at the British Association meeting, mentioning the genesis of the special microphone which proved so invaluable.

Sound ranging is of particular interest to us on account of its almost all-electric operation—the instantaneity of electrical operation being of great utility in measuring the effects of slow-moving sound. But electricity is so " flexible " and controllable that (as with many electrical conveniences of to-day) one simply cannot imagine that duty performed by any other agent. Another point of interest is also a matter for congratulation; it is mere fact to say that the British quite lived up to their reputation for science and invention. More than one ally—" no names, no pack drill ! "—found its own gun-locating methods utterly antiquated in comparison.

To provide our artillery with facts relating to the position of a gun, a number of obvious methods were possible. For instance, a gun flash could be " spotted " by several observers placed at known map points; each man by " getting a line " on it could notify the direction as accurately as possible to his headquarters; and the gun in question must have fired at the position on the map given by the intersection of the direction lines. Again, aerial observations by eye and camera afforded invaluable information. But the presence of fog and the new complications of camouflage, longer range, and the like, militated against such methods.

However, the detonation of a gun charge gave an acoustic clue as well as a visual one, and it became apparent that a ranging method dependent upon sound measurement held inviting possibilities. In 1914 our French allies experimented in this direction, and the results were encouraging enough to persuade the British Army of its possible utility—with the rather revolutionary result that an experimental section was permitted to commence work within our own lines. Certain young scientists tackled this military, yet technical, work with great zest. Apparatus was adapted or evolved which was so successful that, when the war ended, about 40 sound-ranging sections were operating along our own battle front, providing for the artillery units information which was of the highest value.

Each section was, in effect, a number of operating points in electrical communication with a central post. Here, in a dugout or the like, was a chrono-photographic instrument which made the required record; and from such headquarters ran leads to a microphone base, and also telephonic wires to a forward observer and our artillery, etc. The microphone base was naturally a vital part. Six microphones lay at known map positions, spaced more or less parallel to the enemy's front line but some distance behind our own trenches. These microphones were of a specially-developed type, each having a grid of fine wire maintained electrically at a temperature above that of the air; upon the arrival of a tiny gun pulse there was an instant cooling effect upon the hot wire, and the consequent resistance change caused an increased current to flow through the recording apparatus. The invention of the hot-wire microphone was of immense importance to the sound rangers.

Normally, the sound-ranging equipment was " dead," but when a forward observer, who was posted in front of the microphone base, heard a particular gun or battery fire he switched on the whole apparatus, and hence the microphones were ready to intercept the sound by the time it had reached them. Immediately the record was made it was at once handed to the computing staff. From the time interval between the response of each pair of microphones was found direction line, which actually was the hyperbola of which the microphones were the foci; somewhere upon that line lay the enemy gun and, of course, it and the other hyperbolæ intersected at its position.

Thus its location was plotted upon a map. Within a very few minutes of that gun firing, its calculated position was telephoned to our gunners. The reckoning, under favourable conditions, might be within 50 yd. of the real position at a distance of 8–9 miles. Several heavy shells accurately dropped there would dispose of the offender—unless, maybe, it was a naval gun already hurrying along rails to another home.

Naturally, matters were not quite so simple as described. Errors and variations in instruments, and so forth required allowance. Though fog and camouflage might be scorned by the microphones, an adverse and variable wind was most unwelcome. And it must be remembered that the work was carried out under the stress and dangers of the shell zone. The wires running out to the " O Pip " and microphones had to be maintained; they often suffered damage by gun fire, and actually more than one " dis " on a line was caused by the thin, steel-stranded cable being borrowed by passers-by to tie-up knapsacks.

Thus was sound-ranging practised and constantly improved under the rigours and risks of modern warfare, with all its terrifying and devastating and nerve-shattering effects. The technical men of all ranks, however, had a very special sense of camaraderie—and, as has been mentioned, found a certain zest in carrying on scientific work in the battle region. And any light relief was immensely appreciated. Visiting a section one day the writer was escorted to a bomb-proof mess-room; this, however, was not *wasp-proof*, and if there was no great military enthusiasm shown for the " good old plum-and-apple " on the table, the jam by no means lacked appreciation on the the part of the wasps. The air was positively thick with them and, amid loud laughter, the writer retreated from the scene with his rations and sat in a field. However, a chance shell dropped about one hundred yards away, and as he was changing his mind a sapper arrived bearing upon a shovel a tin of jam covered with wasps !

The writer received a shock of another kind in a sand-bagged Nissen hut containing the recording apparatus. It was lighted by acetylene, and, as the writer entered, a neighbouring "How." battery fired with a tremendous concussion—at once putting out the lamps; simultaneously an immense cheer burst from the staff to complete the stranger's discomfiture. . . . In a dug-out one day some petrol leaked under the rough flooring and (of course !) somebody lit a cigarette and incidentally the petrol. Amid some excitement and much subsequent hilarity a jar of developer was used as fire extinguisher.

A story went the rounds of an absent-minded newcomer to sound-ranging, who, armed with notebook, wandered forth one day in old " slacks " and tunic minus identification tabs to study a microphone emplacement; and here he was found by an artillery officer, who dragged him away to Corps Headquarters as a highly suspicious character. . . . One day an officer of high rank appeared and evinced a certain patronising interest in the " new-fangled wheeze." The apparatus was duly explained, and the visitor intelligently interjected, " Hum," " Oh yes," and " By Jove " more or less at the right moments. As the lecturer was recovering his breath the officer shook his head in awe or (was it ?) bewilderment, and then commented: " Marvellous ! I say, *how on earth do they get such a brilliant polish on this mahogany ?* "

It will be seen that, although far from the meditative peace and safety and appurtenances of orderly laboratories, the scientific fraternity was not found wanting.

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# ALTERNATING CURRENT BRIDGE METHODS.

## Their Application to Electrical Engineering Problems, with Special Reference to the Testing of Synchronous Condensers.

By B. G. CHURCHER (Research Dept., Metropolitan-Vickers Electrical Co., Ltd.)

THE article deals with the use of alternating current bridge methods in the testing of electrical engineering apparatus, especially for the measurement of power. The errors arising in wattmeter methods due to the use of instrument transformers are discussed, and the superiority of bridge methods where very low power factors are involved, is pointed out. The choice of bridge networks for specific cases is briefly discussed. A bridge network devised for measuring the energy loss of large synchronous condensers is described, together with details of the set-up used for testing a 10 000 kVA machine.

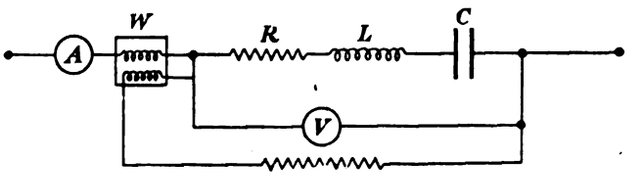


Fig. 1.

The use of methods of making alternating current measurements by means of bridge networks has long been familiar to those working on subjects involving audio frequency currents. Many methods and instruments have been evolved in research laboratories, and especially in standardising institutions, and have been brought to a high degree of refinement. Self and mutual inductances and capacitances, and the phase defects associated with them, can, by modern methods, be measured with a precision far exceeding other alternating current measurements.

The resistance value and residual inductance of alternating current resistance standards can also be very accurately measured. While the development of bridge methods has been of indirect value to heavy electrical engineering, in that it has provided accurate alternating current standards for research work, the application of a.c. bridge methods to engineering testing has been practically confined to the testing of instrument transformers.

Several accurate methods * of measuring the ratio and phase angle of current transformers have been devised. One of these methods is employed for precision measurements by the Metropolitan-Vickers Electrical Co. Transformers with primary currents up to 5 000 A can be tested, and ratios and phase angles determined to an accuracy of well within 0·1% and 0·03 deg. respectively.

### 132 000 V Tests.

In a recent paper † bridge methods for measuring the ratio and phase angle of high voltage potential transformers and potential dividers have been described. The Metropolitan-Vickers Co. have developed facilities for testing potential transformers, having nominal voltages up to 132 000 V, at full voltage, and to a high degree of accuracy. One of the most important measurements in electrical engineering testing is the measurement of the energy less and reactive volt-amperes in electrical apparatus. It is the purpose of this article to discuss the application of a.c. bridge methods to engineering testing, and the advantages arising from their use.

Consider a simple series circuit consisting of pure resistance inductance and capacitance, $R$, $L$ and $C$, having values independent of current, frequency, and voltage. Suppose that a sinusoidal p.d. is applied to the circuit, and that the properties of the circuit are measured by ammeter, voltmeter, and wattmeter connected in the way shown in Fig. 1. We will assume that the voltmeter and wattmeter pressure coil circuit have infinite impedances. In Fig. 2, $I$ is the current through the circuit, $IR$ the resistance drop, $I/\omega C$ the capacitative drop, and $\omega LI$ the reactive drop. The voltage required to balance the resultant of these voltage drops or the applied p.d., is shown by $E$, displaced from $I$ by an angle $\varphi$. Let the complement of this angle be denoted by $\delta$.

Since we have assumed that $E$ is sinusoidal, and that $R$, $L$ and $C$ are constant, it follows that the other voltages in the circuit will be sinusoidal. If $P$ is the power developed in the circuit, then $P=EI\cos\varphi$, which will be indicated by the wattmeter if it is free from error. When $\varphi$ is a large angle, i.e., when the power factor of the circuit is low, $\cos\varphi$ is very nearly equal to $\tan\delta$, so that $P=EI\tan\delta$.

### Causes of Errors.

In measurements at low power factors with wattmeters, errors may arise from the residual inductance or capacitance of the pressure coil circuit, or from the working flux of the instrument not being strictly in phase with the current flowing in the current coils. These errors are constant for a given frequency, and produce the effect of a phase angle error in the instrument. Let this angle be denoted by $\alpha$. The wattmeter will now read $P^1=EI(\tan\delta+\alpha)$. The error arising from the wattmeter phase angle is $P-P^1/P=\alpha/\delta$ for small angles.

Suppose, now, that the currents and voltages involved are such as to require the use of current and potential transformers for operating the wattmeter. Both these transformers will introduce further phase angles, which, if appreciable, must be allowed for. Let $\beta$ and $\gamma$ be the respective phase angles of current and potential transformers. Then the wattmeter will now read $P^1=EI\tan(\delta+\alpha+\beta+\gamma)$ in low power factor measurements. Hence the error, unless $\alpha$, $\beta$ and $\gamma$ are corrected for, will be $\alpha+\beta+\gamma/\delta$.

At this stage it will be well, in order to fix our ideas, to consider magnitudes. The following table gives some phase angles and the magnitude of the correction necessitated by them for a test at a power factor of 0·03, a value that is sometimes met with in engineering testing. We can neglect the ratio errors of instrument transformers, as they will not give rise to serious errors in power measurements of commercial accuracy.

TABLE I.

| Apparatus | Phase angle. | Tangent. | Per cent. correction. |
|---|---|---|---|
| Current Transformer B.E.S.A. Class A | 35 minutes | 0·0102 | 34 |
| Current Transformer B.E.S.A. Class B | 60 ,, | 0·0175 | 58 |
| Potential Transformers B.E.S.A. Class A | 20 ,, | 0·0058 | 19 |
| Potential Transformers B.E.S.A. Class B | 30 ,, | 0·0087 | 29 |

The foregoing are maximum permissible values, and the values met with in practice are generally well below them.

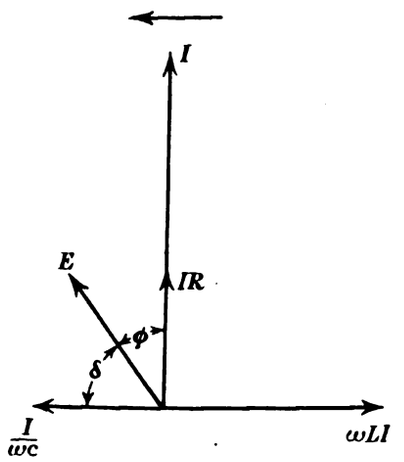


Fig. 2.

Clearly the ignoring of these phase angles leads to enormous errors under such conditions. Even if the phase angles are measured and allowed for, it will be seen that the magnitudes are such that instead of being quantities involving only small corrections, the phase angles become very important quantities which have to be accurately known if a satisfactory over all accuracy in the measurement is to be attained. In a

* Bureau of Standards Method. Law's "Electrical Measurements," chap. xii.; Schering and Alberti, "Archiv. f. Elektrotechnik," Vol. 2, 1914; E. Bitti, "L'Elettrotecnica" (Milan), August 5th, 1923.

† B. G. Churcher, "Journal I.E.E.," Vol. 65, No. 364, April, 1927.

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measurement at 0·03 power factor an uncertainty of 0·1 deg. will cause an uncertainty of 6% in the final result, apart from other sources of error.

The magnitude of the phase angle of a wattmeter depends on the type of instrument. With the best instruments it is possible to apply normal current and p.d. in quadrature, and to obtain no perceptible deflection. If the scale has 100 divisions, and the smallest perceptible deflection is taken as a tenth of a division, the phase angle must be less than $\tan^{-1}$ 0·001 for an instrument giving full scale deflection with the current and p.d. in phase.

If the instrument is one of the type that gives full scale deflection with the current and p.d. at an angle corresponding to 0·2 power factor, the phase angle of the instrument must be less than $\tan^{-1}$ 0·0002. However, with wattmeters which are not of the highest grade, phase angles of many times these values may be present, and may lead to considerable error in low power factor tests.

## Another Difficulty.

Another difficulty in low power factor wattmeter measurements is the small deflection obtained owing to the watts being very small compared with the volt-amperes applied to the instrument. Thus, if full volts and amperes are applied to an ordinary wattmeter at an angle corresponding to 0·03 power factor, only 3% of full scale deflection will be obtained. This has led to the development of wattmeters which give full scale deflection for power factors such as 0·2. With an instrument of this type, a deflection of 15% of full scale would be obtained, which is certainly a great improvement, but hardly adequate.

The consideration of these matters in connection with the testing of engineering apparatus led the writer to consider more fundamental methods of measurement, in which large corrections for phase angles are avoided.

Referring again to the circuit shown in Fig. 1, let the wattmeter be removed. The power developed in the circuit can be written

$$P=EI\cos\varphi=\frac{E^2}{Z}\cos\varphi=I^2Z\cos\varphi$$

or for low power factors,

$$P=\frac{E^2}{Z}\tan\delta=I^2Z\tan\delta$$

$Z$ is the impedance of the circuit and $\varphi$ the phase angle of that impedance. Therefore, if we can measure $Z$ and $\cos\varphi$, we can obtain $P$ in terms of either $E$ or $I$, which are easily measured quantities. These relations hold for any frequency, provided $Z$ and $\cos\varphi$ are measured or calculated for the frequency in question.

The relations also hold when several frequencies are applied simultaneously to the circuit, that is, when the applied p.d. is not sinusoidal in wave form. The fundamental and each of the harmonic frequencies in the voltage wave set up currents of the corresponding frequencies, each current flowing as though the others were absent.

If $l_1$, $l_3$, $l_5$, etc., and $i_1$, $i_3$, $i_5$, etc., are the components of the voltage and current waves and $p_1$, $p_3$, $p_5$, etc., the power associated with each harmonic, the total power is

$$P=p_1+p_3+p_5+\ldots$$
$$=\frac{l_1^2}{Z_1}\cos\varphi_1+\frac{l_3^2}{Z_3}\cos\varphi_3+\frac{l_5^2}{Z_5}\cos\varphi\ldots\ldots\quad(1)$$
$$=l_1^2Z_1\cos\varphi_1+l_3Z_3\cos\varphi_3+l_5^2Z_5\cos\varphi_5+\quad(2)$$

since the average product of a current and voltage of different frequencies is zero, and hence, power is only associated with currents and voltages of the same frequency.

The total volt-amperes under such conditions is

$$EI=(l_1^2+l_3^2+l_5^2+\ldots)^{\frac{1}{2}}\,(l_1^2+l_3^2+l_5^2+\ldots)^{\frac{1}{2}}$$

and hence the power factor, which is equal to the total power divided by the total volt-amperes

$$=\frac{P}{EI}=\frac{p_1+p_3+p_5+\ldots}{(l_1^2+l_3^2+\ldots)^{\frac{1}{2}}\,(l_1^2+l_3^2+\ldots)^{\frac{1}{2}}}$$

This is to be distinguished from the power factor associated with the fundamental frequency, which is $\cos\varphi$.

So far we have assumed that $R$, $L$ and $C$ are unvarying with current and frequency. However, in engineering apparatus these quantities cannot always be considered as constants. $R$ is often dependent on frequency on account of eddy current effects. $C$ may vary with the applied voltage on account of the characteristics of the dielectric forming the condenser. A still more important effect is the variation of $L$ with current in iron cored inductances owing to the varying permeability of the iron with the degree of magnetisation. The variation in $L$ may be very large if saturation is reached.

The non-linear relation between current and flux implies a variation of $L$ with the instantaneous current during a cycle, and leads to the production of harmonics in the current wave that may not be present in the voltage wave and vice versa. Since the value of $L$ in an iron core inductance may be affected by the instantaneous value of the current, it is clear that for a given applied p.d. wave form, the values of the different

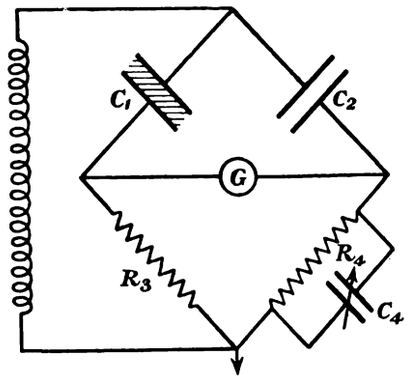


Fig. 3.

harmonics in the current wave are mutually dependent upon one another. The principle of independent superposition, which holds when $R$, $C$ and $L$ can be regarded as independent of frequency and current, now no longer holds.

## A Complex Impedance.

Consider a complex impedance the constituent parts of which are periodic functions of the voltage, current and frequency, and suppose that a p.d. of constant r.m.s. value and wave form is maintained across its terminals. The instantaneous value of the p.d. can be written :

$$E=E_1\sin\omega t+E_3\sin(3\omega t+\theta_3)+E_5\sin(5\omega t+\theta_5)+\ldots$$

This p.d. will give rise to a current the instantaneous value of which, after transient conditions have subsided, can be written :

$$I=I_1\sin(\omega t+\varphi_1)+I_3\sin(3\omega t+\theta_3+\varphi_3)+I_5\sin(5\omega t+\theta_5+\varphi_5)+.$$

This current will be constant in r.m.s. value and wave form as long as a given p.d. of constant r.m.s. value and wave form is maintained. For the given p.d. the impedance of the circuit to each harmonic is :

$$Z_1=\frac{E_1}{I_1},\ Z_3=\frac{E_3}{I_3},\ Z_5=\frac{E_5}{I_5},\ \text{etc.}$$

The power supplied to the circuit is :

$$P=\frac{E_1I_1}{2}\cos\varphi_1+\frac{E_3I_3}{2}\cos\varphi_3+\frac{E_5I_5}{2}\cos\varphi_5+\ldots\quad(3)$$
$$=\frac{l_1^2}{Z_1}\cos\varphi_1+\frac{l_3^2}{Z_3}\cos\varphi_3+\frac{l_5^2}{Z_5}\cos\varphi_5+\ldots$$
$$=l_1^2Z_1\cos\varphi_1+l_3^2Z_3\cos\varphi_3+l_5^2Z_5\cos\varphi_5+\ldots$$

$l$ and $i$ being r.m.s. values. In this case, the impedances $Z_1$, $Z_3$, $Z_5$, etc. only hold for an applied p.d. of given r.m.s. value and wave form, and there is not necessarily any simple relation between the impedances for each harmonic frequency such as exists in the case of circuits when $L$, $C$ and $R$ are independent of current, voltage and frequency. Thus, if the amplitude of one harmonic in the p.d. is changed, not only will the amplitude of the corresponding harmonic in the current be changed, but the amplitudes of other current harmonics may also change appreciably.

Nevertheless, by measuring $Z$, $\cos\varphi$ and $l$ or $i$ for each component frequency for a p.d. of given r.m.s. value and wave form, the power associated with each frequency can be obtained, and hence the total power. Since this would be a somewhat laborious procedure for commercial testing, it may here be pointed out that in practice the harmonic power is always small and generally negligible, so that only fundamental frequency quantities need be determined.

A case which often arises in engineering testing is that in which a p.d. of sine wave form is applied to an iron-cored inductance having appreciable magnetic saturation. In this case harmonics appear in the current wave, although none

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are present in the p.d. By equation (3) the harmonic power is zero because $E_3$, $E_5$, etc., are zero.

A similar case occurs when a sinusoidal current is passed through an iron-cored inductance. Here the p.d. contains harmonics, although the current contains none. The harmonic power is also zero in this case because $I_3$, $I_5$, etc. are zero. In most practical cases, small harmonics are present in both p.d. and current. The e.m.f. wave forms of modern alternators are in general exceedingly good, the total amplitude of the harmonic residue, obtained by eliminating the fundamental, usually being guaranteed not to exceed 5% of the amplitude of the fundamental. In most cases the harmonic residue is well below that figure.

Nevertheless, suppose a 5% harmonic of, say, triple frequency exists in both current and voltage waves, and that $\cos \varphi_3$ is as high as 0·3. Then if $\cos \varphi_1 = 0{\cdot}03$, the error introduced by ignoring the harmonic power would only be 2½%. The fundamental power only would be obtained, which is a very close approximation to the total power which would be obtained with a sinusoidal applied p.d. It is this quantity which may often be required, rather than the actual power obtained with the particular wave form used during the test.

In this connection, it should be noted that the methods of testing instrument transformers referred to in the introduction are used on the tacit assumption that harmonics can be neglected. The ratio and phase angle observed are those ofthe fundamental component of current or voltage, and will be almost identical with the ratio and phase angle of the whole wave if the wave form used in the test approximates to a sine wave.

A large number of bridge networks, consisting of different combinations of resistance, capacitance and self and mutual inductance have been devised for laboratory measurements. In engineering testing, however, the choice is restricted by the magnitude of the currents or voltages involved. This can best be illustrated by briefly discussing the types of bridge network most suitable for very high voltages and small currents, large currents and very small voltages, and cases where both current and voltage are large.

For the testing of dielectrics at high voltages and power frequencies, the Schering bridge * is the most convenient.

The field of application of this bridge is the measurement of small amounts of power of the order of 1 W at voltages of 10 kV and upwards, the power factor varying from 0·001 upwards. The scheme of connections, neglecting subsidiary circuits, is shown in Fig. 3, $C_1$ is the apparatus under test, $C_2$ a standard of capacitance and sensibly zero phase defect, $R_3$ and $R_4$ non-inductive resistance, $C_4$ a variable condenser and $G$ a vibration galvanometer. The lower corner of the bridge is earthed and the testing voltage applied to the upper corner. A suitable value having been chosen for $R_4$, the bridge is balanced by adjusting $R_3$ and $C_4$ until zero galvanometer deflection is obtained. Then it can be shown that:

$$C_1 = C_2 \frac{R_4}{R_3} \cos^2 \delta_1 + \tan \delta_1 = wC_4R_4$$

where $\delta_1$ is the phase defect or "loss angle" of $C_1$. The energy loss in $C_1$ for small values of $\delta_1$, is then given by $Wn\ E^2 w\ C_1 \cos\ \delta_1$.

## Elaborate Precautions Unnecessary.

With a suitable galvanometer a very large sensitivity is obtained when working at voltages above, say, 10 kV. This enables relatively very low values to be used for $R_3$, $R_4$, compared with the impedances of $C_1$ and $C_2$. Hence $R_3$, $R_4$, $C_4$ and $G$ are at a potential of only a few volts above earth, although there may be 100 kV or more across the whole bridge. The bridge can be safely used for the highest voltages without elaborate precautions, which is a decisive practical advantage in favour of this type of bridge. The bridge can be made to cover a very large range of capacitance and power factor in $C_1$ and a large range of voltage. As long as a testing voltage of reasonably good wave form is used, the bridge is capable of ample accuracy. The phase defects of $C_2$, $R_3$ and $R_4$ can all be made negligible compared with 0·001. The bridge can be used for cable testing.

In this work $C_1$ is large, and hence the current through $R_3$ is large. To avoid passing the whole current through dial switches, $R_3$ consists of a low fixed four-terminal resistance shunted by a potential dividing resistance. For further details, the reader must refer to the various publications on the subject.

*(To be continued.)*

* Schering, "Zeitschrift für Instrumentenkunde," 1920, p. 124; Churcher and Dannatt, "World Power," May, 1926.

# MARINE AUXILIARIES.

## Progress and Future Possibilities of Electrical Plant Reviewed.

In his Presidential Address to the Institution of Mechanical Engineers, Mr. Richard W. Allen dealt at some length with the development of electrical auxiliaries for marine use, from the time when his father, the late Mr. W. H. Allen, in 1883, foresaw electricity to be the power of the future, and devoted all his energies to the study and development of the new science, and in association with his pupil, Mr. Gisbert Kapp, designed a high-speed steam-engine directly coupled to a dynamo, a design from which modern electrical generating machinery for use on shipboard has developed.

After tracing the progress made since that time, Mr. Allen then outlined present tendencies and future developments. The invariable tendency to-day he said, was towards the utilisation of electricity for a greater number and variety of purposes. This tendency was reflected in marine work where, in addition to its usual employment for lighting and heating, electricity was used for steering gear, refrigerating plant, boat hoists and winches, windlass, fans for forced draught and ventilation purposes, laundry and bakery, wireless transmitters, and for pumps for lubrication, circulating water, bilge, sanitary, fire and many other purposes. Future developments were therefore likely to require further increase in the size and number of the auxiliary electrical generating sets. Present tendencies in both steam and motor-ships suggested that, in future, marine electrical installations would consist of a rather larger number of exactly similar units, thus facilitating the interchange of parts, and enabling the power plant always to be run at a high degree of efficiency.

### Present Tendencies.

To illustrate present tendencies in marine auxiliaries for the generation of electric light and power, he took three cases, one being the steam-turbine driven auxiliaries in a cruiser, the second the oil-engine driven auxiliaries in a steam passenger liner, and the third the oil-engine driven auxiliaries in a motor passenger ship, all of which have been recently completed.

In the first example of a cruiser, the installation consisted of a steam-turbine running at 6 000 r.p.m. driving an enclosed pipe-ventilated dynamo at 1 000 r.p.m. through helical gearing. The steam pressure utilised was 250 lb. per sq. in. with 150 deg. F. superheat. The output was 300 kW at 225 V. A special feature of this plant was the use of aluminium for the gear and governor cases in order to reduce weight. The condenser was combined with the baseplate and the oil coolers were embodied in the gear-case. By driving the circulating pumps off the outer end of the dynamo shaft and the extraction pump off the turbine shaft, the whole plant was made self-contained and remarkably compact.

The second example was that of the oil-engine driven auxiliary equipment in a steam-driven passenger liner. This consisted of six-cylinder engines of 700 H.P. driving eight-pole dynamos with an output of 450 kW. The oil-engines were of the four-stroke cycle type. These engines ran at 250 r.p.m. and were remarkable for their perfection of balance and freedom from vibration—results gained by careful attention to both gravitational and torsional stresses in the various parts of the engine. A further consideration in marine work was the question of space occupied, and it was interesting to observe that a reduction of length had been made to assist in the preservation of good balance by eliminating the tendency to torsional vibration.

The consideration now paid by shipowners to question of fuel economy had led to the use of greatly increased steam pressures for marine propulsion and as far as possible the driving of all auxiliaries by electric motors. Compared with vessels built in 1922 the "Duchess of Bedford" represented an advance of 50% in power on 10% less weight of machinery without any increase in the cubic capacity of boiler spaces, or in the total daily consumption. Such a remarkable efficiency figure seemed to indicate that one of the main lines of future progress lay in the further development of high-pressure steam for main turbine propulsion and the driving of all auxiliaries by electricity derived from oil-engine driven generators.

The third example consisted of the oil-engine driven auxiliary equipment for a modern passenger motor-ship. Such auxiliaries comprised four sets of 700 H.P. Diesel engines similar to those described as installed in a steamship.

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# FIFTY YEARS OF BRITISH INDUSTRY.*

## The Origin and Development of the Cable Makers' Association—Regulating Competition —Value of Industrial Combination—The Place of Research.

By SIR GEORGE SUTTON, Bt., M.I.E.E.

I AM rather proud of the fact that the industry with which I am associated was among the first to establish a successful joint council for the discussion of all questions affecting employees. This development was greatly aided by the fact that practically all the firms engaged in the industry had themselves been organised at a very early stage. The Cable Makers' Association was founded twenty-nine years ago, and was thus a pioneer in what is now called the "rationalisation" of industry.

Fifty years ago the electric lamp was born, and in turn gave birth to a new industry—the generation and distribution of electricity to the public. Many new problems had to be solved. The carrying of heavy currents at high pressures was in many respects a more formidable problem than that of transmitting the light currents used in telegraphy. The public safety was involved in the solutions of these problems; so also was the prosperity of the new industry, since reliability, efficiency, and long life in cables were essential to satisfactory service.

At an early stage in the cable-making industry, the firms became acutely conscious of these problems and also of the opposition between the need for a high standard of quality and the desire for cheapness. They also realised that there was nothing to distinguish, in the sight of the ordinary buyer, a high-grade cable from a low-grade one. There was an obvious danger that unregulated competition would make price the sole consideration in cable contracts, and would thus bring about a steady deterioration in the quality of the all-important link between the power station and the public, and of the wires which the user of electric light installed on his premises.

*SIR GEORGE SUTTON, extracts from whose Inaugural Address to the Royal Society of Arts on November 7th are given on this page, is Chairman of W.T. Henley's Telegraph Works Co., Ltd.*

In order to avert this danger the leading firms came together twenty-nine years ago and formed an Association primarily for the purpose of fixing and adopting standards of dimensions and quality in electric cables. To-day these standards are recognised all over the world. It is largely to them that we owe the exceptional reliability of electricity supply in this country and the high degree of safety which attends the use of electricity in our homes and in buildings of all kinds. It is perhaps worth recalling that during the war many of our networks of electric mains were heavily overloaded owing to the successive additions of munition factories. The strain put upon them for months, and in some cases years, was far greater than anything regarded as possible, to say nothing of permissible, when they were designed and manufactured. Nevertheless, the margin of safety provided by high quality insulation, and ample dimensions, enabled them to carry their tremendous overloads with only an occasional interruption.

The co-operative action of the Cable Makers' Association did not, however, end with standardisation. It extended to the field of competition. At that time it was a very rare and a very suspect thing for firms in the same line of business to agree not to engage in an orgy of cutting prices, or not to work ruthlessly towards the extinction of competitors. The Cable Makers' Association proceeded on the assumption that the field was large enough for the growing prosperity of all of them, and that their individual as well as their common interests and those of electrical enterprise as a whole would be best served by keeping competition within reasonable bounds.

This view was not, as you can well imagine, shared spontaneously by the public or by the buyers of cables. The Association was regarded as a "ring" and incontinently denounced as such. Protests were continually being made against the maintenance of prices, and in some quarters the break-up of the Association would have been welcomed as an unmixed boon.

Many attempts were made to achieve this destruction. They were made by firms in this country; they were made, on a much more formidable scale, by firms abroad. But the Association was able to resist all these attacks, and its survival is a conclusive proof that the members were able to render better service than their opponents. Users of cable might denounce "rings" in more or less emphatic language, but they appreciated the vital importance of quality in cables, and they realised the value of the guarantees which the Association was able to give with the full weight of organised firms of the highest repute.

Moreover, the security which combined action gave to the firms concerned enabled them to keep abreast of, and indeed ahead of, the needs of a rapidly expanding and changing industry. As the electric light undertakings developed into power supply undertakings, new technical and manufacturing problems arose, demanding for their solution a great deal of costly research and experiment. It would have been impossible for the industry to undertake this development work if it had not enjoyed the security and the financial resources which a measure of combination afforded.

The C.M.A. rightly claims that it has "demonstrated that it is possible for a number of firms, entirely independent of one another financially, and, broadly speaking, working competitively, to concentrate the competition on being one of quality and effective service to the customer, rather than on to a ruinous price competition. The effect of the economies arising from concerted actions in the directions which have been indicated has been such that the actual prices are so low relatively to the quality dealt in, that it has been almost impossible for newcomers to the industry to offer equally high qualities at lower prices."

One need not be surprised therefore that the Cable Makers' Association has been adopted as a model for later groups of manufacturers, and has done a great deal to allay the public suspicion with which every form of industrial combination was once regarded.

The principle of industrial combination is now as firmly established as the principle of amalgamation which came into force about the same period. It may be said that it is more firmly established, since the advantages of combination increase with every application of the principle, while in the case of amalgamation there are strict limits to the benefits which can be realised.

We now live in an era of Big Business. The tendency of the time is to concentrate the power of control over production by mergers or amalgamations in one form or another. At the same time, where manufacturers remain independent, there is a complementary movement towards unity by the formation of industrial and trade associations.

Both movements will, I am sure, tend to greater prosperity for everybody engaged in industry, and to better service to the community. They will also, as I have already indicated, smooth the path of industrial peace by enabling decisions about the conditions of labour to be reached by a small but fully representative conference and given effect over the greater part of the industrial field.

While on this point, I would like to suggest an effect which the higher organisation of industry will have upon the cause of

* Extracts from the Inaugural Address to the Royal Society of Arts on Wednesday, November 7th.

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industrial peace. So far as our own country is concerned, efforts are being made to modify competition by co-operation, and it appears that steps have been taken in some industries to make treaties with the organised industries of other countries. If this movement continues, the nations will in time be bound together by a series of industrial agreements in which their interests are closely involved. This network should prove a powerful reinforcement for international peace.

## Effect of Amalgamation.

The better organisation of industry, both by amalgamation and the formation of associations, has a direct bearing upon the important subject of Research. It used to be a common subject of reproach against our manufacturers that they neglected research. A generation ago there may have been plenty of ground for the reproach; to-day it is only in exceptional cases that it can be justly applied. And the change is largely due to the transformation from independent competing firms to co-operating organisations.

Industrial research on the modern scale is a very costly and speculative undertaking. It needs large laboratories, equipped with expensive plant and manned by highly skilled experts in various branches of science. Its purpose is to adventure across the frontier between knowledge and ignorance and reach out over the unknown in the hope of discovering a treasure. However skilfully conducted, missions of this sort may only too readily end in nothing.

Clearly no industrial firm can embark on an organised research policy without possessing security, stability and surplus profits. When our industrial picture revealed a number of small and exclusive companies fighting each other gallantly for every order that came along, cutting prices in a desperate effort to maintain output in the face of both home and foreign competition, and experiencing rapid fluctuations of good and bad fortune, there was no place where research could have been introduced. The utmost that could be attempted was the equipment of a works laboratory for the testing of materials and for occasional experiments on new inventions. To spend thousands of pounds on a research department and instal in it a physicist, a chemist, a metallurgist and other specialists, in the hope that they might eventually achieve some beneficent revolution, was Utopian.

With the growth of organisation, however, the whole situation changes. A large amalgamation or an industrial association can afford to face the cost, and accept the chances of research on elaborate lines. The research laboratories to which our attention is so often drawn on the Continent and in the United States are all associated with the largest and most prosperous trusts. The further we carry our industrial organisation, either by amalgamation or combination, the more capable we shall become of bearing the luxury—a very profitable one at times—of research.

Some years ago the cable-making industry realised that it enjoyed a rather imperfect knowledge of what actually happened to its cables when laid underground. Dimensions and materials had been determined on empirical lines, and they were known to be satisfactory in a general way. But no one knew with scientific precision whether the standard sizes of cables were capable of rendering a higher service than that for which they were specified.

The problem was one which concerned every cable maker; or rather, it concerned the user of cables more than the manufacturer. A committee was appointed by the Electrical Research Association to investigate the subject of the heating of buried cables, and through the existence of the organisation of the leading cable makers, this joint experience was available for the use of the committee, and the result of this co-operation was that the electricity supply authorities were assured that they could effect material economies in transmission systems.

## Further Joint Research.

A further development of joint research is now under way. Each member of the Cable Makers' Association has been engaged upon independent research for a number of years. But it is inevitable that several cable research laboratories must be engaged simultaneously upon the same problem—as, for example, the behaviour of insulating materials at the extra high pressures now adopted on mains transmitting large quantities of electricity over long distances. Duplication of this kind tends to waste of effort, and arrangements have recently been made for co-ordinating the material and mental resources of many cable research laboratories on the main problems awaiting solution.

In enterprise of this description the British manufacturer finds invaluable aid in the National Physical Laboratory and the Department of Scientific and Industrial Research. Of late years the State has, through these organisations, so efficiently seconded the research work of large industrial firms and associations that we may rest assured that the help which science can render to industry is being adequately exploited.

Of late years there has been an increasing desire to employ public school boys in industry. Their training fits them admirably in many ways for positions of control, but they labour under the disability that they enter the workshops or offices at a comparatively late age. The lad who goes direct from the ordinary school into employment has gained five or six years practical experience, and has therefore become definitely useful to the employer, by the time the public school boy comes on the scene.

What the employer wants is, of course, a combination of higher education and practical experience. Under present conditions this combination is generally impracticable, and a choice must be made of one or the other. Whether it is possible, by some revision of our system of training, to secure a measure of both qualities in the young men who are fitting themselves for responsible positions, is a problem which our educational authorities should seriously consider.

In this connection I do not overlook the excellent results which have been achieved in technical training when a really great teacher gets around him a body of students attracted by the tradition of his teaching. I have in mind two outstanding examples in the Electrical world, one the old Finsbury Technical College under Prof. Ayrton, and the other the Faraday Training Institution under Prof. Harrison and Dr. Alexander Russell.

## BOOK REVIEW.

**Dielectric Phenomena. Vol. II.—Electrical Discharges in Liquid.** By S. WHITEHEAD. (London: Ernest Benn, Ltd.) Pp. 137. 12s. 6d. net.

Extensive research is being carried on to-day into the many complicated phenomena encountered in the operation of industrial dielectrics, and it is safe to say that in this country the lead in this work, so valuable to the electrical industriy, is taken by the Electrical Research Association. It is very appropriate then that, in addition to issuing official reports from time to time on specific subjects, the Association should have adopted the policy of preparing more pretentious publications bringing together within the covers of one volume a critical résumé of available information on some broad field of its work.

This book is the second of a series which the Association is issuing on the subject of dielectric phenomena. The first volume, which appeared last year, dealt with electrical discharge in gases, the present one covers discharge in liquids, and the form of the title adopted suggests that we may anticipate No. III on the electrical discharge in solids.

The first impression one gets from reading the book is that a subject in such a state of flux as the one under discussion, can be written up into text book form too soon. After all, a text book should at least be reasonably conclusive, if not dogmatic; Mr. Whitehead is often decidedly tentative and sometimes inconclusive. The state of knowledge possibly necessitates this attitude on the part of the author. Notwithstanding a mass of data, both previously published, and collected from the Association's own researches, it is quite clear that we must go much further before the study of liquid dielectrics is an exact science.

The first chapter, on the effect of solid and liquid impurities, shows that the breakdown strength of a liquid usually depends more upon the nature of these impurities than upon the nature of the liquid itself, moisture being the principal factor. The shape of the electric field has a considerable bearing on the operation of a fluid dielectric, and a comprehensive chapter reviews very completely and logically the effects of the geometrical forms commonly encountered.

In other chapters, the effects of temperature and pressure and the nature of electrodes are examined, and such phenomena as spark lag described. The book closes with a chapter on theory of liquid breakdown, which, although containing a statement that as there are no quantitative experimental laws which are generally accepted and, consequently, only qualitative theories, does, nevertheless, bring together modern views in a useful summary.

The book is a distinct and valuable addition to the literature of dielectrics. P. DUNSHEATH.

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# THE INTERNATIONAL ILLUMINATION COMMISSION.

## Modern Lighting Equipment—Effects of Glare—Road Surfaces and Street Lighting—Special Applications of Light.

By J. M. WALDRAM and G. H. WILSON.

(*Concluded from page* 494.)

AN interesting paper by H. Maisonneuve on "'L'Art Moderne' in Lighting: The Development in Europe," presented at Toronto, and another at Saranac by J. Wetzel on "The Application of Rational Principles to Decorative Lighting," dealt with the modern trend of design in lighting equipment, which involves fittings designed to harmonise with the architecture of the room in which they are used, and, in many cases, built into the structure. Some buildings, for instance the modernistic Titania Theatre in Berlin, and some American cinemas, are in a sense built round the lighting scheme. M. Wetzel showed in his paper that the modern decorative fittings offer much scope for ingenious illuminating engineering design, and may be efficient as well as effective. The hands of the illuminating engineer are too often tied by the restrictions imposed by a finished building; and in such cases the best results cannot be hoped for.

**Floodlighting of the New Terminal Tower, Cleveland.**

The work of Dr. Cobb on the reactions of the eye under the conditions of artificial illumination at various levels is well known, and he has added to his previous publications in a paper presented at the I.E.S. Convention on "Glare and the Four Fundamental Factors in Vision." The study of the eye is becoming increasingly recognised as a matter of primary importance; and several speakers expressed the view that an illuminating system should provide for good seeing, and that the responsibility of the designer does not cease with the production of a certain density of incident light flux on a more or less hypothetical "working plane." Dr. Cobb described the results of a large number of tests on the effect of a glaring source on the four factors in vision, viz., the size of the object, its contrast, the general brightness level of the background, and the time of exposure.

The Secretariat Committee of the I.C.I. on Glare was unable to prepare a report, but a valuable contribution was made by Mr. Preston Millar, who collated the results of a number of workers on the subject, and suggested lines for future work. Another paper by Mr. W. S. Stiles described work which is in progress at the National Physical Laboratory, and compared the results found with those of Bordoni and Holladay. It is to be hoped that the time is not far distant when it will be possible to arrive at some numerical estimate of the effect on the observer of bright sources. A tentative definition of glare which was put forward by the British Committee for consideration suggested far-reaching effects which may be attributed to the presence of abnormally bright portions of the field of view, ranging from distraction of attention in the mildest forms of glare, to injury to the eye in the most severe form.

The Committee was able to recommend lines for further study as outlined in Mr. Preston Millar's paper.

### Lighting for Traffic.

The problems involved in lighting for traffic are peculiar, whether in the lighting of streets, the headlights carried by the vehicles, or the arrangement and colour of the signals used for control or warning of vehicles, aircraft, or ships. Not only is the maximum of effectiveness called for, on the grounds of safety, but also the eye is generally required to operate under conditions near the threshold values, and very different from those obtaining in ordinary circumstances. Thus, the engineer must in these cases study and make use of any possible factor which he may be able to turn to account, and make proper allowance for other factors which would ordinarily be covered by a factor of safety. In the case of street lighting the effect of the surface of the street may be very considerable, and may either make or mar the installation. It was, therefore, particularly valuable to have presented two papers, one at Toronto by Mr. Preston Millar, and one at Saranac by Mr. A. K. Taylor, giving data on the reflection properties of different street surfaces under various practical conditions. It is only when complete data on surfaces is obtained that the problems of street lighting can be properly attacked.

### Automobile Headlights.

In the case of automobile headlights, the problem is largely one of glare, and of the specification and practical realisation of a driving beam or system which will provide a safe illumination of the road without producing an unsafe glare to the oncoming driver. Since it is useless specifying a given beam unless there are means of producing and—what is much more difficult—maintaining it, a study was made in two papers at Saranac by L. B. W. Jolley and by J. W. Ryde and Doris E. Yates of the properties of the paraboloidal mirror, and the tolerances which are necessary in the lamp and mirror in order to eliminate focussing devices. The elimination of such devices was agreed to be a necessary feature in any standardisation of the beam, in order to prevent improper adjustment by unskilled drivers; and the majority of the meeting decided that any specification of a headlight should be of the final beam from the reflector and lenses, if any. An interesting investigation was described at Toronto by Messrs. Dickinson and H. H. Allen, who determined by an ingenious photographic method the greatest lateral and vertical angles at which vehicles ahead require to be seen over various types of road. Such data should be valuable in designing the driving beam.

The problems of the colours of signal glasses; the lighting of airways and aerodromes, and the use of coloured signals for the control of traffic were all discussed at the appropriate technical sessions at Saranac. All these matters are among the few in which international specification is very desirable, and it is to be hoped that these discussions may bear fruit in due course.

**The I.C.I. delegates and their hosts at the Westchester Biltmore Country Club, N.Y.**

There is a rapidly increasing number of fields at the present time in which artificial light plays an important if not an essential part. In the whole of the cinematograph industry, both in the studio and in the cinema theatre, artificial light is indispensable. Both these aspects were considered at meetings in America. Film production was treated in a paper

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by Mr. Farnham on "The Lighting Transition in Motion Picture Production" at Toronto, and Cinema Lighting was discussed by a technical committee at Saranac. Mr. Farnham's paper dealt particularly with the movement in America, but the developments which compel a recalculation of the factors, such as the desirable quality and quantity of light, apply equally well in Britain. The author traced the recent introduction of the lighting of sets by incandescent

Special demonstrations of floodlighting were given at Niagara Falls. This picture shows the final searchlight fan.

electric lamps which has followed on the use of panchromatic film. Such lamps, it was stated, allow the directing artist a greater freedom in the exercise of his talents, and the new practices have enabled the lighting costs to be reduced to approximately 2½ % of the total. Details of the lighting equipment and its performance were given in the paper, which forms an interesting comparison with apparatus already introduced by some manufacturers into England.

At the meeting of the Cinema Lighting Committee of the Commission, the Japanese Secretariat presented a Report on Screen Brightness and angle of vision. These subjects formed the original terms of reference of the Committee, and the Report, in addition to providing useful data, formed a basis for further discussion. The recommended figure given in the Report for minimum screen illumination with no film in the projector was 25 metre-candles (approximately 2·5 ft.-candles), but in the opinion of the meeting the figure given was too low for general acceptance, as in America and England the average was usually from 8 to 15 ft.-candles. Screen reflection characteristics were also discussed, but owing to the limited data available it was finally agreed to circulate to the National Committee a questionnaire asking for information on the values of screen illumination in use, and on screen reflection characteristics. At the same time it is proposed to obtain information on the layout of theatres in order to find the angles of view normally employed.

Owing to the connection between suitable values of screen brightness and the level of general illumination in the cinema theatre, this matter was transferred from another committee for consideration by the Cinema Lighting Committee. After some discussion it was agreed to include this subject in the questionnaire.

## Examining "Old Masters."

Other special applications of interest to the delegates to the Commission were considered at a specially arranged General Session. Some of these subjects have already been dealt with under other sections of the proceedings, but the paper by M. F. Cellerier (France), on "The Application of Special Radiation to the Study of Pictures," falls in a separate category.

The increasing value of paintings by the old masters has led to the production of fakes which can scarcely be distinguished by inspection from their originals. In consequence, the method of examination suggested by M. Cellerier is worthy of study, especially as in addition to its usefulness in the detection of frauds, it enables retouches and restorations to be traced. The paper describes the method of photographing the picture by X-rays, or when illuminated by coloured or ultra-violet light. The properties of the pigments used at different periods and by various artists have been studied, and it is found that under certain types of illumination a characteristic result is recorded by a photograph, and it is often possible to tell whether or not a picture has been retouched with a pigment differing from the original one used. The methods of painting peculiar to an artist can also be detected by the formation of the brush marks, and the author showed an interesting example of a picture evidently begun by the master painter and then given to a pupil to finish. Further illustrations were shown which demonstrated clearly the application of the methods.

The magnitude of the efforts being made to improve the lighting position and to educate the public in Europe in the benefits of good lighting is probably as little realised as are the difficulties brought about by the language question and the differences in national psychology and point of view. Papers on various phases of the lighting industry in Europe were contributed at Toronto by Mr. W. E. Bush (Great Britain), Mr. C. A. Atherton (Switzerland), and Dr. M. Bausenwein (Austria). It would appear that, despite all difficulties, rapid progress has been made in recent years.

## British Educational Work.

From Mr. Bush's report it is clear that in Great Britain the E.L.M.A. Lighting Service Bureaux have been responsible for much of the educational work. These institutions have, in addition to their lecture courses, well equipped demonstration rooms in which the principles and practice of correct lighting can be illustrated. In no less than ten European countries similar activities have taken place, and temporary or permanent demonstrations rooms have been arranged; the splendid reception given to them testifies to their value.

Research, which is necessary for all sound progress, is being undertaken in many countries. In England, Mr. Bush stated, investigations are being made under Government direction by such bodies as the N.P.L. and the Department of Scientific and Industrial Research, and the results obtained are being made available through publications of the Stationery Office. In addition, investigatory and development work is being carried out by many industrial concerns.

Some indication of the state of advancement of knowledge in illumination may be gained from the publications connected with it. The Report mentions the English periodical devoted entirely to illumination, the "Illuminating Engineer," which is the official organ of the Illuminating Engineering Society. In Germany "Licht und Lampe," and in France the publication "Lux," serve similar purposes. It is worthy of note that one or two of the continental technical electrical journals publish periodically "Lichttechnik," supplements, and the material contained in them is generally very valuable.

One of the most popular schemes for the development of lighting has been introduced into Germany in the form of Lighting festivals. These usually open at noon with a concert, and by nightfall the city is brilliantly illuminated by floodlights and by special shop window lighting, and excursions are arranged to demonstrate the lighting. It is anticipated that twelve such festivals will be arranged during the present year, experience having been gained on the two already held.

The maximum rate of progress possible in illumination is controlled by economic conditions, by the extent of power distribution, and by the availability of good lighting equipment in the various countries, and Mr. Atherton discussed these aspects in his paper on "The European Problem." It was clearly brought out in the discussion of the paper that whilst the economic conditions prevailing in a country are beyond the control of an engineer, a great stimulus can be given to lighting progress by a recognition on the part of central station engineers of the direct financial and advertising value of the lighting load.

The improvement in the excellence of lighting equipment has been greatly assisted in recent years by the drawing up of specifications, already referred to, and by the co-operation between the incandescent lamp manufacturers which is producing standardisation of the most useful and efficient types of lamps, and, whilst improving the quality of the products, will, by reducing the number of special types, effect economies in the cost of production.

In addition to public instruction, the training engineers who are to be responsible for research, development, and commercial work, must also be considered. The subject of

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lighting education was dealt with at one of the technical sessions of the Commission at Saranac. In addition to information on the position of general education in lighting, data on illuminating engineering training in universities, colleges and schools were recorded in the replies to a questionnaire circulated by the American Committee. In both America and in Europe there appears to be little opportunity for a student with special aptitude for illumination work to take a course devoted entirely to this subject. The majority of electrical engineering courses, and some on building construction, include a few lectures on lighting, but generally it is difficult to obtain a complete training at any one institution. In the discussion of the questionnaire Herr Schneider drew attention to the existence of a special faculty for lighting technology in one of the colleges in Germany, and other speakers emphasised the importance of subjects such as geometrical and physical optics, the eye and vision, in the course at such a college.

The reports and replies received on these subjects refer chiefly to activities which have taken place during the past four years at most, and predict for the future considerable progress in a subject still in the early stages of development.

At the final plenary meeting the President, Mr. Paterson, remarked that the Commission could congratulate itself upon a very successful session. Owing to the organisation and to the enthusiasm and good feeling which was evident at the meetings, it had been possible to carry on useful discussions, and the conclusions reached had been expressed in a series of definite resolutions and recommendations. The thanks of the Commission were especially due to those who had been responsible for the organisation and secretarial duties, and upon whom the success of the session to a large extent rested.

The President was unanimously re-elected, and the office of Honorary Secretary was accepted by Dr. J. W. T. Walsh. An invitation was received from the Belgian National Committee, and another from the British National Committee, to hold the next plenary session in their respective countries Some discussion took place on the question of the time and place, and the offer of the British Committee was finally accepted, and the time fixed for 1931. The meetings in Italy and America were rendered especially successful as a result of the co-operation of all the interested bodies, and no doubt all who are connected with the art and science of illumination will do everything in their power to make the meeting in 1931 equally successful.

# HUMOURS OF THE MARKET SURVEY.

## Ourselves as Others See Us—Foreign Impressions of the British Wireless Position.

[COMMUNICATED.]

THE onlooker, according to an oft-quoted proverb, is supposed to see most of the game, and certainly the stay-at-home can obtain from foreign reports upon the English wireless situation curious information of which he was before entirely ignorant. In the course of his duties and investigations into foreign wireless developments, the present writer has for many years been a regular reader of large numbers of foreign publications, and in his reading in this field he has been rewarded by the discovery of much misinformation—as curious as it is inaccurate—upon the subject of the British wireless position.

How many listeners, for instance, are aware that at Rugby we possess the highest power broadcasting station in the world, and how many listen to its programmes? It was the U.S. Department of Commerce, a department which has, on the whole, done more than any other similar official body to investigate broadcasting and general trading conditions, which discovered this station.

Unofficial reports and surveys are, however, a good deal more interesting. The general manager of a large American wireless concern, after a couple of months in England examining trade conditions, gave a summary of his investigations to the trade press. His most curious discovery was the existence of a set-manufacturing monopoly of so serious a character that it was small wonder that British-made receiving sets could not face foreign competition—if it were true!

"The British Broadcasting Company," he reported, "have the entire monopoly of the set business as well as actual broadcasting by Act of Parliament, and therefore fix their own prices on complete sets. They have the situation so well in hand that one rarely sees a set for sale that is not licensed by them, so that 'pirate' sets are practically unknown. The consumer pays a tax on each set he buys of approximately $2 per tube, which goes to the British Broadcasting Company."

The first portion of the statement was undoubtedly founded upon the fact that our broadcasting sets had at first to be marked with the well-known "B.B.C." mark. The latter portion (excepting for the fact that the amount is quite incorrect) is evidently due to some statement heard, and founded upon an imperfect recollection of the old arrangement which operated during the first nine months or so of broadcasting, under which a manufacturer contributed to the funds of the B.B.C. 20s. on a one-valve, 35s. on a two-valve, and 45s. on a three-valve receiver, but it was an arrangement which had been cancelled and forgotten quite two years before the date of this particular investigator's tour.

A question of perennial interest, both to traders and users alike, is how do prices of British and American material compare? Those of us who have been able to follow American announcements may consider that prices on the other side of the Atlantic seem to be on the high side, but the visiting manufacturer already referred to had quite a different opinion. It appears from his report that "even after paying royalties and patent rights to the British Broadcasting Company, prices on American sets are still ridiculously low as compared with those being sold." According to this observer, the English situation is marked by "low prices on accessories, and unreasonably high prices on sets," the fault of the latter state of things being attributed to the B.B.C.

The importance of Great Britain as a potential market was emphasised by the statement that though there were over two million crystal sets in use, valve sets were only just appearing, "prohibitive prices being the obvious reason for the Englishman's backwardness in using tube sets." To be strictly accurate, the total number of licences in force at the time of the visit was only between 1 387 000 and 1 400 000, and although one guess may be as good as another when there is no means of proving which is right or wrong, it is to be doubted if the proportion of crystal sets in use would be very much more than half the total.

### Unnecessary Advice.

Though bearing testimony to the difficulties the British manufacturer has to face in the way of taxation, this observer believes that in the wireless trade he has failed to profit as he might by foreign experience, and the warning was given that "if he does not 'step lively' he will find himself entirely eliminated by the American manufacturer in the course of the next twelve months." It is pleasing and re-assuring to be able to record that though these remarks were written over twelve months ago, the dismal prophecy has so far shown no signs whatever of fulfilment, as American exports of wireless material to this country almost immediately showed a sharp decline.

In some quarters abroad, it is supposed to be difficult, if not impossible, for foreign wireless goods to be sold in England. How many of those in the wireless trade are aware, for instance, that if a foreign producer desires to establish a demand for wireless sets and parts in England it is necessary to establish branch houses rather than attempt to deal through British representatives, as British manufacturers of radio apparatus have declared that they will not supply dealers who also represent foreign firms. The foregoing is from a Government report the writer came across, and, of course, has reference to the attempt made by the old N.A.R.M. to control trading policy. The policy is abandoned, and the N.A.R.M. is no more, but the warning as to the difficulty of selling foreign material in the English market is still encountered from time to time, and must doubtless have served to deter many foreign manufacturers from attempting to tackle the English market.

The statements made periodically as to the number of wireless users in various countries are sometimes calculated to make one wonder from what source outside their own fertile imagination the observers obtained their information. The American estimate of the number of British listeners has already been quoted, and curiously enough just about the same time the writer found a somewhat similar survey in a

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Spanish periodical. In this, the writer expressed surprise that so much attention should be paid to the British system of broadcasting and the British wireless industry, when the German development was so much greater. For the purpose of giving the necessary support to his view, he quoted the number of receiving sets in use in Germany as 3 000 000. Actually, according to German official statistics, it was at that time just over the 1 000 000 mark.

On the whole, a foreign survey of the English wireless situation can usually be relied upon to furnish some curious reading. Some of the mis-statements encountered are probably to be put down to "propaganda" of some kind or another, but a larger proportion are evidently due to the acceptance of people on the spot who possess neither the knowledge of the trade nor the professional qualifications to speak on the subject, and when these are accepted at their face value it is hardly to be wondered at that the resulting picture is sometimes more remarkable for its strangeness than its accuracy.

# CORRESPONDENCE.

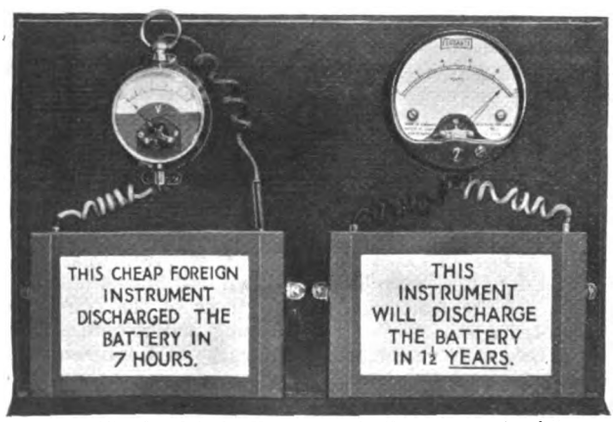
*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## A Point About Voltmeters.

[To the Editor.]

Sir,—Following the interesting comments on the subject of voltmeter resistance in "Current Topics" in your issue of October 5th, we decided to act on your suggestion that the deleterious effects of using low-resistance voltmeters for battery measurement should be demonstrated to the general public.

With this object, we had prepared, for the Manchester Radio Exhibition, a small exhibit, of which a photograph is attached. Two 9 V batteries of the same make were mounted on a small stand, each with a 0–10 V voltmeter connected to it. One instrument is of our own manufacture, and has a resistance




**The exhibit referred to by Mr. Rostron in the accompanying letter.**

of 1 000 Ω per volt, the other instrument being of a cheap foreign make.

Suitable cards were attached to the equipments giving an indication of the effect of each instrument on the life of the battery. This exhibit has attracted considerable interest, and we hope that it will do something towards reducing the evil to which you have drawn your readers' attention.

In connection with the closing sentence of your note, you will notice that the resistance of our voltmeter is clearly marked on the dial.—We are, etc.,

*for* Ferranti, Ltd.,
F. Rostron, Instrument Sales Manager.

Hollinwood, Lancs.

## Selling in Electrical Showrooms.

[To the Editor.]

Sir,—It was very interesting to read in your issue of October 26th the address and discussion on "Selling in Electrical Showrooms," under the auspices of the E.D.A.

The meeting was apparently a very interesting one, many giving such useful information as the width of showroom doors, area of floor space, amount of stock, and, last, but not least, original ideas from the United States of America dating from the year 1907, according to my records.

Not one member, according to your report, explained away the reason for coal fires and central heating in many showrooms and offices of electric supply departments, and not one attendant at the meeting ventured upon the subject of educating the consumer, service after purchase, or any matter that would be materially useful to the user.

I will recite an instance. A lady friend of mine, gifted with average intelligence, installed an electric cooker. One day, when the climate was not very kind, a very humid day indeed, the fuse of the cooker "cut-out," leaving the lady 72 hours with her food uncooked. She conferred with her husband on the matter; they talked more over the disgusting simplicity of "renewing the fuse" by an electrician, and then they decided that, although the cooker was good, the service was bad, on a matter the lady, or her husband, could easily have done themselves had they been told and shown at the time they purchased the cooker. Moreover, they resented the charge of 3s. 6d. which was made by the electrician for his service. Anyhow, one regretfully notes that, in the language of politicians, the result was a gain for the gas cooker.—I am, etc.,

George Humphry.

Wimbledon, S.W.19.
November 3rd.

# I.E.E. CENTRES.

## Annual Report of the Scottish Centre, Dundee Sub-Centre and Scottish Students' Section.

The twenty-eighth annual report of the Committee of the Scottish Centre of the Institution of Electrical Engineers points out that ten meetings were held during the session 1927–28. The average attendance at the ordinary meetings was 61, while the session closed with a total membership of 697, an increase of 38 on the previous year. During the session members visited the works of the British Aluminium Co., Ltd., Balfour and Beatty and Co., Ltd., the Clyde Valley Electrical Power Co., and the Edinburgh Corporation, the occasion being the summer meeting of the Institution last June.

The eighth annual report of the Dundee Sub-centre shows that seven meetings were held during the 1927–28 session, the average attendance at the ordinary meetings being 35. The membership at the close of the session was 67.

The Scottish Students' Section held ten meetings during the 1927–28 session with an average attendance of 36. During the session visits were paid to the hydro-electric station at Stonebyres and the works of Stewarts and Lloyds, Ltd.

# ELECTRICITY IN CANADA.

The municipal council of Red Deer, Alberta, has granted a twelve-months' lease of the local steam power plant to Calgary Power Co. Red Deer Council has agreed to the company using a short length of street for a continuation of the Calgary 13 200 V line to Ponoka.

The Calgary Power Co. is engaged in extending its activities to the north, and has obtained electric franchises in municipalities as far off as Wainwright and Hardisty, south-east of Edmonton. The company recently purchased the Westlock electric light plant, 60 miles north of Edmonton. The growth of electrical transmission by this company in Alberta is indicated by the fact that a recent statement gives the mileage of 13 000 and 66 000 V lines as 794 miles. Three 66 000 V lines connect Calgary with the hydro-electric stations on the Bow River west of Calgary, at Horseshoe Falls and Kananaskis, and the company is now engaged in the development of another site on the Bow below the junction with Ghost River. Between 20 000 and 30 000 H.P. will be developed at the Ghost site, which, with the two present plants, will provide from 52 000 to 62 000 H.P. for distribution in Alberta municipalities.

### A NEW ULTRA-VIOLET LAMP.

A novel ultra-violet source for home actinotherapy has, we understand, just been developed by Mr. P. Freedman. The source is a lamp of the metallic vapour arc type, in which the effect of the metallic vapours is supplemented and modified by the presence of a mixture of permanent gases having certain electrical and optical characteristics, and also the presence of an incandescent solid body. The lamp operates from the ordinary lighting supply, and requires no more manipulation during starting or running than an ordinary incandescent lamp.

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# NEWS IN BRIEF.

## Electrical Trade with Ireland—The "Ack Acks" and a Christmas Card—Bookmakers and Telephones—Report of the Saskatchewan Power Commission—News concerning I.E.E. Centres—The Batti-Wallahs—Torquay's Illuminations.

MORECAMBE-Heysham is to have Christmas illuminations this year.

Electric lighting is to be adopted at Leeds Road Hospital, Bradford, at a cost of £1 249.

In aid of the electric lighting fund a concert was held in the Pitts Memorial Hall, Plymouth, on October 25th.

During September, Manchester electricity department connected 74 hired cookers to its mains, making a total of 4 805.

The output of the plants of the New England Power Association system established a new record on October 16th, when over 5 million kWh were produced.

Imports of electrical goods into the Irish Free State during September last amounted to £52 020, as compared with £33 833 during the same month last year.

The Batti-Wallahs Society will hold a luncheon at the Hotel Cecil, on November 21st, at 1.0 p.m., at which the Right Hon. Sir Hamar Greenwood, M.P., will give an address.

"Cache-Riband," the bell in the belfry of Rouen Cathedral, on which the curfew has been rung by hand-power for 539 years, has just been fitted with equipment for electrical operation.

During the 18 days of the Exhibition of Underground Railway Posters at the New Burlington Galleries, London, 8 500 people attended. The maximum number of visitors on any one day was 931, on October 6th.

Shipley Council has appointed the chairman, vice-chairman, and engineer to decide special cases in which the rateable value system might be applied to the house portion of combined domestic and business premises.

The sales department of the Burnley electricity undertaking booked orders between April 1st and September 30th amounting to £1 850 12s. 5d., including 78 cookers. During the same period the Corporation wired 192 houses.

In the absence of Sir Gilbert C. Vyle, in America, Mr. G. Verity has consented to propose the toast of "The Visitors" in his stead at the annual dinner of the South Midland Centre of the I.E.E., on November 30th. The Students' Section dance will take place on December 12th.

The Great Western Railway directors have decided to extend the automatic train control system, at present in operation on the main line between Paddington and Reading, and on certain branches between Reading, Swindon, and Oxford, and between London and High Wycombe.

Hull Corporation Telephones Committee has placed an order for £350 worth of German-made telephone cable because it was cheaper than British. When tenders for telephone bell sets were considered, it was found that the British-made sets were cheaper, and foreign tenders were rejected.

A £100 000 telephone order, the largest ever given to the Post Office, has been provisionally placed by Messrs. Douglas Stuart, Ltd., the London West End bookmakers. Their scheme, to keep in direct touch with all the large towns in England, is the most extensive private line project ever undertaken.

The opening meeting of the 1928/29 session of the British Institute of Radiology will be held on November 15th. Most of the meetings during the session will be held at the Central Hall, Westminster, and examples of the most modern X-ray and allied apparatus will be shown, including exhibits by all British firms engaged in this industry.

The 27th A.A. Battalion R.E. (London Electrical Engineers) has decided upon a Christmas card which, besides the usual greetings, has in the inside a photograph of the Duke of York inspecting the Guard of Honour on June 26th. In order to obtain a supply of photographs suitable for publication in the Press, or in pamphlets, or for making lantern slides for lectures, an annual competition will be held to obtain the most suitable pictures taken during the year.

The High Commissioner for Canada in London has received from Regina a copy of the report of the Saskatchewan Power Resources Commission appointed on January 7th, 1927, which some time back recommended to the Provincial Government the taking over of the existing privately owned plants in the Province and their linking up in a Government-owned and operated scheme somewhat similar to that in operation in the Province of Ontario. The report can be consulted at the Canadian Building, Trafalgar Square, London, S.W.1.

Willesden Guardians want a lift engineer for the Park Royal Hospital.

The official opening of Shipley Council's new electricity showrooms took place on November 3.

A relief shift charge engineer and switchboard attendant is wanted in the Hereford electricity department.

Oldham Electricity Committee has decided to convert premises in Union Street for use as showrooms.

Premises in Ridgway Street, Douglas, are being converted by Douglas Corporation into showrooms for electrical appliances.

Applications are invited for the position of general manager of Chesterfield Corporation's railless electric vehicle and motor omnibus undertakings.

Lancashire County Council is seeking sanction for a loan of £725 for alterations and additions to the electric plant at High Carley sanatorium.

An assistant exchange engineer and two exchange electricians are required by the Egyptian Government Telegraph and Telephones Administration.

The annual dance of the North-Eastern Students' Section of the I.E.E. will be held on November 23rd at the Grand Assembly Rooms; the annual dinner will be held on November 27th.

At a meeting at the Deansgate Hotel, Manchester, last week, it was decided to form a Manchester branch of the National Association of British Transport Associations. The acting secretary is Mr. H. Auty, Denholme, Clovelly Road, Swinton.

The use of ultra-violet rays for improving the general health of school children was experimented with successfully at the Belfast Royal Academy last winter, and the experiment is being continued. The increase in height and weight of the 60 children treated was pronounced, and their attendance was much more regular than that of the other pupils.

Following a letter from the Electrical Power Engineers' Association, referring to the findings of the District Joint Board of Employers and Staff Members concerning the grading of the technical staff at the Electricity Works, Burnley Electricity Committee has resolved that having regard to the present staffing of the generating station, it cannot agree to any alteration, but when any change is made the matter will be reconsidered.

Disappointment was expressed at a recent meeting of Torquay T.C. regarding the past summer's sea front illuminations, which certain members considered were not bold enough nor large enough to attract attention. The Publicity Committee will confer with the Electricity and the Parks and Pleasure Ground Committees, on the matter, and the offer of Mr. Tom Mostyn, the artist, to help in regard to a colour scheme has been accepted.

Admiral Jellicoe, President of the British Legion, visited Birmingham on October 30th, at the request of the local branch of the Legion. Among the places visited by him were the Witton works of the General Electric Co., Ltd. He was accompanied by the Lord Mayor of Birmingham (Ald. James) and was received by Dr. A. H. Railing, Capt. A. M. Anderson, President of the Works Branch of the Legion, and Major Lewthwaite, Chairman of the Branch.

At Tuesday's meeting, London County Council adopted, by 63 votes to 44, the recommendation of the Special Committee on Traffic to the effect that legislation be promoted in the session of Parliament, 1929, to enable the Council to enter into agreements with the Underground Electric Railways Co. of London, Ltd., and others, with regard to the passenger transport undertakings owned by them, embodying the principles of common management and a common fund.

The President of the Board of Education has appointed a Committee to advise as to scope and methods of the Board's inquiry into technical education of the engineering industry. The members include Sir Dugald Clerk (chairman), Mr. A. P. M. Fleming, Mr. A. E. Berriman, Sir Henry Fowler, Sir Robert Hadfield, F.R.S., Mr. L. E. Mather, Mr. R. W. Paul, Mr. S. L. Pearce and Mr. P. J. Pybus. Mr. H. B. Wallis will act as secretary, and all communications should be addressed to him at the Board of Education, King Charles Street, Whitehall, London.

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# ELECTRICAL MERCHANTS.

## Formation of New Association for the Electrical and Radio Trades.

WHAT has been described as an attempt to put the wholesale distributor in his proper place lies behind the announcement this week of the formation of a new trade association known as the Electrical Merchants and Manufacturers' Association (including Radio).

This Association, of which Mr. A. G. Beaver, of the Sun Electrical Co., Ltd., is chairman, is at present established at 118-120, Charing Cross Road, London. Its membership at the moment comprises the following firms :—Berrys Electric, Ltd. ; Downes and Davies ; Drake and Gorham (Wholesale), Ltd. ; William McGeoch and Co., Ltd. ; Sloan Electrical Co., Ltd. ; Sun Electrical Co., Ltd. ; and Wholesale Electric Fittings Co., Ltd.

The majority of the firms concerned were previously members of the Electrical Wholesalers' Federation, from which they have now resigned.

In an interview with a member of the new Association, a representative of THE ELECTRICIAN gathered that the secession was mainly due to a feeling amongst certain of the larger firms in the E.W.F. that their ideas for placing the wholesale trade on a better footing were not shared by all the members. Although they had no quarrel with the Federation, it was considered that this was the most satisfactory way of securing full realisation of their policy. As the term " wholesale distributor " had fallen into disrepute they had in the title of the new organisation revived the good old English word " merchant " ; the Association would stand for all that that word used to imply.

Membership of the Association is open to wholesalers possessing the necessary qualifications, to wholesalers who are also manufacturers, and also to manufacturers who also act as wholesalers. An interesting point in the conditions of membership is the requirement that members should give preference to British goods.

On inquiry at the offices of the Electrical Wholesalers' Federation, THE ELECTRICIAN was informed that, while no official statement could be made until after the Council meeting fixed for Thursday, the formation of the new Association did not mean that the Electrical Wholesalers' Association would cease to function. On the contrary, it was gathered that under the new conditions the usefulness of the Federation to its members would be increased.

### FIRST AID IN WORKS.

The advantages of a knowledge of first aid to the employees of a large manufacturing concern need no emphasis. Some months ago, it was decided to form a unit of the St. John's Ambulance Brigade from among the Prescot employees of British Insulated Cables, Ltd., and classes have been conducted with such success that, at a recent examination, every candidate passed the required tests. On November 2nd, certificates were presented to the members of the division by Mr. G. H. Nisbett, managing director, who complimented them upon their success and the keenness they had shown in their ambulance work. He said that such excellent results reflected great credit on their instructors, Miss S. Purdue and Mr. D. Pender, and on Dr. Orton, who had acted as lecturer to the classes. Mr. Nisbett then proceeded to distribute prizes to the successful students at the various day and evening classes. British Insulated Cables, Ltd., have for many years taken a keen interest in the technical education of their staff and workpeople and give considerable assistance in the matter of fees and travelling expenses, besides providing prizes for the encouragement of students.

At the first annual gala of Blackpool Electric Trams and Swimming Club, on October 25th, Mr. C. Furness, electrical engineer and tramways manager, gave a handsome shield as the trophy for the two-lengths squadron race.

On completing the work of laying the electric cable in the Plympton Rural District Council's district the staff of the Macintosh Cable Co., Ltd., were entertained to dinner at the Plympton Inn. A company of about thirty-five sat down at the tables, and to a musical programme contributions were made by Messrs. Joslin, Grey, Jones, Edmonds, Barry, Chiswell and Medley. One of the features of the affair was the humorous menu card.

# PERSONAL.

MR. W. W. BARNHAM has taken over the general management of the radio department of the Edison Swan Electric Co., Ltd.

On the occasion of the marriage of Mr. Joseph J. Wheeler and Miss Cicely Swadling, the St. Helen's Cable Co., Slough, presented a clock.

Burnley Electricity Committee has appointed Miss Bullwinkle (Manchester) to be lady sales assistant and demonstrator at the showrooms.

Mr. F. G. G. A. Marraine, has been appointed to the post of lecturer and demonstrator to Faraday House Electrical Engineering College.

Lieut.-Colonel A. Simpson, late deputy managing director of Marconi's Wireless Telegraph Co., Ltd., has joined the board of Recordaphones, Ltd.

The friends of Mr. W. A. Brown will be interested to know the position to which he has been appointed, and will find details on page 533.

Mr. F. R. Cripps, electrical engineer, of The Droveway, High Salvington, has been elected unopposed to represent Durrington on West Sussex County Council.

Mr. E. Jordan, borough electrical engineer, Harwich, has accepted an appointment with the West Wilts Electricity Supply Co., Ltd. It is understood that Mr. Jordan will be the company's resident electrical engineer for Devizes, Chippenham, Trowbridge, Westbury, etc.

Messrs. J. L. Carr and J. D. Peattie, whose paper on " Domestic Electrification : Its Development and Requirements," was a valuable feature of the last I.M.E.A. Convention have been awarded the Association's premium as a mark of appreciation of their " remarkably able " paper.

Mr. P. J. Robinson, Liverpool city electrical engineer, on behalf of the staff, made a presentation to Mr. James Witter, on the occasion of his retirement from his position as superintendent on installations. Mr. Witter holds a record of combined service with the Liverpool Electric Supply Co., Ltd., and the Liverpool Corporation, totalling over 44 years.

Amongst the surprises of the municipal elections in Lancashire and Cheshire was the defeat of three members of the electrical industry, all of whom were previously members of their respective councils. At Bootle, Mr. J. Scott, consulting electrical engineer, and mayor designate of Bootle, lost his seat by 119 votes. At Birkenhead Mr. G. P. Dennis, electrical engineer, who contested the Bebington Ward, failed to retain his seat on the council. Mr. E. A. Heaney, for some years chairman of Preston Electricity Committee, contested the Trinity Ward of Preston, and polled 1 471 votes, or 65 less than his opponent.

The King has approved of awards by the President and Council of the Royal Society, including the Copley Medal to Sir Charles Parsons, F.R.S., for his contributions to engineering science, and the Hughes Medal to M. le Duc de Broglie, for his work on X-ray spectra. Sir Ernest Rutherford is recommended by the President and Council for election as president at the anniversary meeting on November 30th, Sir David Prain as treasurer, Sir James Jeans and Dr. H. H. Dale as secretaries and Sir Henry Lyons as foreign secretary. The President and Council also recommend Sir Thomas Stanton and Mr. A. A. Campbell-Swinton, amongst others, for election as members of the Council.

## Obituary.

MR. PETER H. COSSAR, on October 29th, at Glasgow. Mr. Cossar was for many years engaged in the contracting trade in Glasgow, and at the time of his death was Chairman of the Glasgow Branch of the Electrical Contractors' Association of Scotland.

MR. C. J. JEWELL, on November 2nd, aged 56 years. He was general manager of the Norwich Electric Tramways, and formerly resident engineer, Yorkshire (West Riding) Electric Tramway Co., Ltd. He was in 1920 chairman of the North Midland Section of the I.E.E. and was a past vice-president of the Norwich Engineering Society and president designate for the same society for 1929. He was a member of the Council of the Tramways and Light Railways Association, a Committee member of the Conference of Tramway and Light Railway Companies, one of the eight company-representatives on the National Joint Industrial Council for the Tramway Industry, and a member of the Standing Joint Committee of the Municipal Tramways and Transport Association and Tramways and Light Railways Association on the Standardisation of Overhead Line Equipment.

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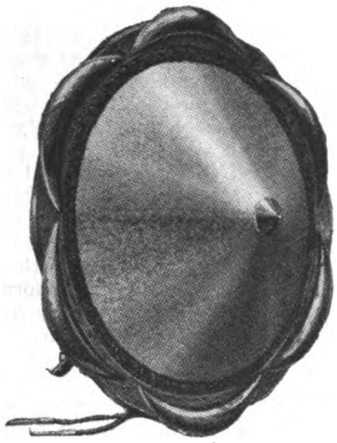
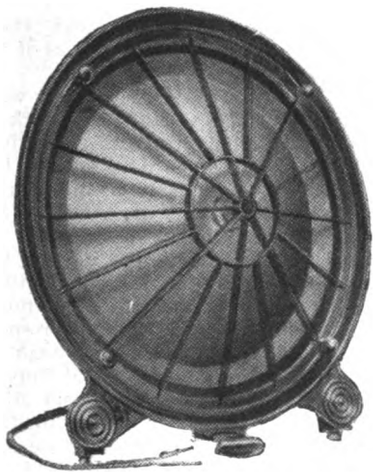
# WIRELESS GIFTS FOR CHRISTMAS.



One of the many cone-type loud speakers offered by the Mullard Wireless Service Co., Ltd.

One of the accumulator units offered by the Hart Accumulator Co., Ltd., for high tension purposes. The unit illustrated is a 10 V. bank of 5 000 mAh capacity.

This popular loud speaker design by Philips Lamps, Ltd., is a further suggestion as a wireless gift.

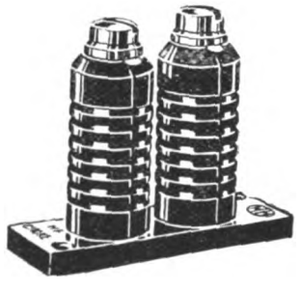


This Mullard instrument possesses novelty in design and is one of the most popular models.

A handsome self-contained portable set by L. McMichael, Ltd., which created considerable interest at the recent wireless exhibitions.

Another widely known loud speaker is this table type model of the Celestion Radio Co.

Battery eliminators for both d.c. and a.c. mains are also included in the range of suitable gifts offered by Philips Lamps, Ltd.



A new high frequency choke by L. McMichael, Ltd., which would be acceptable to all constructors and amateurs.

The "All-Electric Three" by the General Electric Co., Ltd., which, as its name implies, is a mains-operated equipment incorporating three valves. Its wavelength range covers the complete broadcasting band.

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# ELECTRIFIED RAILWAYS

## Railway Electrification Committee Report—Future Schemes and Extensions.

THE report of the Railway Electrification Committee, 1927, which was appointed by the Minister of Transport last November, was published on Monday. The Committee was appointed to review the recommendations made by the Electrification of Railways Advisory Committee, 1921, and to report what modification, if any, should be made with these recommendations, having regard to the developments which have taken place since that date.

### Progress Made.

The Chairman of the Committee was Col. Sir John W. Pringle, Chief Inspecting Officer of Railways, Ministry of Transport, and the eleven members represented the various railways and other interests. The report states that the total single track mileage of electrified railways to date in this country is approximately d.c. low voltage 1 257 miles, d.c. high voltage 77 miles, and a.c. 151 miles, giving a total of 1 485 miles. The Southern Railway has decided to substitute the low voltage d.c. third rail system for the whole of the existing single phase a.c. overhead system, viz., 132 miles, on the Central (L.B. & S.C.) Section, and it is estimated that this substitution, together with the electrification of further sections of line now worked by steam, making 147 miles in all, will be completed within 12 months. By March 31st, 1929, therefore, although the whole of the overhead single phase equipment on the Central Section of the Southern Railway will not have been actually removed, the total single track mileage of electrified railways will be approximately d.c. low voltage, 1 404 miles, high voltage, 77 miles, and a.c. 19 miles, giving a total of 1 500 miles.

The Committee endorses the opinion of the previous Committee that in order to ensure the future electrification of railways in this country being carried out to the best advantage it is desirable that certain general regulations should be observed by the companies. These should be directed specially to ensuring standardisation of methods and appliances and should put no avoidable difficulties in the way of the adoption in future of improvements suggested by increasing knowledge and experience. The decision of the Southern Railway to abandon the single phase a.c. system on the Central Section enables the Committee to simplify its recommendation in respect of the type of current for electrification, but with regard to standard voltages, the fact has to be taken into account that a considerable mileage has now been electrified with a sub-station bus-bar voltage of less than 750. The Committee realises further that railway companies, not so far electrified to any large extent, should not be debarred from adopting a bus-bar voltage of 750. Although no extension on the higher voltage (1 500) has been made, the Committee still considers that the higher voltage must be retained and recommends that d.c. be used on all future electrification, or extensions.

The remaining outstanding conclusions and recommendations of the Committee, are to the effect that the maximum standard voltages at sub-station bus-bars be 1 500 for the higher voltage and 750 V for the lower, provided that a voltage of 3 000 may be used in special conditions. In future all motors either for higher or lower voltage systems, whilst designed to give the best results at the particular voltage at which they are to work, should be capable of operating satisfactorily on the higher and lower maximum standard voltages respectively. The generation of three phase 50 cycles current at such voltage as may be considered desirable—subject to the provisions of the Electricity (Supply) Acts, is recommended, while overhead collection, for the higher voltage with third rail collection for the lower voltage, both with uninsulated return, are also recommended, provided that a fourth insulated rail be permitted for tube lines, and for extensions of systems now employing an insulated return. Electric locomotives intended for inter-running should be equipped on first construction with lower voltage motors designed to work on the maximum higher voltage with series-parallel switching, and the necessary equipment for dual working.

The report is signed by the Chairman and ten members of the Committee, Mr. Herbert Jones, electrical engineer to the Southern Railway, taking exception to certain recommendations with regard to collection and contact, and loading gauges.

# SELLING CAMPAIGN.

## Programme of the E.D.A. Sales and Publicity Calendar Scheme.

THE Electrical Development Association has devised a special Calendar programme which may be used as a basis for a continuous general selling and publicity policy for the whole of the electrical industry. The programme consists of a series of definite selling and publicity efforts, each one being related to a monthly period. Nineteen publications have been prepared on the subject of lighting and these are intended for the month of January. Fourteen similar booklets have been prepared on heating for use in November and April, while eleven publications on cooking have been prepared for use in May. Electrical gifts for Christmas are dealt with in six special leaflets for December, while spring cleaning forms the subject matter of fifteen new issues for February and March. For the same month eleven other booklets are also available, the subjects dealt with being washing and ironing. Fans and refrigerators are the subjects for May and June, no less than twenty-six publications being devoted to these two items. The whole or any of these publications are available to the trade and it is the hope of the association that the supply, manufacturing, contracting and wholesaling branches of the industry will co-operate and direct their publicity during the various periods in the directions indicated.

In addition, during each monthly period the association will provide, advertisements in the national papers; suitable posters; instructions for window layouts associated with window displays, provided free to all members; sales help handbooks with instructions for arranging demonstrations; drafts of direct sales letters; literature to be issued by supply undertakings, contractors, etc.; and layouts and suitable blocks for local newspaper and other advertising in conjunction with the association's national advertising. Further to these activities the E.D.A. will continue to produce and circulate cinema films, lantern slides, lectures, etc., and every endeavour will be made to extend the general activities of the association.

The proposed propaganda divides into (*a*) the direct work of E.D.A., i.e., national advertising, and (*b*) the work of supply undertakings, manufacturers, contractors and others in support of the general idea. With regard to (*a*) this has been based on the idea of carrying a continuous and simple message to the people, designed to remind the public of the existence of electricity and the fact that it can be used for many different purposes. In order to make the most of the money that will be available it has been decided to utilise small spaces in papers and journals with national circulations, the advertisements being simple and very bold. With respect to (*b*) it will be the endeavour of the association, through its Area Committees and Circles, to encourage local supply undertakings and firms to adapt their local press and other publicity to key in with the E.D.A. programme and for this purpose to use E.D.A. posters, issue E.D.A. literature and advertise in the local press using the layouts and blocks mentioned above.

### Extensive Advertising.

During November, 38 advertisements will appear in nine of the biggest daily newspapers, while during the following months up to June the number varies from 41 during December to 6 during June. Six of the popular monthly home magazines will each carry a suitable advertisement during seven months, while "Punch" will carry two per month up to April, with one during May. In addition, other activities of the association will be further developed. Sub-committees are engaged upon special subjects, e.g., rural electrification, industrial heating, refrigeration, etc., while the exhibition sub-committee is organising an exhibit at the Newcastle Exhibition, and is also exploring the possibilities of organising a national electrical exhibition.

A new folder "To help you choose your Christmas Presents," a model Christmas window display and a series of "local" advertisements have been prepared, copies of which will be issued in a few days, while matrices or stereos of the local advertisements, pierced for the insertion of the user's name and address, will be available at cost. To enable readers to reserve space in their local papers the sizes of the matrices and stereos are 4½ and 11 in. triple column and 6 in. for double column advertisements.

From January onwards the association hopes to circulate regularly the various publications enumerated.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

ILFORD CORPORATION.—Supply of an additional 1 000 kW converter, for Grove Road sub-station. Further particulars from Borough Electrical Engineer.

BRADFORD CORPORATION, November 10th.—Electric lighting installation in 10 combined shops and dwelling-houses at Eccleshill and Shirley Manor housing estates. Specifications from City Architect, Town Hall, Bradford.

BRADFORD CORPORATION, November 10th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, porcelain insulators, controller contacts, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

DARLINGTON CORPORATION, November 12th.—Electric lighting installation at Corporation Road Council School. Forms of tender from Education Office, North Lodge, Darlington.

CRAYFORD URBAN DISTRICT COUNCIL, November 12th.—Electric lighting and heating installation at Municipal Buildings. Particulars from the surveyor, Mr. Frank Leary; deposit £3 3s.

DOVER CORPORATION, November 12th.—(*a*) Supply and laying of about 2 500 yards of cable, suitable for 6 600 V; and (*b*) supply and erection of 2 200 V switchgear. Specifications from Borough Electrical Engineer, Park Street, Dover; deposit £1 1s. for each.

LONDON COUNTY COUNCIL, November 12th.—Four electrically-driven sewage pumping sets, at Abbey Mills pumping station, Stratford, with switchgear, transformers, cables, etc.; and also (at the Council's option) installation of four similar pumping sets. Specification, etc., from the Chief Engineer, Old County Hall, Spring Gardens, London, S.W.1.; deposit £5.

PORT OF BRISTOL AUTHORITY, November 12th.—Supply and installation of telephone and electric hooter signalling systems on the Eastern Arm Extension of the Royal Edward Dock, Avonmouth. Specification, etc., from Mr. Thos. A. Peace, Chief Engineer, Avonmouth Docks, Bristol; deposit, £2, to the Acting Manager and Secretary, Docks Office, 19, Queen Square, Bristol.

GLASGOW CORPORATION, November 13th.—Supply of lanterns for electric street lighting. Specification, etc., from the Inspector of Lighting, 20, Trongate, Glasgow.

LIVERPOOL CORPORATION, November 13th.—Supply and installation of artificial sun bath lamps and equipment, at Cornwallis Street Baths. Specification, etc., from the Baths manager, 75, Dale Street, Liverpool; deposit £1 1s.

MANCHESTER CORPORATION, November 13th.—Supply of trolley wire, tramway poles and tramway pole sleeves. Specifications, etc., from the Secretary, Corporation Tramways, 55, Piccadilly, Manchester.

ROCHDALE CORPORATION, November 13th.—Supply of single-phase prepayment meters for twelve months. Specifications from Mr. F. H. Rudd, Electricity Works, Dane Street, Rochdale.

STOKE-ON-TRENT CORPORATION, November 14th.—Overhead wiring and services to 64 new houses on Sutton Estate, Trent Vale. Specification, etc. (£2), from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent.

TYNE IMPROVEMENT COMMISSION, November 15th.—Six or 12 months' supply of electrical accessories and incandescent lamps. Form of tender (No. 22) from the Secretary, Berwick Street, Newcastle-upon-Tyne.

FARNWORTH URBAN DISTRICT COUNCIL, November 16th.—Supply of l.t. cables. Specifications from Mr. A. J. Hutchinson, Electricity Department, Albert Road, Farnworth, Lancs.

LEEDS GUARDIANS, November 16th.—Supply of electric lamps for period ending March 31st, 1929. Specification, etc., from Mr. J. H. Ford, Clerk to the Guardians, 11, South Parade, Leeds. Stamped, addressed envelope to be sent.

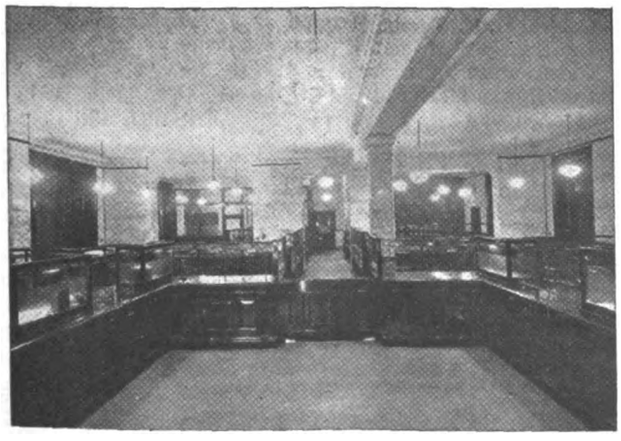
ROCHDALE CORPORATION, November 17th.—Supply and installation of 12 000 kVA, three-phase, 32 000/6 400 V transformer, with boosting transformers and necessary switchgear, at the power house, Dane Street, Rochdale. Specification, etc., from Mr. F. H. Rudd, engineer and manager, Electricity Department.

EDINBURGH CORPORATION, November 19th.—Supply of 1 000 kW motor converters for Cowgate sub-station. Specification (No. 95) from Mr. Edwin Seddon, engineer and manager, Electricity Department, Dewar Place, Edinburgh; deposit 10s. 6d.

LONDON COUNTY COUNCIL, November 19th.—Supply of (1) about 5 590 tons of tramway track rails, guard rails and fishplates (Section A); about 150 tons of bolts and nuts (Section B); and about 450 tons of slot rails (Section C); and (2) about 1 025 tons of conductor tee rails. Specifications, etc., from General Manager, L.C.C. Tramways, Victoria Embankment, W.C.2; deposit £2 in each case (Nos. 1 and 2).

WEST RIDING EDUCATION COMMITTEE, November 20th.—Electric lighting installation at Bentley New Middle School. Specifications, etc., from the Education Department, County Hall, Wakefield.

DUNDEE CORPORATION, November 21st.—Supply of l.t. paper insulated, lead covered and double steel tape armoured cable, to B.E.S.A. specification, for 660 V working pressure.



*TWO recent lighting installations, both carried out by Electricity Services, Ltd., have been brought to our notice and are worthy of illustration. That on the left is of a London bank where "Silvaray" fittings in conjunction with Siemens gasfilled lamps were used, while the right-hand picture is of a wholesale fancy drapery warehouse also in the city. The glassware selected was the new "Ultralite" enclosed lighting units, the glass of which is 3-ply quality with a glass canopy. Ventilation is provided at the base of the canopy, which can be lifted for lamp replacement or for cleaning. In the lighting of the showroom it was important to obtain a shadowless light of high intensity on the counters and this was achieved by using the fittings named.*

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Specifications from Manager and Engineer, Electricity Department, Dudhope Crescent Road, Dundee.

UXBRIDGE GUARDIANS, November 22nd.—Installation of electric lift, in connection with erection of new ward block and corridors at the Hillingdon institution. Specification can be inspected at the office of the architects, Messrs. A. S. Snell and Phillips, 9, Bentinck Street, Manchester Square, London, W.1.

STOKE-ON-TRENT CORPORATION, December 5th.—Supply and erection of natural draught cooling tower, at central power house, Hanley (Contract 2 833). Specification, etc., from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E., P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 9th.—Supply of wall pattern telephones and extensions, for Hillbrow exchange (tender No. 128). (Reference B.X. 4 709.)

EGYPTIAN MINISTRY OF INTERIOR, November 10th.—Supply and installation of distribution network, for the village of Kena. (Reference B.X. 4 707.)

INDIA STORE DEPARTMENT, November 11th.—Supply of two 150 kVA transformers. Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

DUBLIN UNITED TRAMWAYS CO., LTD., November 12th.—Twelve months' supply of stores, including electric lamps, electrical fittings, trolley fittings, etc. Forms of tender, etc., from the Company's Offices, 59, Upper O'Connell Street, Dublin.

VICTORIAN ELECTRICITY COMMISSION, November 12th.—Supply, erection, etc., of steel chimneys and dust eliminators, for Yallourn power station. Specification (No. 28/59) from the Agent-General, Victoria House, Strand, London, W.C.; deposit £1 1s.

GREAT NORTHERN RAILWAY (IRELAND), November 13th.—Six or 12 months' supply of stores, including electric fittings, lamps, cable and wire, etc. Forms of tender, No. 11 (1s.), from the Secretary, Amiens Street Station, Dublin.

NEW SOUTH WALES RAILWAYS AND TRAMWAYS, November 14th.—Supply and erection of ash sluicing equipment, for Lithgow power station. Specification (819) (5s.) from Chief Electrical Engineer.

CAPETOWN MUNICIPALITY, November 15th.—Supply of electric cable (specification 437/1928). (Reference B.X. 4 852.)

INDIAN STORES DEPARTMENT, November 15th.—Motor alternator, testing transformer, and induction regulator controller, for Government Test House, Calcutta (Order No. N. 5 217/1). (Reference B.X. 4 790.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of dry cells and voltoids. (Reference B.X. 4 729.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 15th.—Supply of galvanised wire and aerial cable (tender No. 132). (Reference A.X. 6 590.)

JOHANNESBURG MUNICIPALITY, November 17th.—Supply of electrically-driven pump and motor and automatic starting gear (contract 71). (Reference A.X. 7 055.)

TURKISH RAILWAYS AND PORTS DEPARTMENT, November 28th.—Supply at Haidar Pacha of a steam driven, a.c., 600 kW generator. (Reference B.X. 4 842.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 29th.—Telephone apparatus. (Reference B.X. 4 757.)

SALISBURY (RHODESIA) MUNICIPALITY, November 29th.—Supply of electrically-driven pumping plant. (Reference A.X. 7 089.)

EGYPTIAN STATE RAILWAYS, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500). Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264, 3/34.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of motor generating sets (schedule C. 377). (Reference B.X. 4 810.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd.—Supply of 15 715 electric meters and spares.

NEW ZEALAND POSTS AND TELEGRAPHS, January 15th.—Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

## Tenders Accepted.

OLDHAM CORPORATION.—Union Cable Co., Ltd., supply of l.t. cable.

METROPOLITAN WATER BOARD.—General Electric Co., Ltd., supply of telephone cable, £113 2s. 4d.

GENERAL POST OFFICE.—Edison Swan Electric Co., Ltd. supply of home safes and porous pots.

GREAT SOUTHERN RAILWAY (IRELAND).—Omega Lampworks, Ltd., 12 months' supply of Omega Lamps.

TAIN CORPORATION.—Laurie and Co., laying underground and erecting overhead mains for street lighting, etc., £2 315.

INDIAN STORES DEPARTMENT.—Indian Cable Co., Ltd., 2 500 yards cable, Rs. 1 747; Metropolitan-Vickers Electrical Co., Ltd., electric meters, Rs. 300, and spare parts for motor, Rs. 1 135.

AIR MINISTRY.—Siemens Lamps and Supplies, Ltd., 12 months' supply of vacuum, gasfilled and carbon filament lamps; Metro-Vick Supplies, Ltd., supply of Cosmos gasfilled vacuum and carbon filament lamps (period contract).

GREAT WESTERN RAILWAY.—Metro-Vick Supplies, Ltd., 12 months' supply of Cosmos gasfilled and vacuum lamps, including train lighting lamps; Siemens Electric Lamps and Supplies, Ltd., 12 months' supply of gasfilled lamps; Omega Lampworks, Ltd., 12 months' supply of Omega lamps.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply and erection of two 12 000 kVA three-phase step-up transformers for No. 4 turbo-alternator at Agecroft power station, £5 582; switchgear equipment, £2 500; and neutral earthing switchgear, £928. (Recommended).

GLASGOW CORPORATION.—Andrew Hutchison, Ltd., provision of electric goods lift at Mearnskirk Sanatorium, £313 10s.: W. Jacks and Co., block tin; Thos. Bolton and Sons, Ltd., solid copper rail bonds; W. C. Yuille and Co., Ltd., lifting jacks for bogie cars; British Insulated Cables, Ltd., grooved cadmium trolley wire.

CENTRAL ELECTRICITY BOARD.—A. Reyrolle and Co., Ltd. supply and erection of 132 000 V outdoor switchgear for the northern portion and English Electric Co., Ltd., supply and erection of 132 000 V outdoor switchgear for southern portion of South East England electricity scheme (total of the two contracts, over £600 000). •A. Reyrolle and Co., Ltd., switchgear for sub-stations at Dalmarnock, Paisley, and Port Dundas, in connection with Central Scotland electricity scheme, £18 000 (approximate).

HULL CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., supply of inside telephone wire, £100 1s. 9d.; Standard Telephones and Cables, Ltd., automatic equipment for central telephone exchange, £15 098; Power and Lighting Cables, Ltd., supply of cable, £245; W. F. Dennis and Co., Ltd., supply of lead-in cable, £77 10s.; Hinch Bros., Ltd., construction of concrete ash pits, etc., at power station, £3 898 8s.; H. Smith and Co., electric installation and fittings, at open market, £1 050 15s. 2d.; F. Smith and Co., bronze wire, £294 13s. 10d.

SOUTHEND CORPORATION.—H. Morris, 5-ton hand power crane for Thorpe Bay sub-station, £68; Associated Fire Alarms, Ltd., installation of Pearson automatic fire alarms, Prittlewell Priory, £185 10s.; Union Cable Co., Ltd., supply of cables for one year, £13 546 (approximate); Pirelli-General Cable Works, Ltd., cable for rotaries, £644; Clay Cross Co., Ltd., flange and point lengths, and double flange piles, for extending trawmay loops, £12 10s. and £11 10s. per ton respectively; Standard Telephones and Cables, Ltd., fire alarms, £315.

BRADFORD CORPORATION.—J. Carter, electric light installation at 16 shops and houses on Swain and Lower Grange estates, £202 7s. 4d.; Davenport Engineering Co., Ltd., erection of two cooling towers, at Valley Road power station; Brightside Foundry and Engineering Co., Ltd., supply of high pressure steam piping, for two boiler houses; Stanton Iron Works Co., Ltd., cast iron circulating water pipes, for new pump room; Herbert Morris, Ltd., supply of two 15-ton cranes and one 10-ton crane; Frederick Fox, Ltd., supply of steelwork.

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# BUSINESS ITEMS.

THE Herne Bay and District Electricity Co., Ltd., is to establish showrooms at Mortimer Street, Herne Bay.

The British Vacuum Cleaner and Engineering Co., Ltd., is showing a comprehensive exhibit at the Ironmongery, Hardware and Domestic Appliances Exhibition.

J. G. Statter and Co. point out that it has come to their knowledge that an impression exists in some quarters that their switchgear is of foreign manufacture, and desire to bring notice that all their switchgear is designed and manufactured at Amersham Common, Bucks, from British materials, and that they have no connection whatever with any foreign firm.

We are informed that the four new 20 000 kW steam turbines with condensing plant and auxiliaries required for the Schaerbeek power station are to be of Brown-Boveri manufacture. They are to be of the three-cylinder pattern designed for live steam at 525 lbs. per sq. in. gauge at about 800 deg. F. Each turbine will be supplied with three extraction points for feed heating.

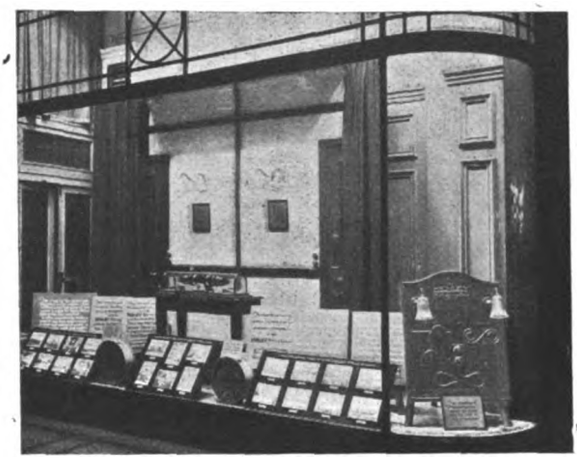
Brookhirst Switchgear, Ltd., will demonstrate at the Textile Exhibition, which will be held from November 14th to 24th, two control devices of special interest to those in the textile trade. There will be a "compensator regulator" designed to take up, automatically, slackness of cloth, and the other will be the end of a roving frame with "Cantie" inching starter, showing method of "inching" by push rod from any point along the frame. The starter is made by the associated company, Cantie Switches, Ltd., Nottingham. The Stand number will be 125, Row L.

Callender's Cable and Construction Co., Ltd., has, owing to the development of business in cables for ships, established a special department to deal with this side of its operations, The department will be under the charge of Mr. T. O. Callender. the only son of Sir T. O. Callender, managing director and deputy chairman, assisted by Mr. J. S. McCallum, formerly sales representative in Scotland, whose headquarters are in Glasgow, where, due to the number of shipyards on the Clyde, much of this business is to be found. This has meant rearrangement of the sales representation north of the Tweed, and Mr. W. A. Brown has been appointed sales representative for Scotland, with offices situate at 111, Union Street, Glasgow.

Under the auspices of the Banbury and District Electric Supply Co., Ltd., and the Shropshire, Worcestershire, and Staffordshire Electric Power Co., of which the former is now a subsidiary company, an electrical exhibition was held for five days last week in the Church House, Banbury. Daily demonstrations were given of cooking, heating, lighting, vacuum cleaning, etc. Contractors participating were Messrs. J. Bustin, T. C. Luckett, and J. W. Turton. The Banbury generating station, of which Mr. A. J. Wray is engineer and manager, is shortly to be interconnected with the Stourport and Smethwick stations of the Shropshire, Worcestershire and Staffordshire Electric Power Co., and also with the Birmingham Corporation stations.

Electricity was well to the fore in the "Health and Hygiene" Exhibition held in Birmingham last week under the auspices of the "Birmingham Gazette," the Health Society, and Provincial Exhibitions, Ltd. The Birmingham Electric Supply Department had a comprehensive exhibit showing lighting fittings, three new types of cookers, fires, tubular heaters, wash-boilers, and many other domestic labour-saving appliances. Kelvinator refrigerating equipment was shown by S. Hodgson in conjunction with Walker Bros., Birmingham, and the local branch of Frigidaire, Ltd., had an attractive stand. Hoover, Ltd., and the Gem Labour Saving Devices Co., Ltd. (Birmingham) showed vacuum cleaners, and the British Hanovia Quartz Lamp Co., Slough, sent a big exhibit of their sun-ray lamps for home and institutional use.

Electric motor cycle lighting outfits occupy a position of prominence on Stand No. 158, at the Motor Cycle Exhibition, Olympia, which concludes to-morrow (Saturday), where the British Thomson-Houston Co., Ltd., is exhibiting such other products as magnetos for single, twin (V or flat) and four cylinder engines, automatic ignition timing devices, "Fabroil" silent timing gears, Mazda automobile bulbs, etc. The lighting outfits are of two types, "PA" and "PB," and with full light on give illumination of the full width of the road for a considerable distance. In the former the generator, which is of the permanent magnet type with armature running in ball bearings, is of short length and large diameter, while the type "PB" or mag-generator lighting set has been developed for use on all types of motor cycles. The mag-generator is made in two designs, form A for four-stroke engines and form B for two-stroke engines, the generator being mounted above the magneto portion and driven by bevel gearing having a ratio of 3 : 1 on Form A, and 1½ : 1 on Form B. Both the "PA" and "PB" outfits include a 6 V battery, and a 7 in. dia. headlamp fitted with four-position switch, illuminated ammeter. Other exhibits include types



*A RECENT Henley wiring system display in the window of Croydon Electricity Department. The display included a telescoped length of 33 00 V cable, while the photographs showed buildings in which the Henley wiring system has been installed. The panels at the back represented a portion of a room wired with this system.*

M1, M2, MV, K1, K2 and KV for single and twin (V or flat) cylinder engines and type G4 for four cylinder engines, and type MC, which has been developed for use where weight is of primary importance.

In connection with the E.D.A. Factory and Workshops Lighting Campaign, Benjamin Electric, Ltd., has organised a special sales campaign to link up with the National campaign. For the past six months the company's activities have taken the form of circularising varying forms of publicity, all dealing with the advantages of correct lighting. Samples of the literature included in the campaign have been received, and these embrace matter of interest to factory owners in addition to other material with which central station engineers have been approached. In many cases supply undertakings have co-operated with the Benjamin Company by sending out special leaflets with their June and September accounts. A special data form included in this central station activity is designed to enable industrial consumers to furnish easily the required information as to their present lighting installation enabling recommendations for improvement to be made. Considerable activity has also been in force for some months past as a result of specially prepared letters addressed to the consumers, samples of which have also been received. The company states that it has been found that a series of three or four of these letters to industrial plants provides a large proportion of replies evincing interest and enabling the lighting service department to make suitable recommendations. Meanwhile the publication known as the "Benjamin Reflector" has been published from time to time dealing essentially with better lighting and such issues are being sent out monthly until further notice. In order to cope with the increased number of requests for advice, the lighting service department of the company was re-organised and considerably enlarged. During the early part of the lighting season special attention was paid to certain individual industries and specially written booklets dealing with the lighting of these were prepared and circularised to each industry. A complete hand book on industrial lighting comprising about 150 pages, has also been prepared, while advertising in the electrical and certain trade journals forms another part of the Benjamin service. The question of production has also received attention, and we are informed that large stocks are available. The alteration in certain sizes of gasfilled lamps has necessitated the re-design and production of certain reflectors, and it is interesting to note that all reflectors now being supplied are suitable for the new sizes.

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# ELECTRICITY SUPPLY.

## Middlesbrough and Battery Eliminators—Bristol and Change of System—Assisted Wiring for Tynemouth—Extensions at Greenwich Power Station—Congleton and Bulk Supply—Proposed New Mains at Shipley.

MANCHESTER Electricity Committee is to seek sanction for a further loan of £50 000 for feeder mains.

Sefton R.D.C. suggests that Liverpool Corporation should apply for a Fringe Order to give a supply in Sefton rural district.

Coleraine Council has dropped the electric lighting scheme, and it is understood that a company will be formed to take up the work.

Bradford Electricity Committee has authorised the provision and equipment of a transformer chamber in Dickworth Lane, at a cost of £5 590.

Tynemouth Electricity Committee recommends the allocation of £15 000 from surplus revenue for assisted wiring and other capital purposes.

Oldham Electricity Committee is considering the installation of two-rate meters to enable traders to obtain electricity at cheaper rates at off peak times.

Bridge R.D.C. has decided to raise no objection to the application of the Canterbury Corporation to supply electricity at Harbledown and Thanington.

Bangor T.C. has applied to the Electricity Commissioners for Northern Ireland for an Order to authorise the Council to supply electricity for all purposes.

The manager of the Maidstone Electricity Works has informed Sittingbourne U.D.C. that the Corporation is willing to provide a bulk supply of electricity for the district.

London County Council has decided to instal by direct labour, cables, etc., in connection with the provision of new switchgear at the Greenwich power station, at a cost of £5 000.

Sir Andrew Duncan on Wednesday officially started up a new 20 000–25 090 kW turbo-alternator set at the North Wilford station of Nottingham Corporation Electricity Department.

Congleton T.C. has adopted a scheme for the supply of electricity for the borough, the capital cost being placed by Mr. A. Ellis, the consulting engineer, at £45 740. A bulk supply is to be taken.

It is stated that the General Electric Co., Ltd., has decided to apply immediately for distributing powers over the whole Isle of Man, excluding the Douglas area, buying their current in bulk from the Douglas Corporation.

Messrs. J. P. and H. E. Sadd have informed Maldon T.C. that it is impossible at present to make any reduction in the price of electricity to consumers. The Council will apply to the Commissioners for a revision of the present tariff.

Alterations to cost about £450 000 are to be made to the electrical generating plant under the control of the Stalybridge, Hyde, Mossley and Dukinfield Joint Board, which has received instructions from the Central Electricity Board to change over the periodicity from 40 to 50 cycles.

Newton Abbot R.D.C., for whose district Torquay T.C. has an electricity Order, passed a resolution at last week's meeting expressing the opinion that the suppliers of electric current should be called upon in normal cases to make consumers' connections at their own expense.

At Tynemouth the high-power lamps have for some time past been put out of operation each night by the police, but the Chief Constable declines to allow his men to continue to carry out such duties. He has been authorised to confer with the Electrical Engineer as to the provision of clock switches.

Shipley Electricity Committee is to seek sanction for a loan of £10 000 for new mains.—The Committee recommends revising the hire purchase terms so that the first instalment shall be 10% of the purchase price and that the balance shall be paid by nine half-yearly equal instalments, the charge for fixing to be abolished.

Bristol Electricity Committee proposes to proceed with the sixth section of the change of the supply system in part of the centre of the city and Queen Square, St. Phillip's Marsh and part of Bedminster. The cost is estimated at £25 796 for mains £7 850 for sub-station buildings and £15 500 for sub-station plant. A sum of £6 000 will also be required for additional panels.

The Electricity Commissioners have decided to hold an inquiry into the proposal of Glasgow Corporation to sanction an expenditure of £237 000 on the re-conditioning and extension of the plant at Pinkston power station. It is suggested that the proposed expenditure could be avoided by an agreement under which the Electricity Department would supply any extra power required by the Tramways Department.

Mr. R. H. Scotson, borough electrical engineer of Middlesbrough, has devised a wireless battery eliminator which can be plugged into an electric light socket and which supplies both h.t. and l.t. current. This unit, with which it is claimed that a multivalve set can be operated at a round figure of 30s. per year, can be obtained from the municipal electricity department on an initial deposit of £1 and half-yearly payments of £1, the eliminator becoming the hirer's property in five years.

Stretford Electricity Committee has received a report from its consulting engineer regarding the Barton-Urmston electricity supply. The report states that up to date 520 applications have been received and 258 services connected up, and applications are coming in from all parts of the district, including a number of streets which were not scheduled in the original scheme. The cost of these extensions will increase the cost of the scheme and it will be necessary to seek further borrowing powers to cover the additional cost.

The electrification of the village of Broadway, Worcestershire, having been completed, the ceremony of closing the main switch connecting the power line to the distribution system was performed by Mrs. Burgess, wife of Capt. Burgess, on October 31st. Amongst those present was Miss C. Haslett, director of the Electrical Association for Women, who gave an address in which she outlined the many advantages of electricity in the home and elsewhere and dwelt particularly upon its value in rural areas such as Broadway. A souvenir in the form of a toaster was presented to Mrs. Burgess.

On the advice of Mr. B. Handley, borough electrical engineer, Portsmouth Electricity Committee recommends that the price per kWh under the two-part domestic tariff be reduced to ¾d.; that another small class of size of residence in the floor-area tariff be instituted, applicable to residences of 1 000 feet and under, the standing charge being 8s. per quarter, that the charge per kWh under the maximum demand tariff be reduced to ¾d., that a reduction of ½d. per kWh for electricity taken through prepayment meters for lighting be made, and that the minimum charge per annum be reduced from 27s. 6d. to 20s.

The wiring of premises constructed previous to September 1st, 1928, under a hire purchase plan is being undertaken by the Free State Electricity Supply Board in 23 towns in Leinster. The charge for current for lighting and domestic purposes will be 2d. per kWh plus a fixed amount, based on the valuation of premises, which will vary from 6d. per week where the valuation is under £5, to 2s. 6d. per week where the valuation is over £20. For business premises the fixed charge will vary from 9d. to 4s. Until the Shannon scheme is completed the towns will be supplied from the Shannon Leinster loop, fed from the Dublin Pigeon House station. The wiring is to be paid for by weekly instalments of 3d. per week where the valuation is under £7 10s., and 6d. per week in other cases.

Colchester Electricity Committee recommends an alternative pre-payment wiring scheme on the following lines: A maximum of five with a minimum of three lighting points and a cooker to be provided; additional points not exceeding two to be allowed under special circumstances; charge to be 2d. per kWh, payable by means of a shilling pre-payment meter. This charge will operate until 4 800 kWh have been consumed where three lights and cooker are installed; 6 200 where installation comprises 4 lights and cooker, and 7 600 where 5 lights and cooker are used; a rebate of ¼d. per kWh to be allowed on all consumption exceeding 1 260 kWh consumed in any one year; also discount of 2½ % on all current consumed. On the termination of the quarter in which the total consumption exceeds the appropriate number of units specified an additional rebate of ¼d. per kWh on all current consumed will also be made every quarter. Wiring installations to be maintained by the consumer.

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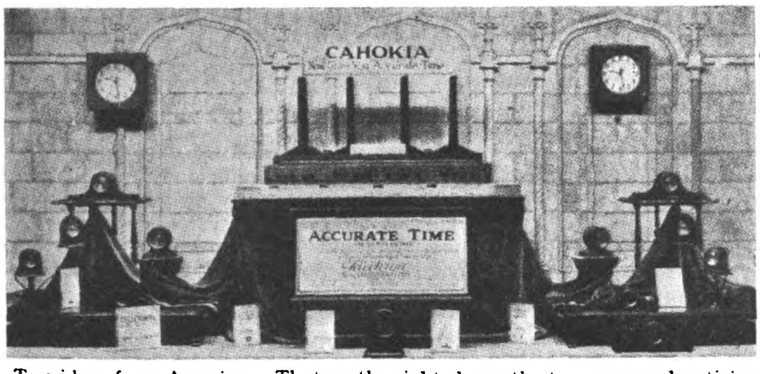
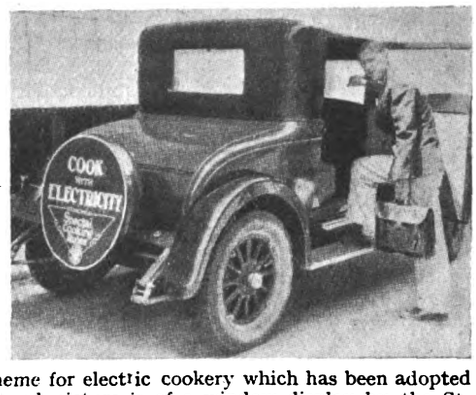
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

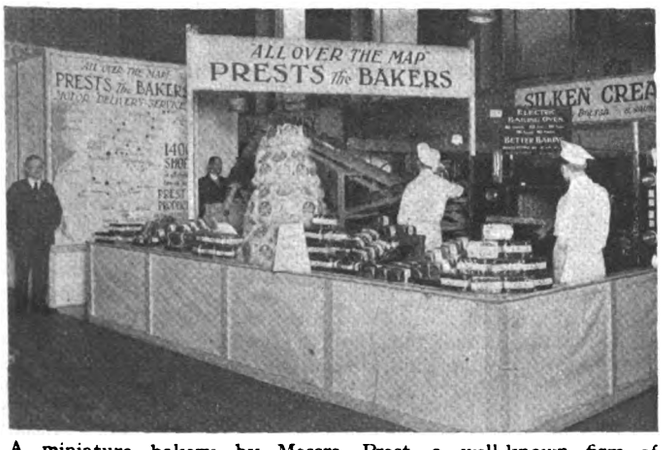
Photograph taken on the Quay at Fremantle showing members of the Government Mission to Australia. Left to right: Miss Duckham, Hon. Mrs. Archer, Sir Ernest Clarke, Mr. F. E. Archer, Mrs. Farquhar, Mr. D. O. Malcolm, Mr. J. G. Henderson, Sir Arthur Duckham, Lady Clarke, Sir Hugo Hirst, and Lady Hirst.

Bringing ashore at Mariehamn the telephone cable which will incorporate Finland in the inter-European system. The length of the cable is roughly 156 miles, of which 132 miles are submerged. The cable contains eight quads, seven of which are used in four-wire circuits, whereas the centre is reserved for short distance calls and is used in two-wire circuits.

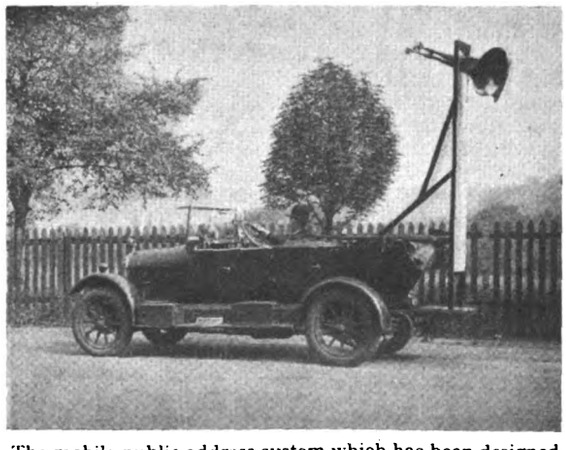



Two ideas from America. That on the right shows the tyre cover advertising scheme for electric cookery which has been adopted by the Valley Electrical Supply Co. for use on 250 service cars, and the left-hand picture is of a window display by the St. Louis Electric Power Co. for the selling of electric time. It is reported that the amount of business done with domestic and industrial concerns following upon a suitable time-selling campaign is remarkable. A large number of private houses in America are fitted with these electric clocks, while jewellers and departmental stores sell them in preference to spring-wound types. (Photos: "Electrical World.")




A miniature bakery by Messrs. Prest, a well-known firm of Lancashire bakers, in the Blackburn Public Halls. All the machinery was electrically driven, and the display created considerable interest in the trade. The illustration shows the G.E.C. oven, the electric mixer, moulder, and other equipment run by the same power.



The mobile public address system which has been designed by Mr. E. A. Paterson, of Birmingham, housed in a small touring car. A pair of large loud-speakers is supported on a collapsable frame mounted on the rear of the car. The outfit has been in great demand for the recent political demonstrations.

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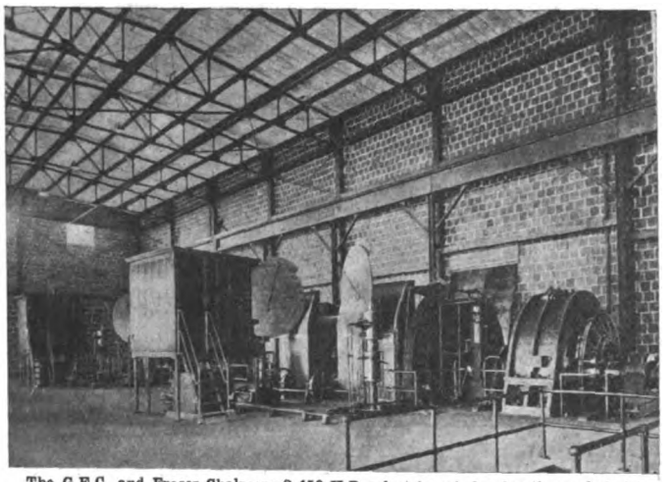
# ELECTRICAL WINDING.

## Installation of New Electrical Winding Plant at McIntyre Porcupine Mines, Canada.

A CONTRACT for electric winding plant has recently been completed by the General Electric Co., Ltd., for the McIntyre Porcupine Mines, Ltd., at Schumach, Ontario,



The G.E.C. and Fraser-Chalmers 2 450 H.P. electric winder for the rock hoist at the McIntyre Porcupine Mines.

where a new 4 100 ft. shaft has been sunk. The shaft has five compartments, containing two rock skips, one cage (man hoist) and ore and waste bins. The ore is mined at different points, and is dumped at the loading pocket at the 4 100 ft. level, whence it is hoisted to the surface by a rock hoist in skips, each holding 12 000 lb. when fully loaded. Two complete winding equipments were installed, one for the operation of the rock hoist, and the other for the cage hoist. In each case it was decided to instal double drum electric winders, the motors being controlled on the Ward Leonard system. The whole of the mechanical portion of the winder was manufactured at the Fraser and Chalmers Engineering Works, while the electrical apparatus, including driving motors, Ward Leonard motor generators, and switch and control apparatus was made at the G.E.C. Witton works. The drum shaft of each hoist is direct coupled to the driving motor. The rock hoist is driven by a 2 450 H.P. d.c. motor, and the cage hoist by a 1 400 H.P. motor of the same type. Power for the Ward Leonard motor generator sets is taken from a local electricity supply at 2 200 V, 25 cycles. The mechanical parts of the winder motors are similar, while those of the induction motors of the rock and cage hoists are identical, but owing to the difference in the maximum speed, viz., 79 and 52·5 q.p.m., the generator for the cage hoist is smaller. As both winders are of similar construction, only the rock hoist equipment is described.

The drums are cylindrical, one being keyed to the shaft and the other free to revolve on the shaft driven by a cast steel multi-toothed clutch operated by compressed air. The shell has concentric grooves turned at a pitch slightly greater than the rope diameter. The drum shaft, about 21 in. dia., is provided with a solid flange coupling between drum and motor. The bearings are all fitted with swivelling boxes and ring lubrication. The bedplate is of cast iron arranged so that its top level is practically flush with the floor. The centre pedestal is provided with a wedge for vertical adjustment. The post brakes are centrally swung and supported in forged bridle rods pivoted in cast iron base plates. The Whitmore brake engine and automatic take-up gear is fitted, and when fully applied the brakes are capable of holding the drum against the full torque applied by the motor. The control cabin, raised 5 ft. above the floor, is fitted with the necessary control levers, and interlocking devices are provided, so that the loose drum brakes cannot be taken off while the clutch is out of gear, neither can the clutch be disengaged until the loose drum brake is fully applied. Slow-action braking is also provided, which prevents the brakes being applied rapidly unless the cage or skip is within a predetermined distance from bank. When necessary, additional braking effort can be obtained by a further movement of the brake lever, which admits compressed air to the top of the brake piston, thereby supplementing the effect of the brake weight. If an overwind is imminent, or other emergency condition arises near the top of the shaft, the full braking pressure can be applied immediately, as the slow-action device is then inoperative. An overwinding-prevention gear is supplied, comprising two vertical screws driven by gearing from each drum.

The gear is also equipped with Fraser and Chalmers' patent decelerating speed control gear, which limits the gradually reducing speed to a predetermined amount, the apparatus acting during the last 150 to 200 ft. of the wind. In the event of (a) an overwind, (b) overspeed, (c) failure of air pressure, or (d) overload, the emergency brake is applied by means of limit switches, or by the emergency hand lever on the driver's platform. These switches interrupt the supply to the brake solenoid, thereby releasing the air from the brake engine, and allow the brakes to be applied, and at the same time remove the excitation from the main generator. The emergency gear can be easily reset by a reverse movement of the emergency lever, without leaving the platform.

The winders are fitted with large dial-type indicators driven by gearing from each drum. A second pointer on each dial comes into action during the last 100 ft. of wind, which indicates the position of the cage on a larger scale. The motor of each Ward Leonard generator set is a 1 700 H.P. machine running at 500/425 r.p.m. The machines are made as duplicates, in order to minimise the number of spare parts. The generator for the rock hoist has an output of 2 000 kW, the set being provided with a flywheel, while the output of the generator for the cage hoist is of 1 200 kW normal capacity. The motor for the rock hoist is built on the same frame as that for the cage hoist. The speed regulating gear for the two hoists is identical, and consists in each case of a faceplate controller with contacts mounted in a circle on a slate panel. The moving arm is carried on a shaft passing through the centre of the contact's circle, and interlocking contacts are mounted on this shaft at the rear of the slate panel. The whole gear is itself fixed in a metal housing, with quadrant and pinion for coupling to the control lever. This controller is connected in the field circuit of the generator, so that as its field is varied from a positive maximum to a negative maximum the speed of the winder motor varies in a corresponding manner and is only slightly affected by varying loads. The winder motor and generator are connected together in a continuous electrical circuit without any switches or interrupter gear. The d.c. side is protected against dangerous overloads by suitable relays, which cut off all excitation should the current exceed a definite maximum. As the d.c. circuit is always closed, it is necessary to provide a device known as a "suicide contactor" to prevent the remnant magnetism in the generator field system from building up sufficient volts to cause heavy circulating currents in the stationary motor armature. These contactors are always in the "suicide" position when the control lever is in the "off" position, and only move to the running position when the preceding operations have taken place in correct sequence. The exciter which provides the excitation of the winder motor and generator is shunt wound, with a contactor inserted in its field circuit. This contactor forms part of the safety attachments of a winder equipment, and with its interlock prevents the exciter from generating any voltage unless the plant is electrically in order. The brake magnet is connected directly across the exciter through a brake contactor so that in the event of voltage failure, the brake is immediately applied.

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### THE BOYS' BALLOT.

The time is drawing near when the names of the lucky winners of the Standard saloon car, and the 350 other gifts in the £1 500 prize list will be announced. In the meantime, interest in the Competition is growing by leaps and bounds, and there is a steady demand for tickets. On Monday the Duncan Sisters from the Gaiety Theatre opened the new depot, in a shop kindly loaned by the Westminster Press, at 170, Fleet Street, where the principal prizes are now being exhibited. The depot will remain open for the next two weeks, perhaps longer, and it is well worth paying a visit to see the prizes skilfully displayed by a member of the staff of the Haycock Press, whose services were most generously given.

Tickets in the Ballot, it will be remembered, are 1s. each, 10s. for a book of 11, and they can be obtained by personal application to the new depot, or through the post from the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

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# WIRELESS NOTES.

## The Marconi Royalty Position—New Step by the R.M.A.

ACCORDING to the "Wireless Trader," events following upon the recommendation of the R.M.A. with regard to the rendering by manufacturers of their royalty returns to the Marconi's Wireless Telegraph Co., Ltd., have been as expected. The recommendation was to the effect that the return should be accompanied by a statement indicating that the royalties had been calculated at the rate of 12s. 6d. per valve holder up to August 27th, the date of the Comptroller-General's decision in the Brownie Wireless case. Manufacturers who have pursued this course have had their royalty cheques returned by the Marconi Co., accompanied by a letter from them stating that they are advised that the existing licence still holds good, and requesting the payment of all royalties due at the old rate of 12s. 6d. per valve-holder. The R.M.A. has issued the draft of a recommended letter for use by manufacturers in these circumstances which reads as follows:—

DEAR SIR,

Referring to your letter of returning our cheque for £ tendered in payment of the amount of royalty which, as shown on our rendered statement, we make to be due to your company, we have to advise in reply to your demand for a remittance for what you consider to be owing that, in view of the award in the Brownie case recently given by the Comptroller-General of Patents, we cannot be a party to the continuance of the charge of 12s. 6d. per valve-holder to the Public.

Consequently, we can do no more than notify you that we are holding at your call the amount shown in the statement already rendered to you and have to state that, if any other steps are contemplated by your company, our solicitors are Messrs. Blundell, Baker and Co., 16, Serjeants Inn, London, E.C.4, who will accept service on our behalf.

Yours faithfully,

An alternative draft letter is provided to meet cases where licensees have only rendered a return and have not tendered a cheque in payment of royalties. This alternative letter differs from the one given above only in the wording of the opening paragraph.

The appeal of the Marconi Co. from the Comptroller-General's decision is expected to be heard shortly.

## Broadcasting In India.

The Indian Broadcasting Co. announces that broadcasting in India will be continued, and that every effort will be made to make it a success.

The Minister of Communications at Athens has decided to permit open tenders from all countries of the world for the concession of broadcasting in Greece. The company must be Greek, with head offices in Athens. Three-fifths of the capital must be Greek, but some of the artistes employed may be foreigners.

The International Wireless Congress recently recommended that preparations should be resumed at an early date for the purpose of revising the Washington Convention, and that a diplomatic conference should be held to arrive at an international regulation of problems of private law connected with wireless telegraphy.

It is understood that B.B.C. engineers have made a preliminary inspection of sites in the Barkisland area, near Sowerby Bridge, on one of which a high-power broadcasting station may be erected. Under the regional broadcasting scheme, which it is hoped to complete in two years, all existing B.B.C. stations (with the possible exception of Daventry) are to be replaced by five high-power transmitters.

A meeting of the Institute of Wireless Technology will take place on November 14th at the Engineers' Club, Coventry Street, W., at 7 o'clock p.m., when a paper by Mr. B. H. J. Kynaston entitled "A Radio Fog Signal Alarm for Ship Stations" will be delivered. Those aware of the activities of the Institute may be interested to learn that a revised number of the syllabus is now obtainable from the Hon. Secretary, Mr. Harrie J. King, at 71, Kingsway, London, W.C.2.

It is understood that the General Post Office is discussing with the Australian authorities the possibilities of establishing a wireless telephony service between this country and Australia. It is probable that experiments will be made at a later date. No tests, however, have yet been made by the General Post Office.

# TRADE PUBLICATIONS.

HERBERT Morris, Ltd., has published a new booklet concerning electric runways.

The Marconiphone Co., Ltd., has published a new board-type valve chart.

The current blotter of the Jackson Electric Stove Co., Ltd., illustrates the Atom fire.

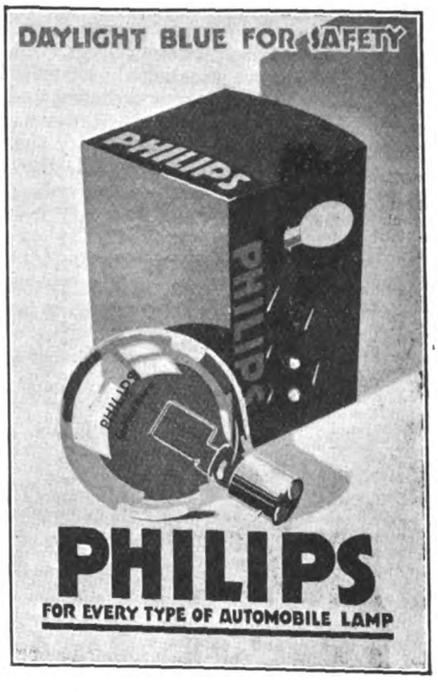
D. H. Bonnella and Son, Ltd., have issued a new list dealing with electric lighting accessories.

Rubber Industries, Ltd., have issued a special leaflet relative to Chatterton compound.

The current stock list of the Electrical Equipment and Carbon Co., Ltd., has been received.

Siemens Brothers and Co., Ltd., have sent us Catalogue No. 820, dealing with thermo-electric pyrometers.

A new blotter featuring the Enfield wiring system No. 1 has been issued by the Enfield Cable Works, Ltd.




A new showcard by Philips Lamps, Ltd. advertising automobile lamps.

List No. 928 describing condensers and other radio components has been published by the Dubilier Condenser Co., Ltd.

Furse Wholesale, Ltd., have published List 22/28. This is a net trade buyers' list of electrical supplies, apparatus and accessories.

A special leaflet dealing with loud speaker type 2 007 has been published by Philips Lamps, Ltd. The reference is leaflet 134 R.

The Hoisting Appliance Co. has published a new leaflet describing pit garages. The lifting and raising equipment is electrically driven.

"Something Better for Shop Window Lighting," is the title of a new publication by Falk, Stadelmann and Co., Ltd. The reference is P. 1 269.

List C.2 dealing with the Boreas automatic electrically driven air compressor, size Elvo 1·5, has been published by Lacy-Hulbert and Co., Ltd.

The hardening and tempering of high speed steel is dealt with by Mr. A. R. Page in "Heat Treatment Bulletin," No. 41, published by Wild Barfield Electric Furnaces, Ltd.

The British Thomson-Houston Co., Ltd., has issued a new leaflet entitled "The Lighting of Industrial Premises," and deals with Mazdalux reflectors and Glassteel diffusers.

Mazda valves with nickel filaments are dealt with in a new booklet by the British Thomson-Houston Co., Ltd. Another new issue describes and illustrates the company's radio receivers and accessories.

The Unbreakable Pulley and Millgearing Co., Ltd., has issued a pocket catalogue which includes details of the most recent developments in mechanical power transmission, and a number of power transmission tables.

The Mead-Morrison electric car puller is the subject of a special publication sent to us by the Rothermell Corporation, Ltd. The booklet gives a description of the general design and construction of the average equipment.

"Large Power Transformers" is the title given to a special publication by the British Thomson-Houston Co., Ltd., which describes in detail the procedure and process involved in the manufacture of the company's transformers.

We have received from Philips Lamps, Ltd., leaflet No. 135R, giving details of a large capacity rectifier. A new booklet describing and giving a selection of illustrations of Neon tubes for night signs has also been published.

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# COMPANY NEWS.

## Market for Electrical Descriptions Less Active—Manufacturing Holdings Weaken—Marconi's Recover—Supply Shares Mainly Firm—Henley's Dividend—Company Reports and Meetings.

THE market for electrical shares has been less active during the past week, and our usual table of price quotations shows few features of interest. Ever Ready shares at 29s. have risen two shillings, but other manufacturing descriptions have weakened, British Insulated, Callender's and Metropolitan-Vickers ordinary and Crompton Parkinson 8 % preference being all 1s. 3d. down. Among supply issues, Yorkshire Electric Power ordinary shares have lost 1s. Marconi's have regained the 2s. 6d. they shed last week.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) 3½ | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord... | 30/7½ | 31/10½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/- | 42/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 45/- | 45/- | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, ,, Elec. Sup. Ord. .. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P... .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B. Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 37/- | 38/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk... | 125 | 125 | 152½ | 24 |
| 6 | ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb... .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 77½ | 77½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk... | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb... | 79½ | 79½ | 98½ | 52 |
| 4 | ,, ,, ,, ,, A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 5 | Lon. & Sub. Trac. Ord. Stk. .. | 60½ | 60½ | 82 | 30 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 69 | 69 | 101½ | 49 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 5 | ,, ,, ,, 5% Deb. .. | 65 | 65 | 84½ | 19 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 71 | 71 | 92½ | 51 |
| 3½ | ,, ,, ,, 3½% Deb. .. | 79 | 79 | 66½ | 12½ |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 80½ | 80½ | 91 | 45 |
| 4½ | ,, ,, 4½% 1st Pref. .. | 116½ | 116½ | 146/12/6 | 80 |
| 6 | ,, ,, 6% Perp. Deb. .. | 79 | 79 | 73½ | 48½ |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 26/- | 26/- | 5/3 | 2/1½ |
| 5 | Underground Electric Rlys. Ord. | 5/- | 5/- | 27/- | 1/- |
| — | Yorks. (W.R.) Trams, Ord. .. | 61 | 61 | 87 | 52 |
| 4½ | ,, ,, ,, 1st Deb. .. | | | | |
| | **Electrical Manufacturing.** | | | | |
| | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 83/9 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P... | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb | 103 | 103 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 83/9 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P... .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 26/3 | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf | 19/- | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 29/- | 27/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord... .. .. | 42/- | 42/- | 59/- | 13/6 |
| †25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 35/- | 36/3 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/9 | 28/9 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25/- | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 257 | 256 | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 80½ | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 28½ | 29 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 76/3 | 73/9 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. .. | 55/- | 55/6 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25⅝ | 23 | 11/3/6 |

(*a*) 1s. 7⅛d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·700d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
† Including 1s. bonus.

SIMMS MOTOR UNITS, LTD.—Intm. div. of 5 p.c., less tax (same rate as last year) is now payable.

SOCIETA INDUSTRIE ELETTRO-TELEFONICHE (S.I.E.T.).—Cap. was recently increased from 200 000 000 to 300 000 000 lire.

INTERNATIONAL POWER SECURITIES CORPORATION.—Div. on common shs. of $1 p. sh. for 1928 will be payable on Dec. 15.

DAYSOHMS, LTD., and GRANVILLE ELECTRICAL AND MOTORS CO., LTD., were struck off the register of joint stock companies on Oct. 30.

YORKSHIRE ELECTRIC POWER CO.—The final instalmt. of 5s. per ord. sh. will be payable on Nov. 12, makg. the shs. fully paid.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Intm. div. on ord. shs. of 1s. 6d. p. sh., less tax (same rate as last year), will be paid on Dec. 1.

UNIVERSAL GRAMOPHONE AND RADIO CO., LTD.—During the present week, subscriptions have been invited for an issue of 560 000 5s. ord. shs. at par.

BUENOS AIRES LACROZE LIGHT AND POWER CO., LTD.—Transfer books of £300 000 6½ p.c. sterling red. mtge. deb. stk. are closed until Nov. 15, inclusive, for preparatn. of int. warrts. due Nov. 15.

BRITISH ELECTRIC TRANSFORMER CO., LTD.—Pft. for half-year ended June 30, £7 229, agst. £17 143 for correspondg. period of last year. Unrestricted competitn. is havg. an adverse effect, but factories are workg. full time.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904), LTD.—Sh. transfer books will be closed from Nov. 9 to Nov. 15, inclusive, for preparation of div. warrants for the three mos. ended Sept. 30, payable on Nov. 16.

ASSOCIATED GAS AND ELECTRIC CO.—The regular quarterly div. on the $6 div. series pfd. stk. of $1.50 p. sh. will be payable on Dec. 1. The div. will also be payable in class A stk. at rate of 3.19/100 of a sh. of class A stk. for each sh. of pfd. stk. held.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Operatg. results for Aug., 1928, were: Receipts $137 067, increase $12 623; net receipts, after provisn. for operatg. exes., $113 855, increase $12 330. Net earngs. for eight mos., $883 545, increase $27 896.

CONTINUOUS GRAMOPHONES, LTD.—Subscriptns. have been invited during the present week for an issue of 555 000 5s. shs. at par. Co. has been formed to acquire rights throughout the world, except in Australia and New Zealand, to certain inventions relating to an electrically driven continuous playing gramophone, etc.

ERCOLE MARELLI ELECTRIC MFG. CO. (ITALY).—The "Financial Times" announces the receipt from New York of a cable stating that Field, Glore and Co. and Kelly, Converse and Co. are arranging a loan on behalf of the co. The co.'s sales of electrical equipmt. last year amtd. to over $5 000 000, or more than $2 000 000 in excess of those for 1924.

COWANS, SHELDON AND CO., LTD.—A statemt., for informatn. only, and not an invitatn. to subscribe for shares, has been issued by this co. Authorised and fully paid-up cap., £150 000 in £1 shs. Co. incorporated in 1873, and has since carried on business of genl. engineers, ironfounders, mfrs. of cranes of all sizes and types, capstans, traversers, turntables, etc. Div. for 1928, 15 p.c.

ENGLISH ELECTRIC CO. OF CANADA.—Shhldrs. have ratified cap. reconstructn. scheme. Pfd. shhldrs. receive two shs. of "A" plus a half sh. of "B" stk. in exchange for each of their existg. shs., while hldrs. of common shs. receive one sh. of "B" stk. for each sh. held. Proxies in respect of both stks. considerably exceeded the necessary three-quarters, and, followg. the ratificatn. of the plan, a div. of $1½ p. sh. on the "A" shs., representg. a half-year's div., has been declared payable Jan. 15.

NORTH AMERICAN CO.—Consolidated income statemt. of the North American Co. and subsidiary cos. for 12 mos. ended Sept. 30, 1928, shows $20 668 750 (agst. £16 405 742 for previous year) for common stk., after deductn. of all operatg. exes., int., pfd. divs., depreciatn. and reserves. Earngs. represent an increase of 25·98 p.c. over those for previous 12 mos., and are equal to $4.40 p. sh. Earngs. of Washington

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Railway and Electric Co. and its subsidiary cos. are included from April 1, 1928, the date from which the North American Co. acquired control. Gross earngs. were $130 668 369, agst. $121 815 468.

COMMERCIAL CABLE CO.—Baring Brothers and Co., Ltd., and Morgan Grenfell and Co. announce that it has been brt. to their notice that in certn. cases trustees and other hldrs. of 4 p.c. deb. stk. of Commercial Cable Co. have been unable to assent to the plan and agreemt. of March last, being precluded from acceptg. securities of the Postal Telegraph and Cable Corporatn. in exchange for their holdgs. Baring Bros and Co. and Grenfell and Co. have been authorised to offer to hldrs. of the small residue of " unassented " stk. the opportunity of exchanging such stk., carrying int. from Nov. 1, 1928, for an equal amt. of a long-term trustee stk.—namely, British Government 4 p.c. fdg., 1960–1990, carrying int. from Nov. 1.

PERNAMBUCO TRAMWAYS AND POWER CO., LTD.—The American and Foreign Power Co. of New York offers to acquire all or part of outstandg. ord. shs. of Pernambuco Tramways and Power Co. at 10s. a share. The American Co. has previously purchased a controlling interest. Havg. recently acquired by subscriptn. 800 000 of the 7 p.c. pref. shs. of the Pernambuco co., the American co. is also willing to acquire all or part of remaing. 400 000 pref. shs. at 21s. each. The offer is made to all the shhldrs. of the Pernambuco co., with the optn. to withdraw if it is not accepted on or before Nov. 7 by such a proportn. of the shhldrs. as will give it, with its own holdg., at least 75 p.c. of the total pref. shs. cap., and at least 75 p.c. of the total ord. sh. cap.

ATLAS LIGHT AND POWER CO.—After mtg. int. charges and taxes, accts. for the year ended March 31 show a credit blce. of £300 907 (agst. £275 591), out of which £30 076 is set aside for deb. stk. redemptn. (agst. £15 369), and £15 000 for sh. cap. redemptn. (same as last year). Divs. for year on pref. shs. amt. to £131 470 and int. div. on ord. shs. took £42 163. A fin. div. of 3 p.c. is proposed on ord. shs., makg. 5 p.c. for year, and carry fwd. is increased from £16 804 to £35 756. D ring year £530 000 6 p.c. deb. stk., £530 000 7 p.c. pref. shs., and £114 789 ord. shs. were issued. Authorised cap. was subsequently increased by creatn. of 1 000 000 additional shs., none of which has yet been issued. Construction of the new power station in Santa Fé is practically completed, and extensions of tramways in Cordoba, which have been in progress during the year, have since been put into operatn. Whilst the businesses in Cordoba and Santa Fé have maintained a satisfactory rate of expansn. the receipts from the tramways in Montevideo have continued to suffer from the competitn. of omnibuses. Co. acquired as from July 1, 1927, the light and power supply and tramway businesses in the City of Parana and a controllg. int. in the Tucuman Tramways, Light and Power Co. Rev. from these holdgs. from the date of acquisitn. to end of financial year are included in present accts.

## Company Meetings.

BRITISH PHOTOTONE, LTD.—Mr. A. G. Smith, presiding at the statutory meeting last week, said the company had recently entered into an agreement with the two largest electrical concerns in Germany, Messrs. Siemens and Halske and A.E.G., through Messrs. Klangfilm, a subsidiary corporation of Messrs. Siemens and A.E.G., formed for the purpose of controlling the sale and equipment for and producing sound pictures. The effect of this agreement was to place the company in the position of using the very latest types of loud speakers, amplifiers, valves, etc., produced by these great organisations, and it gave to the company manufacturing facilities which, in the opinion of the directors, could not possibly be bettered. These negotiations had been partly responsible for the delay in arranging for the first showing of British Phototone pictures. Naturally, extra time would be required to arrange for their own machines to be synchronised for use with those they were obtaining from Messrs. Klangfilm. There had been other systems shown, some of them hurriedly, in order to compete with America, which had not convinced the exhibitor that they were workable propositions. It was not the intention of the directors to be hurried into making the mistakes of others. The prospects of the introduction of the company's sound films and apparatus into the American markets were definitely bright. The managing director of a very powerful American electrical sound reproducing group would arrive here shortly to discuss agreements which were already in an advanced stage.

BRITISH TALKING PICTURES, LTD.—At the statutory meeting last Friday, Mr. W. W. S. C. Neville (chairman) said on taking over the business from the old De Forest Phono-Film Co. one of the first things that had happened had been that their technical research staff had made suggestions for improvements in the apparatus, which the Board had decided to incorporate in all future models of the apparatus. The quality of the company's productions was now, the Board thought, better than anybody else's, and the improvement had had the important effect that they would now put through their apparatus all the films that were made on the systems adopted by the leading producers in America. The Board were very well satisfied with the number of definite orders in hand, and with the very large numbers of inquiries for quotations which they were now receiving. They intended to put up—the work was just about to commence—the biggest and most completely equipped sound-studio in this country, or indeed anywhere outside America, and hoped to be producing in the early part of next year. With regard to the Continental and foreign rights, they had decided on a policy of linking up with existing organisations abroad. They had been in negotiation with most important people, and those negotiations had reached the point of provisional agreements. Given time, the Board had every confidence of creating a big and successful business.

## New Companies.

LOXIT, LTD.—Cap., £100. Electrical and mechanical engineers, etc. Reg. office: 1, New Square, Lincoln's Inn, London, W.C.2.

BUSSENS AND PARKIN, LTD. Cap., £4 000. Electricians, etc. Reg. office: High Street, Downham Market, Kings Lynn, Norfolk.

RELATIVE ENGINEERING CO., LTD.—Cap., £4 000. Cable manufacturers, importers and exporters of wire, etc. Reg. office: 311, Cambridge Road, London, E.2.

HYDRAULIC COUPLING CO., LTD.—Cap., £2 400. Mechanical, electrical and experimental engineers, etc. Reg. office: 38, Gresham Street, London, E.C.2.

JOSHUA BUCKTON AND CO., LTD.—Cap., £100. Electrical engineers, etc. Solicitors: Roney and Co., Orient House, 42-5, New Broad Street, London, E.C.2.

ASH CO. (LONDON), LTD.—Cap., £750. Manufacturers and installers of and dealers in power plant equipment, etc. Reg. office: 21, Wigmore Street, London, W.1.

RICHMORE VALVE CO., LTD.—Cap., £400. Manufacturers of and dealers in wireless valves, electric bulbs and lamps, etc. Reg. office: 182, Miller Street, Aston, Birmingham.

S. HODGSON AND CO. (HALIFAX), LTD.—Cap., £12 000. Manufacturers and sellers of dynamos, electrical and mechanical engineers, etc. Reg. office: High Level Electrical Works, Halifax.

C. H. SOWERBY, LTD.—Cap., £100. Wholesale dealers in and commission agents for electrical appliances and accessories, etc. Reg. office: 22, Ely Place, Holborn Circus, London, E.C.1.

IDEAL HOME ELECTRICAL APPLIANCES, LTD.—Cap., £2 000. Electricians, mechanical engineers and manufacturers, etc. Solicitors: Heald, Johnson and Co., 129, Wardour Street, London, W.1.

CRAUFURD AND FROST (WIRELESS), LTD.—Cap., £3 000. Manufacturers of and dealers in radio, wireless, telephone, telegraph, electrical and scientific instruments and apparatus, etc. Solicitors: Kenneth E. Bartlett, Elliott and Co., 83, Cannon Street, London, E.C.4.

ACCUMULATORS OF WOKING (1928), LTD.—Cap., £10 000. To acquire factory and freehold premises at Woking, formerly carried on by Accumulators of Woking, Ltd., and later by the receiver for the debenture holders; to carry on business of mechanical and electrical engineers, etc. Reg. office: Mayburv Hill, Woking.

MONTAGUE RADIO INVENTIONS AND DEVELOPMENT CO., LTD.—Cap., £1 500. Manufacturers and importers of and dealers in radio apparatus, electrical equipment, mechanical appliances for the transmission of pictures—both still and moving, and with or without wires—electricians, etc. Reg. office: Empire House, 117-9, Regent Street, London, W.1.

J. W. GARY AND SON, LTD.—Cap., £3 000. To acquire the business of electrical and general engineers now carried on by A. Hands and J. W. Forrester at 91, Leadenhall Street, and Saracen's Head Yard, Fenchurch Street, London, E.C., as J. W. Gray and Son, Alfred Hands and Co., and A. Gray and Co. A director: A. Hands, 13, Westbourne Grove, Westcliff-on-Sea.

EVERLITE, LTD.—Cap., £100 000. To adopt agreement with Metropole Developments, Ltd., and to carry on business of electricians, suppliers of electricity for light, heat, motive power or otherwise, manufacturers of and dealers in electric lamps, radiators, dynamos and batteries, manufacturers of radio apparatus, etc. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C.2. (Public co.)

ITONIA GRAMOPHONES, LTD.—Cap., £120 000. Manufacturers, exporters and importers of and dealers in machines and instruments for musical entertainment, scientific, commercial or other purposes, including gramophones, phonographs, apparatus for transmission or reception of telephonic or telegraphic communications and messages, electrical engineers, etc. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C.2. (Public co.)

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CLIFTON, Mr. W. B., 37, Cookridge Street, Leeds, electrical agent. £13 15s. 1d. September 24th.

CROMPTON AND SON, 129, High Street, Chiswick, wireless dealers. £37 1s. 9d. September 21st.

ELLIOTT RADIO MANUFACTURING CO., LTD, 87, Senhouse Street, Maryport, Workington, radio engineers. £10 3s. 6d. September 18th.

HALL, Mr. W. L., 36, Lumley Road, Redcar, wireless dealer. £16 13s. 7d. October 3rd.

HOLDEN, Mr. T., 2, Middle Lane, Rochdale, dealer in wireless apparatus. £28 13s. October 3rd.

LYNCH, Thomas, Harwood Lane, Great Harwood, wireless engineer. £11 15s. 10d. October 1st.

PRICE F. TARVER AND CO., 15, Woking Street, Cardiff, electrical engineers. £21 0s. 8d. September 29th.

SANDS, Mr. C. W., High Street, Kings Langley, electrician and wireless engineer. £18 14s. 8d. October 2nd.

TALLIS, Walter John, 330, King Street, Hammersmith, wireless apparatus dealer. £13 19s. 10d. September 27th.

## Receiverships.

BAKER BROTHERS, LTD.—H. Ricketts, corporate accountant, of 31, Peckway Road, Norbury, S.W.16, was appointed receiver and manager, on October 23rd, under powers contained in debenture dated February 21st, 1928.

BRETWOOD, LTD. (formerly RADIO IMPROVEMENTS, LTD.) E. J. Bell, C.A., of 17, Queen Victoria Street, E.C.4, was appointed receiver on October 18th, 1928, under powers contained in debenture dated September 15th, 1927.

ECONOMISERS ENGINEERS, LTD.—H. S. Jones, C.A., of 3, York Street, Manchester, was appointed receiver on October 26th, 1928, under powers contained in debenture dated July 20th 1926 (revoking the appointment of R. C. Price, made July 22nd).

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BARTRUM ROYLANCE AND CO., LTD., Manchester, electric engineers.—Registered September 27th, £1 181 5s. 4d. debentures (secured by Trust Deed dated September 10th, 1928); general charge. *Nil. October 20th, 1927.

CONTINENTAL RADIO IMPORT CO., LTD., London, E.—Reg. Oct. 11, series of debs. for £1 000, present issue £500; general charge. *Nil. Feb. 14, 1927.

COURTIN AND WALSH, LTD., London, E.C., mfrs. of electl., &c., apparatus.—Reg. Oct. 10, £2 500 deb., to Isabel Baxter, 74, Kingsfield Road, Watford (wife of Ernest J. Baxter); general charge. *Nil. July 31, 1928.

DARBYSHIRE (R.), LTD., Blackpool, electricians.—Registered October 3rd, transfer of mortgage and deed of covenant (supplemental to mortgage dated November 13th, 1920), to Martins Bank Ltd., securing all moneys due or to become due to the Bank (on transfer of the company's account to that Bank consequent on the amalgamation therewith of Lancashire and Yorkshire Bank, Ltd.); charged on 10, Upper Talbot Street, Blackpool. *£1 826. August 25th, 1928.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

TAYLOR, Frederick Alfred, trading as KINGSTON RADIO SUPPLIES, Station Approach, Kingston-on-Thames. A meeting of the creditors of the above was held on November 1st at the offices of Messrs. Hadden and Blake, accountants, 24, Old Buildings, Lincoln's Inn, when Mr. Hadden stated that the liabilities were approximately £200, and the assets included stock £31, and a lease £15. In addition the debtor's friends were willing to guarantee the sum of £50, which would be available in a month. That would bring the assets up to about £90. There were also preferential claims of £13 and £14 respectively, which would be paid by the debtor's friends. The bailiff was in possession, and the debtor had told the accountant that the bailiffs held stock at the present time worth £65, and the judgment debt was for about £14. If, therefore, the bailiffs were paid out, there should be a further asset for the creditors. The debtor had been in the present business for one year, and started with a capital of £100.

Considerable discussion took place at the meeting, and eventually it was decided that a deed of assignment should be executed to Mr. Hadden as trustee, and that the accountant should get into touch immediately with the bailiff with a view to taking over the stock again if of any value to the creditors.

## London Gazette, etc.

### Company Winding-up Voluntarily.

BEDALE AND DISTRICT ELECTRIC SUPPLY CO., LTD.—By Special Resolution, October 15th, confirmed October 31st. R. W. Smith, Bedale, electrical engineer, appointed as liquidator. Meeting of creditors at the Power Station, Bedale, on Wednesday, November 14th, at 6.30 p.m.

### Bankruptcy Information.

CHARLEY, Henry Victor (trading as DINAS POWIS ELECTRICAL SUPPLY CO.), Station Road, Dinas Powis, Glamorgan, electrical engineer. First meeting, November 14th, 11 a.m., 34, Park Place, Cardiff. Public examination, December 13th, 11.15 a.m. Law Courts, Cardiff.

HANBURY, Cyril Kay, 20, Padiham Road, Burnley, electrical engineer. Receiving order, November 3rd. Debtor's petition.

SHARPE, Henry Clifford, 4, Gordon Terrace, Dorchester, Dorset, wireless engineer. First meeting, November 6th, 2 p.m., Official Receiver's Office, City Chambers, Catherine Street, Salisbury. Public examination, November 16th, 10.30 a.m., County Hall, Dorchester.

SMITH, Frederick Walter, 45, Browning Street, Leicester, electrical engineer. Receiving order, November 1st. Debtor's petition. First meeting, November 14th, 3 p.m., Official Receiver's Office, 1, Berridge Street, Leicester. Public examination, December 7th, 11 a.m., The Castle, Leicester.

SPRAGUE, Frederick Charles, 44, Victoria Avenue, Mumbles, Swansea, electrician. First meeting, November 16th, 11.30 a.m., Official Receiver's Offices, Government Buildings, St. Mary's Street, Swansea. Public examination, November 30th, 11 a.m., Town Hall, Swansea.

WHEELER, Frederick George, Wynchwood, Broadlands Avenue, Shepperton, Middlesex, electrical engineer. Receiving order, November 1st. Creditor's petition.

### Notices of Dividends.

BRITTAIN, Percival Frederic, trading as BRITTAIN'S ELECTRIC MOTOR CO., East Down Works, Dermody Road, Lewisham, S.E.13, and at 110, Cannon Street, London, E.C., electrical engineer. Second and final dividend, 6s. 3½d. per £, payable November 16th, at the offices of Corfield and Cripwell, Balfour House, Finsbury Pavement, London, E.C.2.

GORDON, John Henry, 21, Leeds Road, Ilkley, Yorks, electrical engineer, trading as J. H. GORDON. First and final dividend, 2s. 2½d., payable November 22nd, Official Receiver's Office, 24, Lower Bond Street, Leeds.

NUTTALL, Harry, 1073, Chester Road, Stretford, trading as J. A. HARTLEY AND CO., electrical agent and factor. First and final dividend, 2s. 1d. per £, payable November 12th, Official Receiver's Offices, Byrom Street, Manchester.

### Order Made on Application for Discharge.

TIZZARD, Norman, trading with Frank John Tizzard, under the style of TIZZARD BROTHERS, 27, Dalkeith Street, Barrow-in-Furness, and 121, Market Street, Dalton-in-Furness, electrical engineer and contractor. Discharged November 21st, 1928.

## Bankruptcy Proceedings.

BARNETT, Timothy, 934, Woodborough Road, Mapperley, lately 622, Mansfield Road, Sherwood, lately 6, St. Peter's Churchwalk, all Nottingham, and High Street, Stanton Hill, near Mansfield, Nottinghamshire, electrical contractor. The public examination of this debtor was held on November 1st at the County Court House, St. Peter's Gate, Nottingham, when a statement of affairs was presented, which showed liabilities of £1 931 and a deficiency of £1 573. The debtor stated that he studied electricity and started on his own account at a time when there was a boom in wireless, and he took as much as £20 a day, but business fell off after two or three months. He then took up electrical work in houses, but he had had no practical experience. He opened a branch at Stanton Hill early in 1927, at which he sold electrical fittings, but this branch he closed down in 1928. The debtor had borrowed £200, agreeing to pay 33⅓ per cent. interest, the latter being later reduced to 25 per cent. Debtor took the money out of the business with which to purchase his private residence, and for about six to ten weeks he opened another branch in St. Peter's Churchwalk. A friend put £500 into the business, on the agreement that he was

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to be given regular employment, and have a third of the profits. Later this same party found another £200, guaranteeing a like sum at the bank. The debtor stated that his wife had acquired the premises at Woodborough Road, and let them to him, the former having previously sold the Mansfield Road premises for £1 400, of which she let the debtor have £500 in consideration for furniture made over to her. The debtor attributed his failure to loss on contracts owing to want of experience, loss by slump in wireless trade, loss on motor car transactions, illness expenses and bad debts. The examination was adjourned for closing.

HALL, Geoffrey Samuel (trading as Geoffrey S. Hall and Co.), electrical engineer, lately 8, and formerly 55, Malden Road, New Malden, Surrey. The affairs of this debtor, who was adjudged a bankrupt on June 28th of last year, came before Mr. Registrar Francke in the London Bankruptcy Court on Friday of last week on the hearing of his application for an order of discharge. The Official Receiver said that in his opinion the total of the unsecured indebtedness was £716 and that the assets, which were valued by the debtor at £282, had realised only £24 odd, the greater part of them having been taken possession of by a trustee appointed under a deed of assignment who had, however, totally failed to account for them to the Official Receiver. In 1920 the debtor bought an electrical engineer's business carried on at 55, Malden Road, and at a later date he acquired branches in Cheam and Ewell. He continued to trade until February, 1927, when he executed a deed of assignment of his property in favour of a trustee on behalf of his creditors in general. The debtor attributed his insolvency to loss on the sale of his branch businesses, to loss of his trade because of his change of premises and to lack of capital.

The only fact in opposition to the discharge reported by the Official Receiver was the insufficiency of the debtor's assets to pay 10s. in the £ to the unsecured creditors, and his Honour said that a suspension of the discharge for four weeks would be enough.

COHEN, George, electrical engineer, 49, Newman Street, Oxford Circus, London, W. Under a receiving order made in this case, the statutory first meeting of creditors was held on Friday of last week at Bankruptcy Buildings, Carey Street, W.C. A statement of affairs was submitted in which the debtor returns his liabilities at £4 391, of which, however, only £896 are unsecured, and he claims to possess a surplus in assets of £240. But it was understood that this statement might need amendment. It appears from statements made by the debtor that he began business as an electrical engineer in 1901 in the Mile End Road, E. He then had a capital of £45. Afterwards he removed to West End Lane, Hampstead, and opened a branch business in Golders Green Road. In 1908 he had the misfortune to lose several hundreds of pounds through builders for whom he was engaged on work becoming insolvent, and following that he discontinued the business in West End Lane. In 1918 he sold his other business. But at the end of the war he recommenced trading in King Street, Cheapside, City, with the help of his Army gratuity. He was very successful, and when those premises were demolished he removed to 59-61, Queen Victoria Street, City, where he remained until March last. His business had been a success until last year when, in consequence of the general slump in trade, it had depreciated. His failure has arisen from the insolvency of a subtenant against whom he has himself instituted proceedings in bankruptcy. In April last the debtor removed to 49, Newman Street, W., and he has taken a son into partnership. The meeting was adjourned for a fortnight in order that the debtor might have an opportunity of submitting a proposal for the benefit of his creditors.

## METAL AND CHEMICAL PRICES.

Tuesday, November 6th

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £71 10 0 | 0 5 0 | — |
| Electro Wirebars | ,, | £75 0 0 | 0 15 0 | — |
| H.C. Wires, basis | per lb. | 10⅝d. | ⅛d. | — |
| Sheet | ,, | 10½d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1⅛d. | ⅛d. | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8½d. | — | — |
| Sheet ,, | ,, | 10¼d. | 1 4 | — |
| Wire ,, | ,, | 10⅜d. | 1 4 | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £22 15 0 | — | 15 0 |
| Foreign or Colonial | ,, | £21 7 6 | — | 15 0 |
| *Tin*— | | | | |
| Ingot | per ton | £229 10 0 | £6 5 0 | — |
| Wire, basis | per lb. | 3 0 | 1d. | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 2 6 | 2s. 6d. | — |
| *Mercury* | per bottle | £23 2 6 | — | — |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 15 0 *Boric Acid* (Crystals) ,, £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½ l.
*Sodium Bichromate*—Per lb. 3½d.

*Rubber*—Para fine, 11d ; plantation, 1st latex, 9½d.

∴ The metal prices are supplied by British Insulated Cables Ltd. and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

## LEAD MARKET REPORT.

James Forster and Co. state that after a period of steady markets during recent weeks the market became distinctly easier last week, particularly in the prompt position. October lead fell 6s. 3d., November 5s., December 2s. 6d. and January 1s. 3d., but February lead was unchanged at £21 13s. 9d.

Closing prices on November 2nd were £21 15s. for November and December, and £21 13s. 9d. for January and February, a fall of 5s. in the early position but unchanged for forward.

## ELECTRICAL TRADE MARKS.

***This list has been specially compiled for us from official sources by GEE AND CO., Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C. 2, from whom further information may be obtained.***

*Opposition to the registration of the following trade marks can be lodged up to November 30th.*

MAGLITA.—491 822. Class 6. Magneto electric machines for lighting purposes and ignition devices, all being machines or parts of machines for use in connection with motor vehicles. The C.L.I. Manufacturing Co., Ltd., 116, Colmore Row, Birmingham; manufacturers. May 25th, 1928. (To be associated. Sect. 24.)

HUMANOLA.—489 926. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes; instruments and apparatus for teaching. The Humanola Co., 47, Gun Street, Brushfield Street, Bishopsgate, London, E.1; manufacturers. March 28th, 1928. (To be associated. Sect. 24.) (By consent.)

ELDURATOR.—491 912. Class 8. Electric accumulators (not for medical purposes). Poerscke Elektricitats Gesellschaft Mit Beschrankter Haftung, 85, Wilmersdorferstrasse, Berlin-Charlottenburg, Germany; manufacturers and merchants. May 30th, 1928.

ELIMETER.—492 446. Class 8. Electrical measuring instruments for use with battery eliminators. Sifam Electrical Instrument Co., Ltd., Bush House, Aldwych, London, W.C.2; manufacturers. June 15th, 1928. (By consent.)

NEW LEVEL (Sign).—B493 412. Class 8. Electric batteries (not for medical purposes). John Watson, trading as Watsons Wholesale Wireless, 2, Bigg Market, Newcastle-on-Tyne; wireless dealer. July 19th, 1928. User claimed from March 3rd, 1926.

PERFECTAVOX.—493 954. Class 8. Instruments consisting of a combination of a wireless telephonic receiving set and a gramophone. Edward Noel Kent-Lemon, 30, Park Cross Street, Leeds; wireless dealer. August 10th, 1928.

ISOPHONE.—494 055. Class 8. Sound transmitters and loud speakers. Louis Lumiere, 156, Boulevard Bineau, Neuilly-sur-Seine (Seine), France; manufacturer. August 13th, 1928.

## Coming Events.

### Monday, November 12th.

ELECTRICAL ASSOCIATION FOR WOMEN.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture by Mr. H. W. Gambrell on "A Complete Electric Radio Gramophone Equipment." 7 *p.m.*

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. "Notes on Wireless Methods of Investigating the Electrical Structure of the Upper Atmosphere." By Prof. E. V. Appleton, F.R.S. 5 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (WESTERN CENTRE).—South Wales Institute of Engineers, Cardiff. Paper by Mr. H. B. Poynder on "Some Practical Considerations in the Design of Automatic Equipment for Heavy Traction Sub-Stations."

ELECTRICAL CONTRACTORS' ASSOCIATION (HASTINGS SUB-BRANCH).—Lewcock's Restaurant. Ordinary meeting.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Engineering Requirements of a Modern Office Building." (Opened by Mr. J. Coxon.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE).—Armstrong College, Newcastle-on-Tyne. Lecture by Prof. S. P. Smith on "Automobile Ignition Systems." (Joint Meeting with the North-Eastern Students' Section.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE).—University, Edmund Street, Birmingham. Paper by Dr. J. D. Morgan on "Action of a Spark-Gap." 7 *p.m.*

INSTITUTION OF HEATING AND VENTILATING ENGINEERS.—Borough Polytechnic, Borough Road, Southwark. Paper by Mr. H. F. W. Joyce on "Space Occupied by Heating and Ventilating Apparatus." 7.30 *p.m.*

ROYAL SOCIETY OF ARTS.—John Street, Adelphi, London. Cantor Lecture (1) by Dr. Franklin Kidd on "Refrigeration." 8 *p.m.*

### Tuesday, November 13th.

INSTITUTION OF ELECTRICAL ENGINEERS (EAST MIDLAND SUB-CENTRE).—College, Loughborough. Paper by Mr. S. H. Holden on "Electricity Meters." 6.45 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE).—Hotel Metropole, King Street, Leeds. Paper by Mr. W. B. Woodhouse on "Overhead Electric Lines." (To be illustrated by a cinematograph film.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—17, Albert Square, Manchester. Paper by Mr. F. Lydall on "The Electrification of the Pietermaritzburg-Glencoe Section of the South African Railways." 7 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (SWANSEA BRANCH).—Ordinary meeting.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.—Junior Institution of Engineers, 39, Victoria Street, Westminster. Discussion on "Factors underlying the relative Efficiency of a.c. and d.c. distribution for town and urban areas." (To be opened by Mr. H. Blades.) 7.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH CENTRE).—Royal Technical College, Glasgow. Chairman's address by Mr. D. S. Munro on "Some Tendencies in Installation Work."; paper by Mr. P. D. Morgan on "A Critical Study of the Current Rating of Low Pressure Ordinary-Duty Fusible Cut-Outs." 7.30 *p.m.*

### Wednesday, November 14th.

ELECTRICAL CONTRACTORS' ASSOCIATION (EASTBOURNE SUB-BRANCH).—5, South Street. Ordinary Meeting.

ELECTRICAL TRADES BENEVOLENT INSTITUTION.—Trocadero Restaurant, London. Annual Festival. 7.30 *p.m.*

BRITISH INSTITUTE OF RADIOLOGY.—Barnes Hall, Royal Society of Medicine, 1, Wimpole Street, London. Mackenzie-Davidson memorial lecture on "X-ray optics," by Prof. W. L. Bragg, F.R.S. 8.15 *p.m.*

### Thursday, November 15th.

BRITISH INSTITUTE OF RADIOLOGY.—Central Hall, Westminster. Opening of Exhibition of X-Ray Apparatus, 10.30 *a.m.*: Presidential Address by Prof. G. W. C. Kaye, O.B.E., on "Radiology, Mediæval and Modern," 2.30 *p.m.*; Silvanus Thompson Memorial Lecture, "Radiology from a surgeon's standpoint," by Dr. W. Sampson Handley. 5 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—46, Kensington Court, London. Social sub-committee "At Home." 3 *p.m.*

SCOTTISH LIGHTING SERVICE BUREAU.—20, Trongate, Glasgow. Eighteenth Illumination Design Course. Lecture on "Colour Lighting." 7.30 *p.m.*

### Friday, November 16th.

ENGINEERING AND SCIENTIFIC CLUB (WOLVERHAMPTON).—Annual dinner.

INSTITUTION OF ELECTRICAL ENGINEERS (STUDENTS' SECTION OF THE NORTH-WESTERN CENTRE).—Engineers' Club, Albert Square, Manchester. Lecture by Dr. S.P. Smith on "Ignition Systems in Automobiles." 7.15 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—Welfare Hall, Renfrew. Lecture to the Babcock and Wilcox Staff Association, on "Principles of Good Lighting." 7.30 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Paper by Mr. A. H. Croucher on "Some Applications of Time and Remote Control Switches." 7.30 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Modern Lighting designs for domestic and business interiors." 7.30 *p.m.*

### Saturday, November 17th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (WESTERN SUB-BRANCH).—60 Wind Street, Swansea. Paper on "Cable Layout," by Mr. J. A. B. Horsley.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

277 929 F. Meyer and H. J. Spanner. Method of or means for reducing voltage drop in rectifiers. (24/9/26.)
299 071 F. G. Martin and W. Ramsay. Method of and apparatus for electrolytically depositing metal on metal tubes. (22/4/27.)
298 920 British Thomson-Houston Co., Ltd., and R. D. Parry. Electro-magnetic relays and other devices. (16/6/27.)
298 963 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Vacuum tubes. (16/6/27.)
299 076 J. L. Baird and Baird Television Development Co., Ltd. Facsimile telegraphy. (20/6/27.)
274 470 British Thomson-Houston Co., Ltd. Automatic control of dynamo-electric machines. (15/7/26.)
274 499 L. A. Wisler. Brush-adjusting and switching-devices for electric motors. (17/7/26.)
298 932 Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. Telephone systems. (16/7/27.)
274 507 Dr. S. Loewe. High-emission thermionic valve. (19/7/26.)
274 509 Dr. S. Loewe. Incandescent cathode for electron-discharge tubes. (19/7/26.)
274 871 Western Electric Co., Inc., and Western Union Telegraph Co. Telegraph systems. (21/7/26.)
298 994 T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. Protective gear for alternating-current systems. (19/7/27.)
298 995 T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. Protective gear for alternating current systems. (19/7/27.)
274 518 Associated Telephone and Telegraph Co. Telephone systems. (19/7/26.)
279 390 Electrical Research Products, Inc. Acoustic apparatus particularly applicable to telephone transmitters. (20/10/26.)
279 391 Rainbow Light, Inc. Luminous electric discharge tubes. (20/10/26.)
299 088 G. Wilkinson, W. E. M. Ayres, and English Electric Co., Ltd. Electrical distribution systems. (21/7/27.)
299 089 Gramophone Co., Ltd., and B. E. G. Mittell. Thermionic valve circuits. (21/7/27.)
299 098 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Incandescent cathode discharge tubes. (22/7/27.)
299 099 Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. Telephone systems. (27/7/27.)
274 899 J. F. Rider. Radio receiving systems. (22/7/26.)
275 962 Dr. G. Seibt (trading as Dr. G. Seibt Fabrik Elektrischer Apparate,) Loud speakers. (14/8/26.)
299 112 F. A. Becker. Electric conductors. (29/7/27.)
282 628 H. Vogt. Electrostatic device for the reproduction and reception of sound waves. (24/12/26.)
299 132 W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. Cabinets, kiosks, and like housings and shelters. (20/12/27.)
299 135 E. G. Craven and P. A. Craven. Wireless loud-speakers. (22/8/27.)
299 136 R. Greaves. Magnetic separators. (23/8/27.)
299 141 General Electric Co., Ltd., L. B. W. Jolley, and C. H. Nunn. Electric transformers. (1/9/27.)
299 151 Siemens Bros. and Co., Ltd., and S. H. Long. Wireless telegraph transmitters. (8/9/27.)
299 153 Chamberlain and Hookham, Ltd., and S. James. Electricity meters. (8/9/27.)
299 155 General Electric Co., Ltd., H. J. Coales, and W. Royle. Electric motor control gear. (10/9/27.)
299 161 C. Farrar. Portable or self-contained wireless receiving apparatus. (23/9/27.)
299 163 B. Turner and Ferro-Arc Welding Co., Ltd. Manufacture and production of electrodes, welding rods, and the like, for use in welding and depositing metal. (24/9/27.)
278 715 International General Electric Co., Inc. Voltage regulation of rectifier plants. (5/10/26.)
299 175 General Electric Co., Ltd., and P. H. Coales. Electric switches. (10/10/27.)
299 176 J. E. Wimshurst. Articulated nipple or flexible jointing means for electric wires and cables. (11/10/27.)
299 180 G. H. Brown. Bearing compasses. (17/10/27.)
299 182 General Electric Co., Ltd., and R. J. Kaula. Electric terminals. (19/10/27.)
299 197 F. A. Borzych. Electric condensers. (3/11/27.)

## Applications for Patents.

### October 9th.

29 007 British Thomson-Houston Co., Ltd., and H. Trencham. Electrical contacts.
28 980 S. A. Byard. Telephone repeater systems.
29 027 A. D. de Castro. Electric lamps.
28 936 Coventry Automatic Telephones, Ltd. Measurement of mechanical forces.
29 035 N. R. Davis and Metropolitan-Vickers Electrical Co., Ltd. Induction furnaces.
29 040 G. N. Haden and Sons, Ltd., and F. H. Horton. Electric heating apparatus.
29 005 International General Electric Co., Inc. Electric switch operating devices. (15/10/27, Germany.)
29 034 H. Kuchenmeister. Control of electrical energy. (14/10/27, Germany.)
28 991 M. P. A. Wireless, Ltd. Production and reproduction of sound records.
29 000 M. P. A. Wireless, Ltd. Production of combined kinematograph picture.
29 054 E. E. and M. C. Pollock. Electrical connection plugs.
29 071 J. R. Robertson and J. Vielle. Mercury vapour lamps.
28 980 Siemens Bros. and Co., Ltd. Telephone repeater systems, etc.
28 982 C. J. M. Thornhill. Apparatus for reception of signals, etc.

### October 10th.

28 177 J. L. Baird, and Television, Ltd. Television, etc., apparatus.
29 087 A. E. Berriman, and Birmingham Small Arms Co., Ltd. Moving coil loud speakers, etc.
29 170 C. A. Jeffers and J. R. Whincop. Electric junction boxes, etc.
29 144 R. A. Johnson. Electric connectors.
29 145 R. A. Johnson. Indicating devices for accumulators.
29 120 Landis and Gyr, S.A. Time switches for electric circuits. (6/12/27, Switzerland.)
29 074 F. A. Lindemann. Apparatus for converting fluctuations into electric energy into sound.
29 198 T. Okamoto. Electric heating apparatus.
29 073 J. H. R. Peers. Conversion to electrical drive of talking machines, etc.
29 115 Siemens and Halske A.G. Electrolytic production of protective coating on electric conductors. (22/10/27, Germany.)
29 112 Standard Telephones and Cables, Ltd. Loaded transmission system. (1/11/27, U.S.)
29 113 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephone exchange systems.
29 158 S. Thompson. Imitation fires.

### October 11th.

29 326 A. C. Spark Plug Co. Sparking plug electrode. (30/8/28, U.S.)
29 375 W. G. Adie and Grosvenor Battery Co., Ltd. Primary batteries.
29 318 R. L. Aspden. Electric starters for internal combustion engines.
29 357 P. Betz. Manufacture of electric insulating tubes. (11/10/27, Germany.)
29 257 T. A. Biddington and R. Field. Wireless receiving apparatus.
29 284 Brandes, Ltd., A. K. Paterson and T. D. Ward-Miller. Transformer coils.
29 274 British Thomson-Houston Co., Ltd. Electric switches. (13/10/27, U.S.)
29 213 British Vacuum Cleaner and Engineering Co., Ltd., and W. J. Frame. Portable electric vacuum cleaners.
29 206 W. Brooke. Control of electric motors.
29 219 R. A. Brown. Electric filament lamps.
29 360 W. A. Buckley and S. D. Griffin. Batteries.
29 309 Chamberlain and Hookham, Ltd., and S. James. Electricity meters, etc.
29 236 H. W. Clothier and A. Reyrolle and Co., Ltd. Electrical plug and socket connectors.
29 370 E. H. Cribb and General Electric Co., Ltd. Electric signalling systems.
29 242 A. E. Davis and H. H. Thompson. Magnetic separating machines.
29 202 F. J. Davis. Apparatus for timing telephone calls.
29 345 J. N. Dean, H. J. Garnett, W. S. Smith and H. F. Wilson. Insulating materials.
29 312 Ferguson, Pailin, Ltd., and J. Pailin. Electric circuit breakers.
29 368 R. E. Gore and A. R. Upward. Primary batteries.
29 271 W. C. King. Electric heaters for houses, etc.
29 311 J. Lucas, Ltd. Contact breakers.
29 263 Metropolitan-Vickers Electrical Co., Ltd. Vacuum electric discharge devices. (11/10/27, U.S.)
29 295 Metropolitan-Vickers Electrical Co., Ltd. Electric rectifiers.
29 320 A. H. Midgley. Battery charging systems.
29 321 A. H. Midgley. Electromagnetically operated switches, etc.
29 243 S. T. Quilliam. Boxes, etc., of mechanism for electrically operating tramway points, etc.
29 239 H. Rees. Central starting of d.c. motors.
29 337 C. E. C. Roberts. Television apparatus, etc.
29 299 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. X-ray apparatus (28/11/27, Germany.)
29 300 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Sealing metal upon glass. (31/11/27, Germany.)
29 285 Siemens-Schuckertwerke A.G. Electric protective device for generator plants. (10/11/27, Germany.)
29 280 Standard Telephones and Cables, Ltd. (L. J. J. Schreiber). Anti-vibration mountings for electric switches.
29 279 Standard Telephones and Cables, Ltd. (Western Electric Co.). Impulse controlling systems.
29 341 Telefunken Ges. fur Drahtlose Telegraphie. Frequency changers. (12/10/27, Germany.)
29 311 E. O. Turner. Contact breakers.
29 231 J. Walker, and Walker, Hunter and Co., Ltd. Electric cooking ranges, etc.

### October 12th.

29 505 J. L. Baird and Television, Ltd. Television apparatus, etc.
29 452 Brandes, Ltd., and T. D. Ward-Miller. Combined condenser and grid leak.
29 438 British Insulated Cables, Ltd., and L. B. Wilson. Prepayment mechanism for supply of electric energy.
29 458 W. J. Cole and Telegraph Condenser Co., Ltd. Electrolytic condensers.
29 486 J. O. Drews. Portable electric light stands, etc.
29 433 Fabrik Elektr. Apparate F. Sauter A.G. Electric switch and valve apparatus. (13/10/27, Switzerland.)
29 461 B. B. Fenn. Incandescent lamps.
29 477 Ferranti, Ltd., and V. Z. de Ferranti. High voltage rectification.
29 436 F. R. Francke. Electric switches.
29 469, 29 472 Siemens-Schuckertwerke A.G. High voltage machines. (21/10/27, Germany.)
29 501 Telefunken Ges. fur Drahtlose Telegraphie. High frequency signalling. (14/10/27, Germany.)
29 475 R. W. Thompson. Selenium cells.
29 457 S. F. Warren. Television apparatus, etc.
29 443 R. St. C. Young. Prevention of ignition of gas, etc., by electric arcing.

### October 13th.

29 591 Aktiebolaget Ljungströms Angturbin. Steam turbines, etc. (15/10/27, Sweden.)
29 574 A. Bain and J. Fenton. Electromagnetic clutches.
29 582 British Electric Transformer Co., Ltd. Cooling transformers.
29 607 S. G. Brown. Sound apparatus.
29 599 N. Dennes, and Metropolitan-Vickers Electrical Co., Ltd. Thermostatic control of electric ovens, etc.
29 600 E. M. Johnson and Metropolitan-Vickers Electrical Co., Ltd. Electric circuit interrupters.
29 601 E. M. Johnson and Metropolitan-Vickers Electrical Co., Ltd. Electric control systems.
29 534 A. T. Masterman. Selenium cell.
29 541, 29 542, 29 543, 29 544 W. K. V. Phillips and R. C. Wood. Devices for converting photographic records of sound into oscillating electrical energy.
29 519 G. Redmayne. Galvanic batteries, etc.
29 594 Siemens-Schuckertwerke A.G. Means for driving machines by electric motors. (15/10/27, Germany.)
29 585 J. Vielle and A. E. Chapman. Sound receivers, etc.

### October 15th.

29 667 H. D. Akerman. Automatic fire alarms.
29 703, 29 704 A. W. and H. E. Angold, E. W. Smith, and Smith Meters, Ltd Prepayment mechanism for electricity meters.
29 788 Automatic Telephone Manufacturing Co., Ltd., C. Gillings and J. G. Rice. Telephone systems.
29 698 British Thomson-Houston Co., Ltd. Apparatus for heat removal by mercury. (14/10/27, U.S.)
29 699 British Thomson-Houston Co., Ltd. Gaseous glow lamps. (15/10/27, U.S.)
29 806 British Thomson-Houston Co., Ltd. Automatic circuit breakers. (14/10/27, France.)
29 794 F. S. Clifford and A. E. Snell. Loud speakers.
29 795 F. S. Clifford and A. E. Snell. Electrical transmission of sound.
29 804 J. H. Erskine, Falkirk Iron Co., Ltd., H. J. Kennard and A. Kinnes. Imitation fires.
29 770 H. Flieg, J. Lewy, Gloria-Werke and H. Lewy. Pocket lamps. (14/10/27, Germany.)
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29 805 J. N. Tester and H. Watkins. Device for disinfecting telephones.
29 649 H. C. Wilson. Wireless receiving apparatus.
29 679 C. D. Wood Electric Co., Inc. Lock-nut.

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## A Lesson for Contractors.

A HARDWARE trade paper last week referred to "a fine piece of hardware enterprise." Enterprise it certainly was, and it intimately concerns those electrical contractors and retailers who are content to wait for business to come to them. It appears that a firm of Colchester ironmongers, wishing to obtain electrical business, co-operated with electrical and radio manufacturing firms to such good effect that no fewer than four full pages of the "Essex County Standard" were devoted to advertisements and articles dealing with electrical and radio goods. The Colchester ironmongery firm was linked up with the advertising and it backed up the Press publicity by means of a special electrical window display. An effort of this kind is entirely praiseworthy, though electrical traders should certainly regard it as a danger signal. We have frequently drawn attention to the determined bids which ironmongers in various parts of the country are making for a share of the electrical retail trade. It is up to electrical traders to see that the ironmongers do not consolidate their gains in this profitable field; this will not be done by complaining to the manufacturers who are so misguided as to wish to sell their goods, but by meeting and beating the intruder on his own ground. Some of the big ironmongers, we gather, have established proper electrical departments which operate under electrically-trained supervision. An enterprise of this kind can only be regarded as a legitimate electrical business, but most of the electrician-cum-ironmongers are merely meddling with a business of which they have either no knowledge or that modicum which is reputed to be so dangerous. In any case, they see possibilities on the electrical side, and it seems that it is their intention to make the most of them.

## Retailing Possibilities.

THE opening which so many ironmongers have seen still seems to be hidden from many electrical installation contractors. The wiring side, important as it is, should only mark the beginning of the up-to-date contractors' activities. The public demand for electrical appliances is growing apace, and British manufacturers are catering for it in a way that leaves little to be desired. What we need most is a vigorous retail selling policy which will move the big stocks into the countless homes that are ready to receive them.

## The Post Office and Electric Vehicles.

THE Post Office is so frequently belaboured in print for shortcomings, real or imaginary, that it is particularly pleasant to be able to congratulate that Department upon its encouraging, if belated, interest in electric vehicles. It must have been news to many, before the reading of Mr. F. LANE'S paper to the Institute of Transport on Monday, that the Post Office has already in use about 40 electrics which run between railway stations and sorting offices. Encouraged by the success of these vehicles, and impressed with results obtained in other countries, the authorities are installing, experimentally, small fleets of electric vans in London and Leeds to be used mainly for parcel delivery work in congested traffic areas. Investigations so far made appear to show that to obtain the best economic advantages from electric vehicles it is necessary to operate them in relatively large groups. We hope that the lead set by the Post Office will be followed by commercial firms whose transport requirements could be met economically by the electric vehicle. The atmosphere of our cities and towns to-day is vitiated by the fumes from the exhausts of what an electric vehicle enthusiast picturesquely terms the "stink-wagons." Every electric vehicle put on the road helps to reduce this and the numerous other obvious disadvantages of the internal-combustion engined vehicle.

## Overhead Electric Lines.

THOSE who are interested in the design and construction of overhead lines will find much of practical value in Mr. WOODHOUSE'S I.E.E. paper, which we abstract on a later page of this issue. The results of tests of the strength of wooden poles of various types are of particular interest. Apparently, however, they are concerned with unsupported poles, though many engineers hold that as a wood pole is subject to bending, it should be supported and strengthened accordingly. By installing means, such as a stay, to counteract the overturning force, it is possible to convert a large part of the load to shear stress, place less strain on the mechanical connections and bracings, and transfer earth compression deep down. It may be said that if we support all poles alike we get the same relative conditions; actually this is not so, as foundation conditions of soil and area are different. What we are doing is giving strength to the unsupported pole where it is most needed, and we are increasing the strength efficiencies



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best to suit the particular pole or structure. In the compound pole the bending stress is split up into components; in the single pole and the "A" and "H" structures the bending stress should also be broken up.

### Lord Birkenhead and the Individualists.

BUSINESS circles are awaiting with keen interest Lord BIRKENHEAD'S speech, at the Individualist Luncheon, at the Hotel Cecil, on November 21st. Speculation has for a long time been active as to whether the latest recruit from the Cabinet to the City would direct our cables or our Press, or even lend his weight to one of the powerful groups in the metal world. Whichever bodies are fortunate enough to secure the services of one of the most important men of to-day, the Individualists are to be congratulated on having persuaded Lord Birkenhead to make a public appearance so soon after his official resignation from the Cabinet. Incidentally, it is interesting to note that the first speaker at these luncheons this winter was Sir ROBERT HORNE, who also found "business" more attractive than politics. Sir ERNEST BENN, one of the prime movers in this much-discussed movement, is taking the chair on November 21st, so we may also hope to hear something of the future schemes of the Individualists.

### Factory Lighting.

As will be gathered from the latest report by the E.D.A. on the Factory and Workshops Lighting Campaign, details of which are published elsewhere in this issue, the progress made so far is distinctly encouraging. Evidence of considerable business arising out of the lectures and direct mail propaganda is reaching headquarters daily, while the attendances throughout the country at the various lecture demonstrations have so far been up to expectations. The adaptability and usefulness of the excellent E.D.A. circles are once again proved by the number of trial installations which many of the circles are putting into manufacturers' works, and though these, we understand, are meeting with every success, it is yet too early to give the number of actual sales resulting from the enterprise. No less than 111 lecture-demonstrations have been arranged, and of these, over 50 have already been delivered. Of special interest is the news that the Manchester Electric Circle has arranged for a lecture-demonstration in the new switchgear works of the Metropolitan-Vickers' Electrical Co., on November 22nd. Six thousand invitation tickets are to be issued, and though when we last saw these works they were not complete, we feel sure that their educational value, from the point of view of the campaign, will be considerable. The E.D.A. has arranged to cover practically the whole of the country with its propaganda, as will be gathered from the list of places where lectures have either been given or are to be delivered, and for this alone the promoters of the compaign deserve to be congratulated.

### October Trade Recovery.

WITH the exception of March, the figures for our import and export trade in October were, according to the Board of Trade returns, the highest recorded this year. For the first time in many months coal exports show an increase, which by comparison with the figures for the corresponding month of last year amounts to £147 054, and £556 209 in advance of September last. Iron and steel manufactures, perhaps the most depressed of the heavy trades, also show an increased turnover when compared with September last. Turning our attention to the electrical figures, which are detailed elsewhere in this issue, we learn that following upon the slight decline of last month, the October exports have increased by no less a sum than £67 125 when compared with the corresponding month of last year. The increase in electrical overseas trade during the month under review was largely due to increased trade in electrical machinery, submarine telegraph and telephone cables, batteries and accumulators and electrical goods and apparatus classed as "all other sorts." The export figures for the ten months of the year are, however, somewhat behind those for the same period of last year, the actual decline amounting to £100 326. It should be remembered, however, that we have still two months' figures to reckon with before the end of the year, and, given the same trade conditions as now, our total for the year should bear very favourable comparison with last year's aggregates, even though it may not exceed them. Electrical imports increased during the month under review by £43 101, while for the ten months the increase is £497 750, both increases being by comparison with the returns for 1927. The favourable balance between exports and imports is being maintained, the figures being £894 324 for October and £10 191 805 for the ten months, as against £870 300 and £10 592 555 last year. Apparently, the electrical industry is not on the whole doing quite so well as last year, but still the position does not seem quite so bad as recent statements by the Statistical Department of the B.E.A.M.A. would suggest. Moreover, it should be borne in mind that these trade returns naturally have no concern with the enormous business that is being done within our own islands, and when we take into consideration the valuable contracts which have been placed this year in connection with the national electricity scheme, power station extensions and the like, the electrical manufacturing world is probably not unduly worried because our export trade balance is, so far, £400 750 less than at the same period of 1927. However, it is early yet to be weighing things up, and for all we know the revival indicated in October may bring the scale well down on the credit side.

### Rural Electrification.

THE eighteenth report of the Development Commissioners for the year ended March 31st has just been issued, and of particular interest is that section devoted to rural electricity services. The provision of a cheap and efficient electricity supply is, according to the report, by general admission, of the first importance alike for agriculture, rural industry and the amenities of the countryside. There are, it appears, roughly 100 000 farms in Great Britain using oil, wind, water, steam and gas for driving machinery for farm work and tractor operations, but "there is no reason to suppose that where electricity is to be had farmers are indisposed to scrap existing plants in favour of the far more simple, foolproof method offered by the electric motor." The conclusion reached by the Commissioners is a pleasing one, for "given even a sprinkling of new industries in rural areas and the entire supply position becomes hopeful." The report also contains a point which in the circumstances might, in part, be dealt with by the E.D.A., which reads to the effect that if lack of information should stand in the way of development, this could be rectified by the provision of an agency for collecting, collating and disseminating relevant facts and figures on industrial migration, electricity projects, markets, etc. Generally speaking, the Commissioners appear to have accomplished good work, while their appreciation of the possibilities of rural electrification should do much to answer the objections of those whose hands go up in horror at the mention of overhead lines.

### Aircraft and Overhead Lines.

FROM time to time we have referred to needless agitation against the erection of overhead power lines, on the ground that their existence is potentially dangerous to airmen. To restore the equilibrium, we now hear of real co-operation between aircraft and the owners of an overhead transmission line. A Texas linesman, receiving a notification of trouble on a new high tension transmission line, hired an aeroplane with which he proceeded to locate the fault. Flying 50 ft. above the line he had little difficulty in finding the fault, and in less than an hour he was able to instruct a repair gang to proceed to the seat of the trouble. Use of aircraft in connection with the supply industry in this country has so far been confined to the transport of a London borough electrical engineer to an I.M.E.A. Convention. Who will be the next to make aero-electrical history?

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# ALTERNATING CURRENT BRIDGE METHODS.

## The Kelvin Double Bridge—Dealing with Voltage and Current of Large Values—Testing a Synchronous Condenser—A Special Device for Works' Testing.

By B. G. CHURCHER (Research Dept., Metropolitan-Vickers Electrical Co., Ltd.)

(*Concluded from page* 520.)

A case which frequently arises in engineering research work is the measurement of the energy loss in circuits where the current is large, say over 100 A, and the voltage small, e.g. 1 V or less. While such voltages can be dealt with by a reflecting laboratory type of wattmeter, they are altogether too low for the " portable precision " type of wattmeter which is generally used for engineering testing.

For such measurements a Kelvin double bridge, of the general type shown in Fig. 4, may be used. The bridge is shown arranged for the measurement of the impedance and power factor of an inductive circuit $L_2$ $R_2$ in terms of a non-inductive standard resistance $R_1$. The bridge is capable of a large range in impedance and power factor and a high degree of precision when suitably arranged. Its use for the measurement of the residual inductance of four terminal standard resistances has been fully discussed by Mr. L. Hartshorn in an excellent paper* to which the reader is referred for further information.

A disadvantage of the method is that when very large currents (e.g. 5 000 A) have to be dealt with, the non-inductive resistance $R_1$ has to be of inconveniently large dimensions, and a considerable amount of power is dissipated in it. For measurements where an accuracy of 1 per cent. is sufficient, and where the power factor is not less than about 0·1, a simpler and more convenient method involving the use of a calibrated current transformer can be employed.† The connections

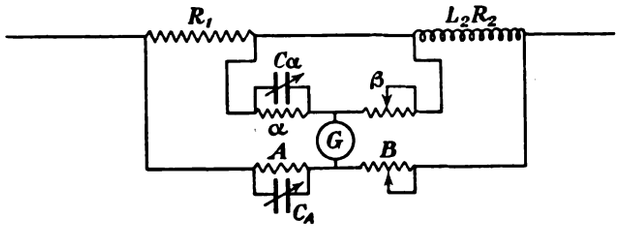


Fig. 4.

are shown in Fig. 5. The method obviates the difficulty in the use of shunts for very large currents and has been found to be very satisfactory in practice. The calibration of heavy current current transformers presents no technical difficulty.

### Low Power Factor.

We have now to consider the case where both voltage and current are of large values. The development of a bridge method for such conditions arose out of the necessity for determining the energy loss in a large synchronous condenser when delivering full kVA. Under these conditions the power factor was so low that ordinary wattmeter methods would have given entirely erroneous results.

The synchronous condenser which it was desired to test is rated at 10 000 kVA, 11 000 V, three-phase star connected, 50 cycles, 750 r.p.m. When the machine is excited to give its full kVA, the current per phase is therefore 525 A. It was desired to measure the energy loss in the machine under conditions of both under and over-excitation; that is with both lagging and leading currents. The total loss expected at 10 000 kVA with a leading current was about 250 kW. The power factor involved in the input measurement was, therefore, of the order of 0·025.

As the measurements had to be carried out in a works testing department, it was necessary to devise a bridge that would give the requisite sensitivity with a portable vibration galvanometer. As the over-excited synchronous condenser constituted a capacitance, and as the voltage was fairly high, a Schering network was first considered. It was found, however, that, to obtain adequate sensitivity under such conditions, an impracticably large standard air condenser would be necessary.

The network in Fig. 6 was therefore devised by the writer. Arm 1 consists of the apparatus under test, viz., one phase of the armature winding of the synchronous condenser. In series with this winding, and at the star point end, is connected a non-inductive shunt of suitable resistance, and capable of carrying the full current of the synchronous condenser continuously. The resistance between the potential

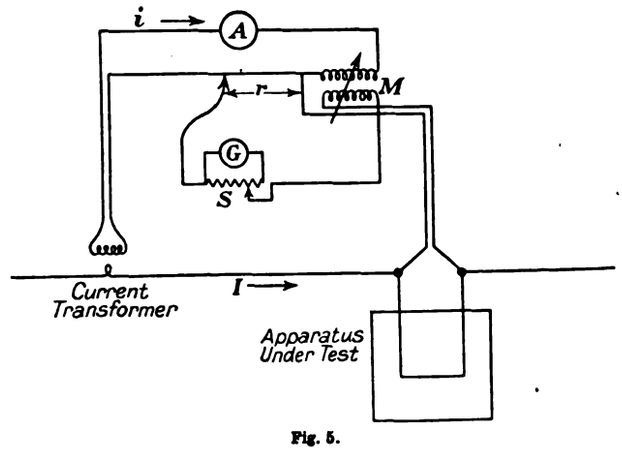


Fig. 5.

tappings of the shunt constitutes arm 3. Between the terminal $T_1$ of the machine phase in question and potential tapping $P_1$ of the shunt adjacent to the star point, is connected a high non-inductive resistance capable of withstanding the phase voltage of the machine, in series with the primary of a variable mutual inductance and a low variable non-inductive resistance. The vibration galvanometer $G$ is connected in parallel with a suitable shunt for varying the sensitivity. One terminal of the combination is connected to the potential tapping $P_2$ of the shunt and the other, through the secondary winding of $M$, to a sliding contact $C$. Arm 2 of the bridge then consists of the impedance between the points $T_1$ and $C$ and arm 4 of the impedance between $C$ and $P_1$.

### Bridge Operation Visualised.

The operation of the bridge can be visualised as follows: The current through arms 2 and 4 will be very nearly in phase with the voltage applied to the machine. The voltage across arm 4 will be closely in phase with the current through it, and the secondary induced voltage of $M$ will be very closely in quadrature with the current in the primary. These two voltage components are adjusted by varying the position of $C$ and the value of $M$ until they are together equal to the

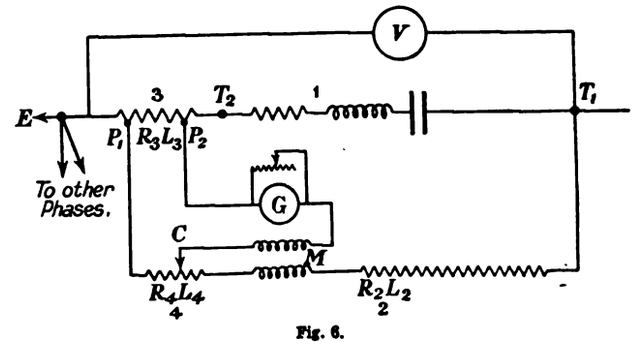


Fig. 6.

voltage across arm 3, as shown by zero galvanometer deflection.

Referring to the vector diagram, Fig. 7, the power absorbed in arm 1, i.e. in the synchronous condenser, can then be deduced in the following manner.

At balance the voltage across arm 3 is equal to :—

$$I_{13}\,(R_3+jwL_3)=I_{24}\,[R_4+jw\,(L_4+M)].$$

The phase angles of arms 3 and 4 are:

$$\delta_3=\tan^{-1}\frac{wL_3}{R_3} \qquad \delta_4=\tan^{-1}\frac{wL_4}{R_4}$$

The current $I_{24}$ lags behind the applied voltage by a small angle, which is equal to :

$$\delta_{24}=\tan^{-1}\frac{w(L_2+L_4)}{R_2+R_4}$$

* L. Hartshorn, " Proc. Physical Society," Vol. 39. Part 5, August 15th, 1927.

† Churcher and Dannatt, " World Power," December, 1925.

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The total power in the phase is equal to :

$$W = VI_1 \cos(\varphi_m + \delta_4 - \delta_3 - \delta_{24})$$

where $\varphi_m = \tan^{-1} wM/R_4$ and $V$ and $I_1$ are the phase voltage and current of the synchronous condenser.

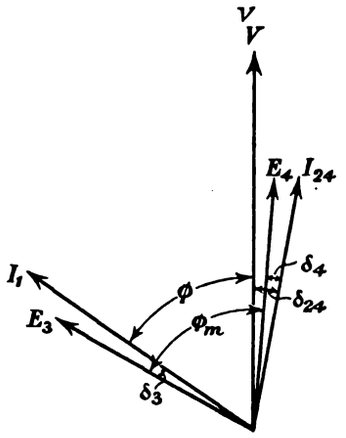


Fig. 7.

But

$$I_{13}(R_3 + jwL_3) = I_{24}\left[R_4 + j\,w\,(L_4 + M)\right]$$

$$= \frac{V}{(R_2 + R_4) + jw\,(L_2 + L_4)}\left[R_4 + j\,w\,(L_4 + M)\right]$$

$$\therefore I_{13} = \frac{V}{[R_2 + R_4 + jw\,(L_2 + L_4)]\,[R_3 + jwL_3]} \cdot \left[R_4 + jw(L_4 + M)\right]$$

In practice, $L_2$, $L_3$ and $L_4$ are made very small. Hence

$$W = \frac{V^2}{(R_2 + R_4)\,R_3} \cdot [R_4^2 + (wM)^2]^{\frac{1}{2}} \cos\left(\tan^{-1}\frac{wM}{R_4} + \delta_4 - \delta_3 - \delta_{24}\right).$$

Also $R_4$ is negligible compared with $R_2$. Therefore :

$$W = \frac{V^2}{R_2 R_3} \cdot \left[R_4 + w\,M\,(\delta_3 + \delta_{24} - \delta_4)\right]$$

It can be seen that as $(\delta_3 + \delta_{24} - \delta_4)$ is small, the term $wM(\delta_3 + \delta_{24} - \delta_4)$ will be small. It is only appreciable at low power factors. The quantity $W$, which is the total power in the phase, includes the loss in the impedance between points $P_1$ and $T_2$. If the resistance between the points $P_1$ and $T_2$ is $R_e$, the power absorbed by the machine is $W - I_{13}^2 R_e$. In practice the quantity $I_{13}^2 R_e$ is usually quite negligible.

## Defining Sensitivity.

The sensitivity of the bridge for changes in $R_4$ and $M$ i.e., for the measurement of power and reactive volt-amperes can be arrived at in the following way. Suppose the bridge to be initially balanced, and then the resistance of arm 4 changed from $R_4$ to $R_4 + \Delta R$. Then if $R_m$ and $L_m$ are the resistance and inductance of the secondary winding of $M$, $R_g$ and $L_g$ those of the galvanometer and $S$ the sensitivity of of the galvanometer in mm. per $\mu$A, then if arm 2 has a very large impedance compared with the other arms, it can be shown that the galvanometer deflection is equal to :

$$d = \frac{\Delta R.VS \times 10^6}{R_2\,[(R_g + R_m + R_3 + R_4)^2 + (\omega L_g + L_m)^2]^{\frac{1}{2}}} \text{ mm}$$

Similarly for a change in $M$ of $\Delta M$, the deflection is :

$$d = \frac{\Delta M\,W\,V\,S \times 10^6}{R_2\,[(R_g + R_m + R_3 + R_4)^2 + (\omega L_g + L_m)^2]^{\frac{1}{2}}} \text{ mm}$$

In testing the 10 000 kVA synchronous condenser, power was obtained from a large turbo-alternator. In the bridge, arm 2 consisted of a 200 000 Ω oil immersed non-inductive resistance, capable of withstanding 6 360 V without overheating, connected in series with the primary of a variable astatic mutual inductance of 20 mH maximum value. $R_2$ was known to well within 1 part in 1 000, and $M$ to 1 or 2 parts in 1 000.

Arm 4 consisted of a 0·1 Ω non-inductive four terminal resistance shunted by a 1 Ω slide wire. The arrangement was calibrated, with the lead to $P_1$ included, for several points on the slide wire. The phase angle $\delta_4$ of arm 4 was quite negligible. The combined phase angle of arms 2 and 4 was found to be scarcely measurable. The result obtained was that $\delta_{24}$ did not exceed $\pm 0{\cdot}00015$.

Arm 3 consisted of an oil-immersed non-inductive shunt of 0·0002 Ω resistance. Its resistance value was known to a few parts in 10 000. Its inductance was $0{\cdot}001_3$ μH, giving a value of $\delta_3$ of $0{\cdot}002_0$. This was the only appreciable phase angle. The maximum value of the correction term $wM\delta_3$ in any observation was 8 per cent., and since $\delta_3$ was known to 10 per cent., the resulting error in the power measurement was well within 1 per cent.

A portable vibration galvanometer was used, and the sensitivity was such that about 3 mm. deflection could be obtained for 1 per cent. change in $R_4$. The galvanometer had to be set up within a few yards of the synchronous condenser, the vibration of which caused some blurring of the indications.

## Exact Settings.

However, there was no difficulty in repeating settings of $R_4$ to 1 per cent., and of $M$ to a greater degree of exactness. For a given frequency and excitation of the synchronous condenser, the bridge readings were found to be very steady. If the losses and kVA of the condenser for a given frequency and excitation were exactly proportional to the square of the voltage, the bridge setting would be independent of voltage. It was actually found that the usual small variations in the supply voltage did not affect the bridge settings appreciably. This gives the bridge method an incidental practical advantage over the wattmeter method.

Suppose, in using the wattmeter method, an error of, say, 1 per cent. is made in measuring the voltage. This will cause an error of 2 per cent. in the observed watts. Also if the voltage fluctuates, the wattmeter readings will fluctuate by twice as much. Now, with the bridge, an inaccuracy in the applied voltage of 1 per cent. will not affect the bridge setting appreciably ; so that if the nominal or rated value of $V$ is inserted in the equation for $W$ instead of the measured value, no appreciable error will arise. In other words, with the wattmeter method the voltage must be carefully measured, whereas, with the bridge method, it need only be approximately measured.

The test demonstrated the ease with which the Vee curves of a synchronous machine may be obtained with the bridge. At unity power factor the setting of $M$ is sensibly zero. For leading currents, balance is obtained by adjusting $M$ to a positive setting. For lagging currents $M$ is adjusted to a negative setting. Care must be taken to give $M$ the correct sign when working out the power. The independence of the $M$ and $R_4$ adjustments enables balance to be quickly obtained. The power factor of the synchronous condenser is equal to :

$$\cos\varphi = \frac{[R_4 + \omega\,M\,(\delta_3 + \delta_{24} - \delta_4)]}{(R_4^2 + W^2M^2)^{\frac{1}{2}}} \doteq \frac{R_4}{(R_4^2 + \omega^2M^2)^{\frac{1}{2}}}$$

which can be worked out immediately from the bridge readings.

To obtain the total power input to the synchronous condenser, it is unwise to assume that the phases are balanced, without concrete evidence ; so that readings were taken in each of the three phases in turn. With regard to wave form errors, it was found, from oscillograms of the phase voltage and current, that the harmonics were small, and that the harmonic power, even supposing voltage and current harmonics of the same order to be in phase with one another, was negligible. The correction for the loss between points $P_1$ and $T_2$ was of the order of 100 W, and was therefore negligible.

The actual power factor of the synchronous condenser at 10 000 kVA was found to be 0·0243. If a wattmeter had been employed with B.E.S.A. Class "A" instrument transformers, corrections of the order of 24 per cent. for the potential transformer and 42 per cent. for the current transformer would have been involved, and these corrections would have had to be accurately determined.

With a wattmeter giving full scale deflection for 0·2 power factor, only 12 per cent. of full scale deflection would have been obtained. With the bridge method, the only appreciable correction arising is that for the inductance of the main current shunt, which amounted to 8 per cent. In addition, the advantages of adequate sensitivity and the elimination of the effects of errors in voltage measurement were obtained.

It should be noted that the bridge may be used to measure the output of a generator as well as the input to a motor. The connections in Fig. 6 are those for a motor. If the machine is running as a generator, balance may be obtained by interchanging the leads to $P_1$ and $P_2$. There is no limit to the power and kVA which can be dealt with by this type of bridge, provided suitable resistances for arms 2 and 3 are available.

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It is not claimed that bridge methods possess appreciable advantage over wattmeter methods unless the power factor involved is low. In such cases, bridge methods give results unobtainable by wattmeter methods. In engineering testing, low power factor measurements are constantly being made, not only on synchronous machines but on induction motors and power transformers.

While great advances in the improvement of the performance of instrument transformers have recently been made, a very much greater improvement is required to make the phase angle errors negligible for low power factor measurements of the kind discussed here, and the difficulty of low wattmeter sensitivity would still remain.

In conclusion, the writer wishes to acknowledge the interest taken in this work by Mr. G. A. Juhlin, of the Metropolitan-Vickers Electrical Co., Ltd., at whose request the test method for the synchronous condenser was devised. He also wishes to acknowledge the permission of the Metropolitan-Vickers Electrical Co., Ltd., to publish the article.

NOTE.—The following typographical errors appeared in the first part of Mr. Churcher's article (THE ELECTRICIAN, November 9th) :—

On page 519, col. 1, line 53, $l_1$, $l_3$, $l_5$ should read $e_1$, $e_3$, $e_5$. In equation (1) the same error occurs. In equation (2) $l_1$, $l_3$, $l_5$ should be $i_1$, $i_3$, $i_5$. The same mistakes occur in the equations following equation (3) in column 2. The equation in line 63, column 1, should be :—

$$EI=(e_1^2+e_3^2+e_5^2+\ \ldots)\tfrac{1}{2}(i_1^2+i_3^2+i_5^2+\ \ldots)\tfrac{1}{2}$$

The equation on line 66 should read :—

$$\frac{P}{EI}=\frac{p_1+p_3+p_5}{(e_1^2+e_3^2+e_5^2+\ \ldots)\tfrac{1}{2}(i_1^2+i_3^2+i_5^2+\ \ldots)\tfrac{1}{2}}$$

In equation (3) and in lines 37 and 47, column 2, $l$ should be $e$.

# BOOK REVIEWS.

**The Lineman's Handbook.** By EDWIN KURTZ. (London: McGraw-Hill Publishing Co., Ltd.) Pp. 547. 20s. net.

Any book covering line construction and maintenance should be useful, even though manufacturers and dealers of line materials do supply instructive and illustrative catalogues and other publications gratis. This book should prove specially useful to line foremen. It is an American publication, and gives American construction and maintenance practices throughout.

There are thirteen chapters, including an introduction. Elementary electrical principles are first treated, and in succession are the following : the electric system, distribution circuits, line materials, line protective equipment, line control equipment, fundamentals of line design, pole line erection, tower line erection, inspection and testing and maintenance, first aid, accident prevention course.

For this country we can find little excuse for not circulating information on the more desirable standards of line construction. And, if we are to accept the statements of those who are supposed to know, we have a standard for one undertaking just because they are supposed thoroughly to understand the work, and a different standard for another undertaking just because they are supposed not to understand the work to the same extent. The fallacy of this method of controlling standards of construction is self-evident, because the smaller undertaking cannot pay for the " bigger " man or for the heavier construction, etc. Moreover, independent of established construction standards, there should always exist some flexibility, i.e., allowance for certain local practices, within limits. The U.S.A. and Canada probably give the best examples of this character. What is more, the various operating companies and manufacturers of materials have long since co-operated with the object of standardising and meeting the requirements. This book is but another practical example helping to show us what others are doing and that we should long ago have had effective Overhead System Committees consisting entirely of men actually engaged with electric supply undertakings or/and with the manufacture of overhead system materials.

Most of the pole line practices given in this book can be used in our rural districts. They are cheaper than our present standard practices.

This book can be recommended, even if it be for no less purpose than showing us the safe and cheaper line practices of another country—by means of 603 illustrations in a space of 547 pages of a pocket-size book.

WILLIAM T. TAYLOR.

**Elements of Alternating Currents and Alternating Current Apparatus.** By Prof. J. L. BEAVER. (London: Longmans, Green and Co.) Pp. xii+393. 18s. net.

This book is intended for the first technical classes in American universities, and has some of the features peculiar to their system of education. One of the most characteristic is the use of what are called " recitations," in which a student comes before the class and demonstrates or " recites " the proof of a given proposition. His statement is then criticised by his fellow students, and finally the teacher sums up. At an advanced stage of a subject this has distinct advantages ; in a first course it is regarded by English educationalists as premature, and as encouraging surface knowledge. The author in the preface states that the questions can be used for recitation purposes, and this method of education would seem to be intended throughout.

The ground covered is that which long experience has shown to be necessary in an elementary treatment of alternating current theory. Vectors, the generation of alternating voltage, mean and crest values, the various circuits with resistance, inductance, and capacity in series and parallel, symbolic rotation, single and polyphase relations. These take eight chapters, occupying the first half of the book. The treatment is largely for the solution of examples and is rather dry and formal, though good and thorough, but the lettering of the diagrams is so small as to be difficult to read.

The transformer is next dealt with. The magnetising current in Fig. 125 is shown with a symmetrical fifth harmonic instead of a displaced third, missing the point of the third harmonic introduced by hysteresis. The theory is rather bare statement, the photographs not very good, and there are many references to American text books. Under the head of synchronous machines generators are discussed, and are called synchronous generators. Referring to synchronous reactance, the remark is made " synchronous denotes that measurements are taken at the name-plate frequency," meaning that reactance depends upon frequency. The chapters on polyphase and single-phase induction motors and on converters are treated in the same way as the transformer. The process blocks are apparently from lantern slides, and are too small to be useful. A short chapter on measuring instruments, dealing more fully than usual with the oscillograph, and one on transmission lines complete the book.

The impression left is that it contains much good material arranged systematically with many worked examples. It would be improved by the omission of most of the photographs, and by larger and better lettered diagrams.

W. M. THORNTON.

**Alternating Current Motors and Starting Gear.** By L. E. WOOD. (London : Electrical Review, Ltd.) Pp. xiv +158. 4s. net.

In the introduction the author explains that this booklet is an extension of his first book to include all induction motors. The subject matter is contained in 158 pages, with 106 figures, so that no long theoretical discussion is to be expected, nor is there any attempt to go into the theory of the subject. This accounts for the brief and sketchy treatment of the principles in the introductory chapter.

More solid ground is reached in the description of the construction and starting equipment of single, two, and three phase motors. In the first class are included squirrel cage, " Tork " and repulsion start induction types. The three-phase machines are more fully considered than the other types, but much useful information is given about them all.

One chapter is headed " High Torque High Efficiency Motors," but is mainly a description of the Fynn-Weichsel motor. As this machine has mainly synchronous characteristics, some reference to these and synchronous motors might have been expected, even though outside the scope mentioned in the introduction.

An attempt is made to cover the subject of power factor and to explain how this effect can be improved by the use of a condenser, other methods being omitted. The treatment is very perfunctory and leaves much to be desired. More theory is required when tackling such a subject, but this does not prevent the author from showing how to calculate condenser capacity. The concluding chapters on " Earthing," and " Troubles and Their Remedy " are full of useful practical experience.

This booklet should be of use to those concerned with the practical working of a.c. motors. For the earnest student, information on the principles must be sought elsewhere.

A. N. A.

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# OVERHEAD ELECTRIC LINES.*

## An Account of the Work of the British Electrical and Allied Industries Research Association—Results of Tests on Wood Poles—Wind Pressure Investigations with Lattice and Other Supports.

By W. B. WOODHOUSE, M.I.E.E.

DURING the past few years the British Electrical and Allied Industries Research Association has been studying the materials and methods used in the construction of overhead electric power lines.

The data available for the designer were found to be incomplete and unreliable, and the information so far obtained has proved of immediate practical use and has led to further research. The researches completed or in progress deal with the following matters :—

### Mechanical Properties of Wires.

(1) The mechanical properties of hard-drawn copper wires and cables. This research has established a new value for the modulus of elasticity ; (2) the properties of compound steel and aluminium cables and the division of stress between the two components. The growing use of long-span construction makes an accurate knowledge of the strength and properties of such cables a matter of considerable importance. The research has enabled the calculation of the strength and behaviour of such cables to be made simply and accurately ; (3) the reactions of the foundations of overhead line supports. This research, which has already led to substantial improvements of design, is being pursued ; (4) the strength of wooden poles, single and braced ; (5) the wind pressures on wires and cables, and on wooden poles and lattice structures used for supporting overhead lines. This paper deals with the results of the last two of the above-mentioned researches.

The use of wooden poles for overhead power lines has followed the practice of the Post Office. The red fir obtained from Northern Europe when creosoted is well suited to the purpose.

These poles may be used singly or, where greater strength was needed, as compound structures known as " A " or " H " poles. It was desired to know the strength of these poles under ordinary conditions of use. The available figures were not regarded as reliable, and a series of tests representing conditions in practice was therefore carried out, the poles being set in the ground in the usual way, and subjected to a transverse load at the top equivalent to that of the wind pressure on the line wires. Three series of tests were made, two on full-sized poles and one on small-scale models. The following full-sized poles were studied :—Three single poles, four " A " type poles, two " H " type poles, two French type poles, three Rutter type poles, one Wedmore type pole. They revealed a fundamental weakness in the usual design of compound poles, and led to a greatly improved design.

In the original paper the methods adopted in the tests of full-sized poles are next set out, the depth in ground, dimensions of pole, maximum load, etc., being tabulated. Except in certain cases all poles had been set two months before the tests, the material being in general a loamy clay, but in two cases sandy gravel.

The load was applied by a steam crane through a flexible wire rope which passed from the drum of the crane over a guide pulley on the tower along to a snatch block attached to the top of the pole under test, thence back to the tower and over another guide pulley to a special dynamometer designed by Professor J. Goodman. The movement of the poles under load was recorded on a drawing board arranged to slide vertically in a frame fixed to the tower ; the movement at the foot of the pole was recorded by a pencil, sliding in a fixed horizontal frame across the drawing board and connected to the pole foot by a wire. Readings of the load corresponding to each movement were taken, and diagrams relating the load to the movement of the pole could thus be prepared. Cinematograph films of the poles were taken whilst they were being pulled, and these aided the interpretation of the results secured.

The single poles were loaded to destruction, but failure was preceded by a large displacement of the pole in the ground. The calculated rupturing stress (4 724–5 498 lb. per sq. in.) was checked by tests on sample beams, made at the National Physical Laboratory. Figures obtained are compared with those in the Post Office " Technical Instructions." The variety in the figures indicates the need for a substantial margin of strength. The Regulations of the Electricity Commissioners require a factor of safety of 3·5 on a maximum fibre stress of 7 800 lb. per sq. in., and allowable stress of 2 200 lb. per sq. in.

Tests were also conducted on " A " poles, i.e., two equal poles bolted together at the top and braced at the bottom by a cross beam, additional resistance to buckling being provided by a steel cross-tie and distance piece about midway. It has hitherto been believed that the strength of such a structure was from four to five times that of a single pole. Tests have shown that, under practical working conditions, the strength of the " A " pole is very much less. As a framed structure it is not well designed to resist the stresses encountered in practice, and undergoes distortion under the action of shear stress. The design of such poles has accordingly been reconsidered, and for the first time placed on a sound engineering basis.

In order to illustrate the weakness of the design now to be superseded it may be mentioned that poles which, theoretically, should support a safe loading of 2 240 lb. were actually overturned by 450 lb.

The " H " poles consisted of two single poles set parallel with centres 5 ft. apart, braced near the top by horizontal steel arms, and at the foot by a wooden brace block, and also braced midway by distance pieces and diagonal ties of steel. Insufficient foundation reaction was again a contributing cause of failure ; an additional 2 ft. in the depth of setting gave 67 per cent. increased strength against overturning.

Tests on French poles (consisting of two poles placed side by side and bolted together by six bolts, each of 0·625 in. dia., and fitted with " kicking blocks " for the foundations) were also made. The claim that the strength of such poles is five times that of a single pole was not supported, again owing to inadequate resistance to shear stress, failure commencing at the top foundation block, where the shear stress is a maximum. If the strength had been five times that of a single pole the breaking load would have been about four tons. Actually they broke at 1·7 and 1·42 tons respectively.

Tests on " Rutter " poles showed that better resistance to shear is provided. In this case the two poles are spaced by blocks of wood notched into them to resist shear stress, and secured by through bolts, foundation resistance to overturning being furnished by cross bars.

### Wedmore Pole Strongest.

Experiments on Wedmore poles, which are substantially Rutter poles with the unit poles initially stressed by bending, were also made. The tests on these special poles were supplemented by experiments with small scale models. The general conclusions arrived at are summarised as follows :—

General conclusions from these small-scale tests must be drawn with caution on account of the relative coarseness of the wood fibre in proportion to the model-pole dimensions. It may be said, however, that the Wedmore pole is the strongest, and permits of deeper notching of the shear blocks. If the maximum fibre strength of each unit pole is utilised, the strength of the Rutter pole should be eight times that of a single pole, while the strength of the Wedmore pole should be even greater. On the full-scale tests of Rutter poles the average observed strength was six times that of the single pole, or more than three times that of the French pole. This shows a striking gain in the economical use of the materials due to skilled design.

The tests of the various types of poles as a whole have brought out clearly the necessity for further knowledge of the behaviour of earth foundations. This subject is now being studied by the Research Association, and the research is yielding results which will greatly simplify and improve present practice. The Association's work has for the first time placed the design of compound poles on a sound basis, has condemned as unsound and uneconomical the types in common use, and has evolved new designs in which the materials are used to greatly increased advantage.

* Abstract of a paper read before the Institution of Electrical Engineers on November 8th.

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The more accurate data resulting from these tests and the more definite basis of design of overhead lines should lead to greater security and to lessened cost—a twofold good.

An accurate knowledge of the loads imposed by the pressure of the wind is essential to the economical design of overhead lines. Even to-day that knowledge is not fully available. The Association found that great uncertainty existed on this point, but recent researches conducted by this body have improved the position considerably.

It is of interest to observe that a formula, relating wind pressure to velocity, was framed by Smeaton in 1879, and was as follows :—$P=0{\cdot}005\ V^2$. According to this formula a wind velocity of 80 m.p.h. would create a pressure of 32 lb. per sq. ft. of surface. Definite records of the velocity of the wind have been obtained in this and other countries by means of anemometers. But the wind does not flow uniformly like a placid stream, and gusts and eddies are rarely absent. Consideration of such complexities suggests that many of the deductions from earlier experiments were unreliable, but recent researches at the N.P.L. have been made with a high degree of accuracy, and have produced consistent results.

The Research Association's Report F/T16, entitled "Investigations on Wind Pressure on Poles and Cables for Overhead Transmission Lines," is added as an appendix to the original paper. A diagram is plotted from a research made on the effect of wind pressure on small wires, with diameters ranging from 0·002 to 1·25 in. The coefficient $K^1$ when multiplied by the square of the wind velocity in miles per hour ($P=K^1V^2$) gives the pressure in lb. per sq. ft. of projected area. There is one value of $K^1$ corresponding to any one value of $V \times D$, but the value of $K^1$ varies with the product.

These experiments on smooth round wires were supplemented by tests on smooth cylinders of 3 in. and 9 in. diameter, with wind velocities of 20 to 100 ft. per sec. The results are set out in detail in the Report. They reveal the existence of certain effects at critical velocities, and illustrate the importance of dimensions in relation to the maximum wind velocity likely to be experienced. The effect of wind pressure on stranded cables was also studied. Small variations in the surface have a considerable influence on $K^1$, but sufficient data have been collected to enable allowances to be made for the effects of wind pressure on wires and cylindrical poles of the sizes commonly used for overhead lines.

Other experiments are in progress to determine the wind pressure on lattice supports. The wind pressure on a flat surface is found to depend on its dimensions, e.g., the ratio of length to breadth in the case of rectangular surfaces, the so-called "aspect ratio." The law of dynamical similarity—that bodies of equal aspect ratio present the same resistance per unit area to the wind—applies generally to angle bars such as are used in the construction of steel towers, and the effect of flange thickness was found to be negligible.

Tests were made on steel angle bars of British Standard sections and of varied dimensions such that the aspect ratio varied from 8 to 64. The results of these tests, which were conducted with a wind pressure of 40 ft. per sec. (27 m.p.h.), show how the value of $K^1$ in the formula $P=K^1V^2$ increases with the aspect ratio. The maximum value of $K^1$ for round wires, at a wind velocity of 27 m.p.h., was approximately 0·003. For cylinders of 9 in. dia. the value was only 0·0017, and for angle bars with an aspect ratio of 20 (a likely practical figure) it was 0·004.

## The "Drag" Effect.

Further tests were designed to determine the effect of altering the angle of inclination of one face of the bar in the wind direction, while the other face was maintained parallel to the wind direction. The results of this investigation are assembled in diagrammatic form. The resultant force may be resolved into two components, one parallel to the direction of the wind, the "drag," the other normal to the wind direction, and termed the "cross wind" force. In practice, the cross wind forces of a structure tend to neutralise each other, so that the effect of greatest importance is the "drag."

These and other experiments afford data which is of considerable service in enabling the overturning moment of a tower, corresponding with a given wind velocity and a certain structure, to be determined. Consideration of the best form of section in relation to the coefficient of wind resistance may substantially reduce the cost of construction.

The tests as a whole showed that in order to determine the wind pressure on an angle bar one requires to know the value of the aspect ratio, the angle of inclination of the bar to the wind direction and the angle $\beta$. These being known, the test results give the value of the coefficient $K^1$.

Tests were also made on an assembled frame similar in arrangement to a panel of a lattice mast. The structure was mounted in the wind tunnel with its two members horizontal plane, and so arranged that it could be rotated about a vertical axis through angles up to about 50 deg. in either sense. The total wind pressure was measured at a wind velocity of 40 ft. per sec. (27 m.p.h.) with the frame at various angles to the wind direction. The rotation from the position in which the face of the frame is normal to the wind is described as the "angle of yaw." The wind pressure was then calculated from the general results already obtained and from a consideration of the position and dimensions of each component bar.

It was found that the actual measured pressure on the complete frame did not vary from the calculated pressure by more than 5% up to an angle yaw of 40 deg. Above this angle the actual pressure is still less than that calculated from the components.

There is no reason to suppose that the satisfactory accordance of the results is peculiar to the particular frame tested. It would seem that the resistance of any plane frame of normal design composed of equal angle sections can be satisfactorily estimated, subject to the total projected area of all members being small in comparison with the total area covered by the frame. In the frame tested the ratio of these areas was 0·183 to 1; it appears not unreasonable to suppose that the ratio might be increased substantially before interference of one member with another became important.

## The Discussion.

Mr. J. E. RUTTER urged the need for paying greater attention to the foundations of poles. In the tests carried out in 1907 by Mr. Wade, the poles were not fixed in the ground in the ordinary way, but were lying on the ground with their bottom ends fixed rigidly, a condition of things which did not occur in practice, as necessarily the ground gave way when pressure was put upon the pole under test.

Col. R. E. CROMPTON pleaded for further research and commented upon the fact that on the Continent greater use is made of steel and ferro-concrete poles. He believed the public feeling against overhead line construction in this country was largely due to the prejudice created by the Post Office methods of construction.

Mr. R. BORLASE MATTHEWS also drew attention to the use of ferro-concrete poles and other forms of construction as used on the Continent, and in addition suggested the use of ferro-concrete sockets for wooden poles as an economical means of construction inasmuch as it eliminated the necessity for creosoting. He further suggested the use of sawn timber in order to avoid the difficulties of always obtaining suitable round poles.

Mr. E. B. WEDMORE emphasised the need for further financial support for the Research Association which, he said, is endeavouring to carry out a £36 000 per annum research programme with an income of £25 000. Many problems in connection with overhead line construction had had to be postponed for lack of funds, and investigation of the ferro-concrete pole was one of them. One of the handicaps of the ferro-concrete pole, however, was its great weight which introduced transport difficulties. Moreover, nobody had yet been able to decide the proper factor of safety to use with ferro-concrete.

Mr. C. H. SMYTH illustrated a new method of anchoring wooden A poles, and of erecting them. This method consists of a heavy cross anchoring piece, the two poles being fastened to it by means of galvanised stays. Poles using this method of construction had, he said, been erected in Kent.

Major THEODORE RICH spoke with some emphasis against the use of wooden poles, and criticised the making of experiments upon them and ignoring all other types. He called attention to the large number of ferro-concrete poles that are being used on the Continent and to the impossibility of using them here, owing to the high factor of safety insisted upon.

Mr. W. B. WOODHOUSE replying to the discussion said that, personally, he did not think the wooden pole would disappear from this country, at any rate in the next few years, for certain purposes, although other types of construction would be used for other classes of line. The original work done in these tests was carried out several years ago, and there were now on the market many improved designs of foundations. As to the Commissioners' regulations, these had been relaxed, and if more accurate data could be obtained he believed that further relaxation would result.

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# COMMUNICATION EFFICIENCY.*

## Striking Illustrations of Numerical Values Concerned in Telephony—The Engineer as a "Communicator"—Cultivating the Impartial Attitude.

By T. J. MONAGHAN, B.Sc.(Eng.), M.I.E.E.

THE two essential engineering characteristics of speech are, of course, frequency and power. The frequencies used in speech are from about 80 to 5 000, and the average energy of an ordinary speaking voice is of the order of 10 μW. But the power peaks—which occur in the vowels—are very much higher than the average, and may be taken as of the order of 200 μW—the consonants have low energy values. It is found, strangely enough, that although the low frequencies are the ones of high energy content, more than 80% of the whole energy of speech being contained in the frequencies up to 1 000, yet these low frequencies can be cut off to a quite large extent before the speech begins to lose its intelligibility.

A glance at the electrical values used in ordinary telephony is of interest. The voice frequency a.c. input power at the sending end of a telephone circuit is round about a μW or two, the voltage being about 0·5 V. At the receiving end we have in use one of the most sensitive devices known to science, the telephone receiver. At the telephone receiver powers measured in μW will, under suitable conditions as to external noise, give intelligible speech, which explains the statement that all the telephones in the world—and there are more than 30 million of them—could, if suitably arranged, be worked simultaneously by the energy necessary to light a 100 W lamp. It is estimated that the minimum current necessary to energise a good telephone receiver so as to give an audible signal for an attentive ear is of the order 10–9 A, and the amplitude of the movement of the diaphragm at this current is of the order 10–9 cm. ; less than the mean molecular diameter of the diaphragm material.

### Minute Currents Involved.

These limiting currents are not, of course, of interest from the point of view of speech transmission, though they give some idea of the minuteness of the currents that can interfere with telephonic speech. In the ordinary telephone receiver 1 μW gives a very loud sound, 0·25 μW a loud sound, and, say, a 0·02 μW a good audible signal.

Now, although the telephone works with such small currents, it is actually a very inefficient instrument from the point of view of its output in sound energy compared to the input of electrical energy. At resonance of the diaphragm this efficiency is of the order of 1%, and off resonance it falls very much below this figure. It will be evident from the figures given that the ear itself must be highly sensitive ; actually energies of the order $2 \times 10^{-10}$ μW, i.e., pressure variations of the order of a thousandth of a dyne, will produce an audible signal.

I should like, before passing on to other matters, to give one more striking illustration of the numerical values concerned in telephony. It is a calculation made by engineers of the Bell Telephone Co., who state that if all the repeaters on the New York-San Francisco telephone circuit were omitted, and an attempt made, by stepping up the power at the outgoing end, to produce conversation of the quality now obtained, it would be necessary to feed in the estimated total world production of mechanical and electrical power. Actually by feeding in energy at intervals along the line, 15 doses in all, amounting in the aggregate to something like 10 μW, excellent speech over this 3 000 mile circuit is obtained.

One of the great difficulties that exists in this matter of communications is to persuade the engineer that he has something of importance to communicate. There is a saying that every man should be able to write at least one book, and it is certain that every engineer should be able to contribute some really valuable facts to the common fund.

I feel very strongly that the engineer should be more vocal than he is on matters both technical and non-technical, for by keeping silence he fails to exercise influence that would be good for the world at large.

If there is one thing that an engineer really can claim to be, it is an accurate observer of facts. His work is anchored to fact, his tasks are observation, trial, and then definite action as an end or result of the observations. And if he makes a mistake in his observations of fact, there will be a mistake in his acts, and the truth will out, for his work will proclaim the error with clarion voice.

Now we come to the question of judgment, and here again I am going to claim high marks for the engineer, for the following reasons. Although, as I have just said, the engineer's work is anchored to facts, we all know that our practical engineering problems have to be solved with, as actual data, some facts and a greater or less admixture of material ranging from the highly probable to the highly improbable—but possible.

And confronted by this mass of data we cannot procrastinate—at least for long—we must do something. We analyse, weigh in the balance, consider alternatives, and by a more or less conscious admixture of logical deduction and inspired guesswork we decide what shall be done. And unless our judgment is right much more often than it is wrong, we are not really engineers, for " He that has more knowledge than judgment is made for another man's use more than for his own." So that on the question of judgment we at least qualify.

### Freedom from Bias.

As to freedom from bias, it is the proud boast of science—and the engineer is a scientist—that truth is her goal. She seeks to record those unvarying successions we call the laws of nature, laws not in the sense of obligations laid upon us by a higher authority, but merely man's scheduling of events as they seem to him to be interconnected. I say, seem to him to be, because the whole attitude of the scientist is that he is prepared to reconsider his views immediately the evidence appears to make such revision necessary. Now, when one grows up with a hypothesis one becomes attached to it, and the newer hypotheses appeal to us by their very youth, so that we are inclined to cherish hypotheses old and new. But this we must not do for one moment after the discovery of a new fact that wrecks the current hypothesis. This strictly impartial attitude, this cool, calm, dispassionate weighing of the evidence, this freedom from bias is of the utmost importance, but is not easy to attain.

If the engineer is so well qualified to be of service to the non-engineer, why is it that his influence is so unimportant ? I venture to offer the solution that it is because he has the defects of his qualities. He is so accustomed in his daily tasks to use logical methods that he makes the grave mistake, when dealing with mankind at large, of assuming that man is a reasonable being in the sense that his actions are ruled by reason, whereas, as a matter of fact, the principal use we make of the reasoning faculty is to find perfectly sound reasons for doing what we wanted to do—when we have done it from entirely different motives. If we engineers wish to make our presence felt as it ought to be felt, we shall have to learn the motives that impel mankind to act—and we can begin to study the matter, with ourselves as test cases.

* Extracts from the Inaugural Address to the Irish Centre of the Institution of Electrical Engineers.

## LOOKING BACKWARD.

FIFTY years ago, according to THE ELECTRICIAN, dated November 16th, 1878 :—

Leicester Corporation decided to " ask for powers to use the electric light in that town."

The Sun Electric Light Co. had arranged to light the centre transept of the Crystal Palace by means of the Harrison light.

* * *

Twenty-five years ago it was reported (in THE ELECTRICIAN for November 13th, 1903) that :—

Construction of the electric railway up Mount Vesuvius was completed.

The Faraday Club, which was housed at St. Ermin's Hotel, Westminster, was closed on November 11th.

The British L.M. Ericsson Manufacturing Co., Ltd., was registered with a capital of £200 000. Mr. P. Hammarskjold was first managing director.

In his Presidential Address to the Institution of Electrical Engineers Mr. Robert Kaye Gray suggested that a " Temple of Engineering " costing a quarter of a million and housing all the important engineering bodies of the country would be preferable to a separate building for the I.E.E.

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# MARINE ELECTRICITY—A NEW INDUSTRY.

## Possibilities of an All-Electric White Star Mammoth Promise to Open Up a New Era—Big Future for Electric Ship Propulsion—Marine World Receptive to Electrical Idea.

By A. C. HARDY, B.Sc., A.M.I.M.E. (Author of "Motorshipping," "Merchant Ship Types," etc.).

APPROACHING completion of an electrically propelled ferry boat for service on the Parana River in South America, recent completion of an electrically operated dredge, in Holland, also for South American owners, and rumours now officially confirmed which have been persistently floating about to the effect that some form of electric propulsion will be used for the mammoth 60 000-ton liner contemplated for the White Star line, must unquestionably be riveting the attention of the entire electrical world upon marine possibilities. Considerable interest has hitherto been expressed, both in the Diesel-electric tanker built and completed this summer on the Clyde for American owners, and in the turbo-electric vessel now fitting out for the P. and O. Co.

The possibility that a British-built and owned mammoth transatlantic liner of some 60 000-tons displacement, 1 000 ft.. in length, and (these are all round figures, of course), 180 000 S.H.P., will definitely be electrically propelled, should give to those electrical firms who have inclinations towards matters marine an indication of the potentialities of marine electricity which they have hitherto not possessed. Cheap current generated by Diesel engines on ship board, combined with ease of operation, has enabled the electrically driven auxiliary to go a great way towards eliminating the steam auxiliary, but hitherto, in this country at any rate, there has been no great enthusiasm shown, either by electrical manufacturers or by shipowners, towards electricity for main propulsion.

There is every sign now, however, that a change of opinion and ideas is coming about. Electric propulsion in this new big White Star liner will unquestionably usher in a new era for big passenger liner propulsion. Diesel-electric propulsion, if fitted—and rumour is very strong in this direction—will go a long way towards showing that this is the ultimate form of electric ship propulsion.

Electric propulsion has now emerged from the experimental stage, to the extent that we can speak of an electric ship as contrasted with a motor ship or a steam ship. And yet the use of electricity for propulsion would appear to be justified only under special conditions and circumstances. For example, if Diesel-electric propulsion is adopted for the new White Star liner then it will be so because the owners wish to combine the known economies of the Diesel engine with the advantages given by a rotary prime mover to big passenger liners from the point of view of smoothness of operation. Even if it were possible to obtain a power of about 180 000 S.H.P. with direct drive Diesels (which at the moment emphatically it is not), then it would be carried out by an excessive number of reciprocating parts. All these reciprocating parts would be directly concerned with the manœuvring of the ship. In electric propulsion, the prime movers driving the generators —even if they are reciprocating (as is the case with Diesels) are non-reversing. In turbo-electricity the reciprocator is eliminated entirely—a point which is being made much of in connection with the powering of the new P. and O. electric ship "Viceroy of India." In the new White Star mammoth, too, it is unquestionable that one reason for the use of electricity will be the enormous auxiliary requirements, which with this form of propulsion can be taken care of—in addition to the main propulsive requirements by suitably arranged generators and exciters.

### An Important Departure.

At the other end of the scale, the reason for fitting electricity on the recently completed ferry boat "M.O.P.5B.A." to be used in passenger, freight and motor traffic on the Parana River, was probably mainly one of manœuvrability. The ship is double ended (i.e., of American type), and the four screws (two at each end) are driven by 200 H.P. 250 V motors. This is the first occasion on which twin electric motors (one per shaft) have been fitted on a double ended ferry boat, and for this reason the ship is an important one. Pilot house control is arranged in a pilot house at each end of the ship, arrangements being made for controlling the starboard or port (ahead or astern) pair of motors jointly or independently. Power is supplied by two 6-cylinder airless injection M.A.N. Diesels of 300 H.P. each, driving a 170 kW generator, a modification of which has proved very successful in the powering of Diesel-electric ferry boats in American waters. Construction and delivery of a ship of that type should certainly awaken in the minds of the big electrical firms specialising in the building of marine electrical machinery, the builders of the electrical machinery, the possibility of applying similar powering to similar ships in this country. The big service of Liverpool ferries, for instance, would unquestionably benefit enormously in manœuvring qualities from electrical propulsion.

If, returning to our original theme, we imagine something of the power requirements of a supposedly Diesel-electric passenger liner of some 60 000 tons, allowing for reserve power and for losses, etc., between generators and screws, we can approximate somewhere in the neighbourhood of 280 000 H.P. developed by the Diesel prime mover sets coupled to generators and exciters. It is reasonable to postulate that the largest number of small generators would be used, and this would appear to indicate sets of about 10 000 H.P. output apiece, arranged in some convenient but hitherto unadopted manner in the machinery space.

### Problems of Motor Control.

A total of 180 000 S.H.P. means—assuming, as would unquestionably be the case, a 4-shaft arrangement adopted—45 000 per shaft, which power would unquestionably have to be split up—on each shaft—among a convenient number of motors. Six motors per shaft would mean an output per motor of some 7 500 H.P.

The power plant of such a ship would be colossal in any case, and whether turbo or Diesel-electric is actually or ultimately adopted, it is difficult to see how such an arrangement of shafts and motors can be avoided. The problem of motor control and switchgear on such a ship would form a piece of work fit to gladden the heart of any electrical manufacturer. In fact, if such a ship is electric, and there now seems some reason to suppose that it may be Diesel-electric, it should provide work for a large section of the electrical and allied and subsidiary industries for many months. It is not only the actual heavy electrical construction which will provide work, although that in itself is of considerable importance. It is the auxiliary electrical work in the way of fittings, passenger and cooking equipment, heating, lighting, wiring, from which so much work will come.

Furthermore, once such an electric ship is an established fact, she must unquestionably be followed by others. Remember that scarcely any mammoth liners have been built since the War, and that, though few in number, they are large and important, designed as they are to carry the pick of transatlantic traffic in the face of tremendous and virile competition.

The White Star Line is building this new ship. It is an open secret that the Cunard Line must soon follow suit with its mammoth, and rumour is very busy here that this also will be an electric ship—probably of turbo-electric type. It is, in fact, the considered opinion of many naval architects, that the big ship of the future—for passenger work—must be an electric ship.

Marine electricity most definitely has a future, but it is largely up to the electrical companies to develop that future. No useful purpose will be served by preaching electrical propulsion for all types of ships. On an 8 000-ton tramp ship it would be a sheer waste of money to fit electrical propulsion. For special cases—on certain ferries and dredgers for example —and where large and varying auxiliary loads are necessary, and for large passenger liners of the highest type, there will be unquestionably—even in this country—a tremendous future in the next few years. The marine world is now receptive to the electrical idea—more receptive in fact than it has been for some time past. The era of marine electricity has definitely dawned.

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The British Government sent delegates to an International Conference which opened in Paris on Monday to discuss the limitation and regulation of the number of international exhibitions and to conclude an international Convention on the matter. The main object is to limit the long period general exhibition. The British Government takes the view that the short period trade exhibition or fair stands in a different category and in the main is a valuable aid to business.

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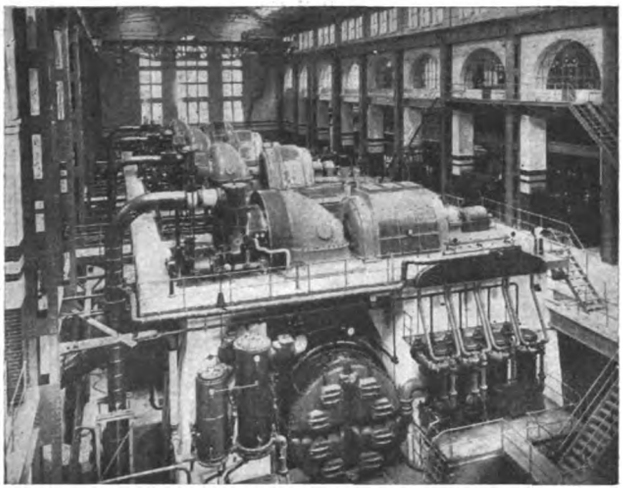
# EXTENSIONS AT NOTTINGHAM.

## New 20 000 kW Set Officially Inaugurated by Sir Andrew Duncan—Economical Working of the North Wilford Station—Low Coal Costs.

SINCE the official opening of the Nottingham Corporation's North Wilford power station in November, 1925, the station has been the source of the whole of the public electricity supply within the city of Nottingham, and a large district outside, comprising a total area of about 47 square miles.

The growth of the demand was such that, even before the opening of the station, the Corporation authorised the



**A general view of the North Wilford station with the new set in the foreground.**

first extension of plant, in the shape of a 20 000 kW turbo-alternator, two additional boilers, switchgear, etc. This plant was formally put into service on November 7th, Sir Andrew Duncan, chairman of the Central Electricity Board, performing the opening ceremony.

To accommodate the new machine the turbine room and switchgear house have been extended for a length of 90 ft., leaving space within the building for a second 20 000 kW machine in the near future.

The original boiler-house was sufficient to take the two additional boilers, but a second boiler house will be required when further extensions of plant are made.

The new turbo-alternator is of the same general design as the three original 10 000 kW machines, and is capable of giving a continuous output of 20 000 kW at a power factor of 80 per cent. (25 000 kVA) at a pressure of 11 000 V, and running at 1 500 r.p.m.

The condenser of the new machine, while contained within one casing, has been divided into two separate water compartments, each supplied from its own centrifugal pump. The failure of either pump would only have the result of reducing the output of the machine to one-half its maximum load, while keeping the vacuum constant. By working at a lower vacuum, the output in such a case would be more than one-half. The water tubes of each half of the condenser can be cleaned out while the machine is at work.

The exciter is mounted at the end of the alternator shaft, and consists of two machines. The larger one provides the exciting current for the alternator and is itself separately excited from the smaller one. The latter is shunt wound, and run at a constant pressure. The control of the alternator field is by means of a resistance in the exciting circuit of the larger machine. Field stability at all loads is thereby assured.

The demand upon the power station, pending the completion of the 20 000 kW machine, became such that it was necessary to adopt some means of increasing the output from the three 10 000 kW machines. Owing to the generous rating of these sets, it was found that each alternator would carry a load of 12 500 kW without reaching the allowable temperature limit.

Certain alterations were therefore made to the steam nozzles, and the three 10 000 kW machines will now carry, and are rated at 12 500 kW each.

The two new boilers, with economisers, which have been erected in the boiler house, are of the same size and design as the six original boilers. These were also found to be very generously rated, and they are now regularly worked, without forcing, at an evaporative rate of 70 000 lb. of water per hour as against the original rating of 55 000 lb. per hour.

The extension of the switchgear, consequent upon the additional generating plant, consists of one alternator and four feeder circuits for the main 11 000 V switchgear, and of low-pressure direct and alternating current auxiliary switchgear.

The new switchgear is of the same design as the original. The high-pressure gear is erected in an extension of the two floors of the switch house, and the low-pressure gear in the auxiliary bay.

The total installed capacity of the station plant is now 57 500 kW (71 875 kVA at 0.8 power factor), and the maximum load, after keeping the equivalent of the largest machine in reserve, is 37 500 kW (46 875 kVA).

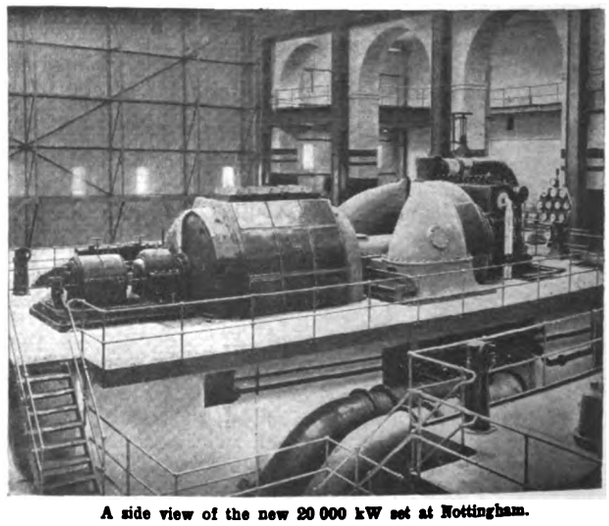
When a second 20 000 kW turbo-alternator is erected in the space already provided, the installed capacity will be 77 500 kW (96 875 kVA), and the maximum load will be 57 500 kW (71 875 kVA).

The North Wilford power station has been included in the list of selected stations for the Central England Electricity Scheme, and, as such, will shortly be operated under the direction of the Central Electricity Board.

When the station was opened in 1925 the coal used was washed peas. Since that date, and after exhaustive experiments by the station staff, it has been found possible to burn successfully a mixture consisting of two-thirds washed peas and one-third fine slack.

In the year ended March 31st, 1926, when the load factor of the station was 15.59, coal costs per unit generated were 0.1770d. In 1928 with load factor at 26.04 coal cost 0.1199d. per kWh generated, while, during the six months ended September 30th last, with a load factor of 17·00 the approximate figure for coal was 0·0942d. This, it is believed to be a record for power stations in this country, particularly when the low station load factors are taken into account. No pulverising plant is used and the coal is burned on standard chain grate stokers.

The consulting engineers under whose direction the contracts were carried out were Messrs. Reece, Cardew and Rider. The contractors were: Stirling Boiler Co., Ltd., boilers; Underfeed Stoker Co., Ltd., stokers; Davidson and Co., Ltd., fans; W. H. Allen, Sons and Co., Ltd., centrifugal pumps; Babcock and Wilcox, Ltd., economisers; Aiton and Co., Ltd., pipework; Cape Asbestos Co., Ltd., covering; P. and B. Evaporators, Ltd., evaparator; Geo. Kent, Ltd., meters; F. W. Brackett and Co., Ltd., screens; Dewrance



**A side view of the new 20 000 kW set at Nottingham.**

and Co., Ltd., Hopkinsons, Ltd., J. Blakeborough and Sons, Ltd., valves; British Thomson-Houston Co., Ltd., switchgear; Brush Electrical Engineering Co., Ltd., transformer; British Thomson-Houston Co., Ltd., turbo-alternator; Worthington-Simpson, Ltd., condensing plant and air pumps.

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# TENDENCIES IN INSTALLATION WORK.*

## Future Openings for the Installation Engineer Envisaged—Private Plant in Remote Rural Areas—Provision for Stoppages—The Heating Field.

By DONALD SMEATON MUNRO, M.I.E.E.

IT is an outstanding merit of the national electricity scheme that it compels everyone to think about electricity supply, and so is the best advertisement the industry could hope for. Even if, as some think, the extra fuel economy of super-power steam stations will be well absorbed in transmission and administrative costs the general permeation of the population with electrical ideas and desires must ultimately be of benefit to all; and the great diversity of requirement will tend inevitably to reduce cost of supply. Then the great purpose of the scheme will be justified.

The installation engineer can look on the present situation from a comparatively detached, and, on the whole, favourable aspect. It is true that he may be losing by the hundred the smaller self-contained installations which it had been his pride to design and maintain. The majority of his clients will find it expedient to change over to the standard supply services, but he should see to it that the opportunity be taken to extend the range and capacity of the consuming appliances.

As the great bulk of consuming appliances will be produced in mass for standard pressures the installation engineer will, of course, assist the natural tendency to instal such appliances so that consumers may, at minimum cost, accept the advantages of unlimited supply—where or when it becomes available advantageously.

Some important industries, as collieries, breweries, dye works, paper mills, tweed mills, etc., and some of the largest institutions, as asylums and the like, require so much steam heating that apparently it will always be advantageous to generate electrical power as a by-product. A large proportion of these lie outside the town areas or off the direct path of overhead connecting lines, and many are established on rivers which themselves supply all—or nearly all—the power required.

Isolated country houses are plentiful in the Scottish Highlands and islands, and here there should be no tendency to wait on Government schemes when wind and water, petrol and oil are immediately available. Recent improvements in automatic control of small plants, and the greatly increased efficiency of engines using low grade fuel oil have enabled installation engineers to introduce electricity into many districts at very low running costs.

### Private Plant Possibilities.

Even in lowland areas with overhead supply lines within a mile or two, owners of country estates to-day frequently find the installation costs of private plant considerably less than transformer and service line, and so are doubly induced to preserve their independence and the amenities of their policies.

The isolated country house or farm installation of 15 or 20 years ago was almost invariably fitted for lighting only. Now that the advantages of electric cooking, heating and power are appreciated the tendency is to replace 2 to 5 kW paraffin units with 10 to 50 kW sets using residual oil. The newer engines are simple and reliable, and within the limits of power stated the fuel and lubricating costs approximate to 0·5d. per kWh.

Higher fuel efficiencies are obtained with the class of vertical multi-cylinder cold starting oil engines ranging from about 50 to 600 B.H.P., and a large proportion of these fitted since their introduction about 12 years ago are in towns where they render the users immune from any risk of failure of the common supply.

The consequence from stoppage become increasingly serious as more industrial applications tend to be entirely dependent on electricity, and some important business enterprises take the view that super-stations with large units, plus involved new distribution networks, are unlikely to eliminate the possibilities of interruption. In the past few years there are recorded instances of important involuntary stoppages, and localised and sectional failures are much more frequent, while the consumers seriously affected have no compensation, as electricity authorities are free from responsibility for loss occasioned by interruption of supply. Hitherto with moderate sized generating sets and comparatively attenuated networks failures of public supply affected a factory, a pumping station or a mine in a comparatively passive way. But with giant units and great capacity cables novel and more active causations and accompaniments of stoppage must be to some extent anticipated.

Some Government departments and others concerned with the maintenance of public services and vitally requiring an uninterrupted supply of electricity set an example in the use of independent generation. The chain of Post Office telephone repeating stations is provided with heavy oil engines, so also are the more important lighthouses. Dockyards and railways have their own generating stations. In cities we see the Bank of England, some of the largest stores and theatres adopting a policy of decentralisation to guard against possible stoppage. Our President's output chart shows that in 1928 private generating plant is producing over 5 000 millions of units.

### Direct Current Applications.

Apart from detached and completely independent installations, there is already evident a tendency for increase in the use of motor driven generators, rotary converters and static rectifiers for conversion for the processes and purposes for which direct current is necessary or most desirable, as works for the electro-deposition of nickel, chromium, cadmium and zinc, and in picture houses, cinema studios, light clinics, etc. There are likely to be additions to the class of supplementary or pilot installations which are fed from a battery charged by motor generator, then trickle-charged from the town mains and automatically switched on by a contactor closing coil when the outside supply stops.

It would appear that the means of transport by rail, road, sea or air must retain a large proportion of d.c. appliances in the provinces. Any recent considerable increase in the number of battery driven road vans and lorries in this country has not been so apparent. But accumulator driven platform and elevator trucks and works locomotives are to-day performing very heavy duties so efficiently that it is evident these comparatively inexpensive and easily controlled d.c. vehicles have won a permanent place among transport agencies, and their most suitable charging arrangements will always require attention. Night and "off peak" tariffs for battery charging would assist mutually both supplier and consumer.

The extreme simplicity and effectiveness of the d.c. constant current system for the control of cranes, hauling gear and other purposes for which the steam engine even yet holds the field, opens up new prospects for this necessarily self contained generator and motor system. The method is of special interest to the Scottish Centre, as it is being developed and perfected in Glasgow and is being applied to the auxiliaries of our most up-to-date all-electric ships.

Apart from conditions in which it is still possible to make out a good case for local generation, either as the only, the main or the supplementary source of supply, there are more abundant directions in which the installation engineer may exercise his functions in the great change-over which is taking place. The new a.c. motors in many cases involve more elaborate gearing or multiple reduction chain drives. The fact that motors have to be replaced often leads to more or less complete rearrangements of workshop drives, and the comparative freedom from attention required by a.c. motors permits of more bracket or roof positions being chosen, and so floor space is saved.

In the towns there is much work being done converting lift, fan and refrigerator drives. The smaller towns and villages are being rapidly awakened to a new pride and efficiency as one by one they are being connected up to electricity supply. The adoption of electricity for farming and all the processes of agriculture and horticulture can truly be said to be in its infancy compared to the expansion we expect to attain under the National scheme.

The extent of the field for electrical heating for all purposes is only now opening to our view. Indeed, the chief likelihood of the "off peak" problem being solved in a satisfactory way is by the application of electricity on a wide scale to heat storage systems. The selection of position, type and size of boiler and tank and the applications of the varied styles of

* Extracts from the Inaugural Address to the Scottish Centre of the I.E.E. on November 13th.

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elements in themselves offer much scope to the installation engineer. The arrangement and design of the thermostatic and time switch controls for the manifold domestic requirements and tariffs give ample opportunity for improvement and invention.

For large works, offices, and possibly for communal supplies the direct heating of water in large boilers by means of three-phase electrodes at the higher pressures affords obvious economies and at the same time suggests further methods of facilitating many chemical processes by electricity.

### Electric Furnaces.

Muffle, arc and eddy current and annealing furnaces are being increasingly applied to the working and the production of metals; and their peculiar properties and exact control being so different from the crude heat processes formerly used must introduce hitherto unknown alloys, composite metals, and produce old metals with new qualities.

Electrical engineers owe much to the British iron and steel industry, and now, when that great staple industry of our country, needs revival, it is appropriate that the electric induction furnace may prove a potent factor to this desirable end, halving—as it does in some cases—the cost of production of the finest crucible steel by eliminating much of the old laborious workings.

In association with steel castings and forgings, improved magnetic methods of testing are being used; irregularities or defects in the interior of the metal being indicated by distortion or change in magnetic flux. Minute cracks are now successfully traced by placing the magnetised metal in a bath of paraffin in which iron dust is sprinkled. The particles are attracted and held along the line of cracks which are otherwise invisible even under the magnifying glass.

Air warming for large buildings by electrically-heated elements combined with electric blowers has its usefulness, and there is an increasing tendency to instal tubular and Igranic panel heating in place of coke fired central heating.

We have almost reached the stage when it can be said that no dwelling house is up-to-date unless it has electric heaters in every room. For domestic work the radiant electric fire has immense popularity, and the quality of the heat produced is more suited to our island atmosphere than the steam heating so common in the U.S.A. and on the Continent.

*(To be concluded).*

## CORRESPONDENCE.

***The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.***

### The Swan Centenary.

[To the Editor.]

Sir,—With reference to the note in the article in your issue of November 2nd, relating to the invention of the incandescent lamp, it is, I think, well known that "Edison used bamboo of a special kind, and with the aid of very ingenious machinery stamped out pieces of the required size. Specimens of the bamboo in the various stages of reducing the size were exhibited at the Crystal Palace Exhibition in 1882."

Swan was the first to use parchmentised cotton threads, and therefore may be regarded as the "father" of the carbon incandescent lamp.

A very good history of the development of the carbon incandescent lamp is to be found in Chapter 2 of Mr. Ram's book on "The Incandescent Lamp and Its Manufacture," published originally in 1893, from which the above quotation has been made.—I am, etc.,

E. W. Marchant.

The University, Liverpool.
November 6th.

### Hot Spot Temperatures.

[To the Editor.]

Sir,—Being responsible for the "anti-hot-spot" transformer advertisements to which Mr. Norris's letter in your issue of November 2nd takes exception, we welcome the opportunity of replying in terms which will not be accused of vagueness.

People other than Mr. Norris have written on heat transference from electrical windings, and it was more particularly American experiments—which bear out our claims—that we had in mind.

As to Mr. Norris's remarks on thermal transference, it is, of course, obvious that a body which is losing heat must be hotter than the body to which it loses heat, and, therefore, the maximum temperature in a properly constructed transformer will be in the active stalloy or copper.

The important fact in the whole letter, and to which we draw particular attention, is that Mr. Norris really evades the point at issue.

The "anti-hot-spot" advertisement in no way states or implies that there is no maximum temperature in our transformers, but that they are designed without hot spots. The meaning of the commonly-used expression "hot spots" in electrical windings is—definitely localised positions where abnormal heating is experienced with relation to the remainder of the material performing similar functions. In other words, quite explicitly, a hot spot is an abnormality occurring in an otherwise smooth temperature gradient curve. A hot spot is due to faults in design or workmanship, which cause a dangerous local temperature under normal loading conditions. In our opinion the indicator which Mr. Norris favours does not, and cannot, measure or indicate it.

It is possible to eliminate hot spots in a well-designed and properly constructed transformer, and the advertisement is quite accurate in saying so. It is also correct to say, and we repeat it, that hot spot indicators are an anomaly since they imply something which should not exist, and which they do not indicate when they do exist. All that a hot spot indicator can give is given equally well by an ordinary mercury thermometer.

Mr. Norris, in his letter, states that "the essential point is that the maximum safe load the transformer will carry thermally is determined entirely by its 'hottest spot' temperature. The temperature of the hottest oil under operating conditions is not a reliable guide, and will most often be positively misleading." We claim that the hottest oil temperature is a very satisfactory indication, and the experience of many engineers since oil immersed transformers came into use bears us out. There is such a thing as "factor of safety," but apparently Mr. Norris believes in screwing down the safety valve. If a hot spot indicator allows a transformer to be run with the oil above 90 deg. C. then it encroaches on the margin of safety in a dangerous manner. In a time of dire emergency, an engineer may consider the risk of running at a temperature in excess of 90 deg. worth while, but under normal conditions this temperature is seldom, if ever, reached, so the extra cost of the indicator over a thermometer is wasted.

It is just possible that the use of hot spot indicators may be considered if it is desired to work at abnormally high densities in the active material so as to cut the cost down to the lowest possible figure, but even here the use of such an indicator would fail, for it would work to a formula, and not to a fact. In any case, although a cut-down and over-rated transformer might survive its twelve months' maintenance period, during which it might be lightly loaded, it would not give long service when its full duty was being required of it.

One other point. The "British Standard Rating" was formulated so that engineers could readily make comparisons between the offers in different firms' tenders and for tests at makers' works, and was not intended as a basis of maximum loading.

The figure of 90 deg. C. has for long been the test of how much load to put on any individual transformer, and it is accepted as a reasonable figure by the vast majority of users.—We are, etc.,

Hackbridge Electric Construction Co., Ltd.,
W. C. Kennett, Technical Director.

Hersham,
Walton-on-Thames.
November 5th.

### POINTS OF VIEW.

If interference is not to take place in reception there is only room for 100 stations (broadcasting) in Europe.—*Capt. P. P. Eckersley.*

* * *

The electrical industry should see that a woman gets what electricity she wants at the price she can afford. The domestic demand goes on seven days a week, with no break and no strikes. The greatest future lies in the domestic line of electricity.—*Mr. E. E. Hoadley.*

* * *

The mere cash value of the space devoted to our competitor for some years past, free of charge in the Press, would make the annual income of our Association (B.C.G.A.) look ridiculous.—*Mr. H. E. Bloor.*

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# AYLESBURY ELECTRICITY.

## Inauguration of New Electric Drive at Chinnor Cement Works.

THE area supplied by Aylesbury Corporation's electricity department is over 200 square miles, and it extends as far as Chinnor, 15 miles from the generating station. There is comparatively little power load, although there are a few large power consumers, including Messrs. Hazell, Watson and Viney's printing works and two water pumping stations. Mr. W. A. Turnbull, the borough electrical engineer, has sucessfully tackled the problem of rural electrification and his success in this direction is largely due to the use of simple and economical apparatus and material. These may be said to commence in the generating station, where the whole of the switchgear designed by Mr. Turnbull for the rural area has been installed at a cost of about £120. Then, in the rural districts, light copper wire is used for the main lines, and galvanised steel wire on wood poles for distribution. This is found to have practically no sag, which enables longer spans to be obtained, with consequent reduction of outlay for poles. Again, in the case of street lighting in the villages, the "Aylesbury" wood poles with swan-neck brackets are used, which show a saving compared with ornamental iron standards.

This economy in construction enables moderate charges to be made to consumers, and these charges might be reduced if the Corporation were permitted to extend its generating plant to enable it to connect up many would-be consumers whose demands for current have had to be held in abeyance owing to the difficulty of obtaining the Electricity Commissioners' consent to an extension of plant. The Commissioners have advised the Corporation to endeavour to obtain a bulk supply, and negotiations have taken place with Luton Corporation and with the Wessex Electricity Co., but no satisfactory terms have been offered. The Wessex Co. has offered to give the supply, but the cost to the Corporation would be considerably in excess of that at which it generates in its own station.

On October 23rd members of the Electricity Committee and representatives of the Press made a tour of the area of supply, and attended the formal inauguration by the Mayor (Coun. Viscount Stopford) of the electric driving of the Chinnor cement and lime works.

The installation was carried out by the Lancashire Dynamo and Motor Co., Ltd., using Maxtorq induction motors and Lancashire self-starting and self-synchronising motors for the heavy low speed drives. The 350 B.H.P. 187·5 r.p.m. self-starting synchronous motors driving the cement tube mills and the 200 B.H.P. 187·5 r.p.m. self-starting synchronous motor driving the coal tube mill are each designed to start up against twice full load torque four times per hour, and are operated by Brookhirst type starting panels. Each of these motors drives through a flexible coupling and straight tooth gearing. They are capable of running at a leading power factor of 0·85, which allows of the power factor of the whole installation being brought up to unity at full load. A 125 B.H.P. 485 r.p.m. Maxtorq motor drives the washmill separators and elevators, and is designed to start up against twice full load torque, and is controlled by a Brookhirst auto-transformer type starter. All motors for driving elevators, pumps, fans, etc., are of the Maxtorq single speed type controlled by star-delta starters.

The majority of the cabling is carried out in paper insulated lead covered and armoured cable, and precautions have been taken to prevent the cable being exposed to any excessive temperatures in the vicinity of the rotary kiln and hot clinker elevators, etc. Triple earths are provided and arranged so that tests of their efficiency can be carried out. Fool-proof interlocks and indicators have been provided where necessary.

Power is received at 10 250 V, and the works are fed through an 865 kVA Ferranti transformer, giving a 400 V, three-phase, 4-wire supply for power and lighting, provision being made for an additional transformer to be supplied at an early date. An auxiliary low tension supply will shortly be provided and arrangements made so that when the main plant is shut down the lighting and workshop motors can be run from the auxiliary supply. The power transformer feeds a Switchgear and Cowans cubicle type switchboard, from which it is distributed by industrial draw-out type switchgear of the same make, to the motors and lighting of the works.

*VIEWS of the distribution system at Aylesbury.* (1) *A 100 kVA transformer for small town distribution mounted on a 4-member pole.* (2) *Village overhead 11 kV line showing transformer mounted on* H *terminal on right.* (3) *A 10 kVA pole transformer for town supply. Cost, complete with switchgear,* £30. (4) *An 0·075 copper 6-wire 2-circuit 11 kV line to the Chinnor Cement Works.* (5) *Village overhead line distribution showing Aylesbury poles.* (6) *Overhead equipment for street lighting. Swan-neck brackets support the insulators.*

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# OVERSEAS TRADE.

## Electrical Exports for Ten Months Exceed Imports by Over £10 000 000.

EXPORTS of electrical machinery, apparatus, and materials shipped from the United Kingdom during October last amounted to £1 545 122, as against £1 477 997 during the corresponding month of last year, representing an increase of £67 125. The total value of exports of British electrical goods for the ten months of this year amounted to £15 248 588, representing a decline of £100 326 when compared with the total for the corresponding period of 1927. Imported electrical goods and machinery during October, 1928, amounted to £650 798, whereas for the same month last year imports were valued at £607 697, the increase being £43 101. For the ten months of this year the total electrical imports amounted to £5 157 109, as against £4 656 359 for the corresponding months of 1927, the increase being £497 750.

These figures indicate that the electrical exports for October, 1928, exceed imports for the same month by £894 324 while for ten months the excess is £10 191 805.

Export items which show increases during October, 1928, when compared with the corresponding month of last year, include various motors and generators, increase £28 260; submarine, telegraph and telephone cables, £21 800; electric glow lamps, £13 398; batteries and accumulators, £11 458; measuring instruments, £10 159; and various electrical goods and apparatus, £51 943.

We give below detailed figures for October, 1928, and for the ten months of the year, contrasted with those for the corresponding month and period of last year.

| | Month of October | | Ten Months | |
|---|---|---|---|---|
| | 1927. | 1928. | 1927. | 1928. |
| IMPORTS. | £ | £ | £ | £ |
| Electrical Machinery | 143 147 | 153 324 | 1 322 800 | 1 437 061 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 17 061 | 29 722 | 105 121 | 151 621 |
| Insulation other than rubber (not being Telegraph or Telephone Wires or Cables) | 62 437 | 62 871 | 507 826 | 490 270 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 11 838 | 4 179 | 79 179 | 66 437 |
| Submarine Telegraph and Telephone Cables | — | — | 73 | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 56 479 | 76 055 | 364 203 | 523 487 |
| Carbons, Electric | 7 004 | 9 845 | 75 667 | 102 835 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 47 478 | 25 781 | 324 254 | 378 813 |
| Arc Lamps and Electric Searchlights | 829 | 633 | 7 568 | 5 839 |
| Parts thereof (except Carbon Rods) | 3 126 | 4 013 | 22 439 | 26 043 |
| Batteries and Accumulators (including parts) | 107 552 | 114 857 | 576 027 | 551 081 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 25 212 | 27 695 | 230 868 | 233 490 |
| Switchboards, other than Telegraph and Telephone | 89 | 145 | 1 158 | 937 |
| Electrical Goods and Apparatus, all other Sorts | 125 445 | 141 678 | 1 041 176 | 1 189 195 |
| Total of Electrical Goods and Apparatus | 607 697 | 650 798 | 4 656 359 | 5 157 109 |
| EXPORTS. | £ | £ | £ | £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 44 564 | 44 676 | 449 107 | 421 953 |
| Other Motors and Generators | 195 630 | 188 831 | 1 941 544 | 2 006 015 |
| All other Sorts | 299 967 | 328 227 | 3 213 541 | 3 111 502 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 110 212 | 112 604 | 1 175 582 | 1 141 445 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 134 592 | 122 448 | 1 341 901 | 1 212 369 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 97 246 | 57 155 | 777 772 | 721 219 |
| Submarine Telegraph and Telephone Cables | 14 025 | 35 825 | 458 334 | 566 030 |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 225 004 | 220 371 | 2 121 320 | 2 222 884 |
| Carbons, Electric | 3 058 | 552 | 20 405 | 12 770 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 44 677 | 58 075 | 486 267 | 434 812 |
| Arc Lamps and Electric Searchlights | 2 473 | 812 | 13 833 | 10 585 |
| Parts thereof (except Carbon Rods) | 3 231 | 118 | 6 044 | 5 716 |
| Batteries and Accumulators (including parts) | 95 820 | 107 278 | 1 055 929 | 921 944 |
| Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 26 112 | 36 271 | 299 398 | 318 913 |
| Switchboards, other than Telegraph and Telephone | 5 267 | 3 817 | 58 643 | 62 204 |
| Electrical Goods and Apparatus, all other Sorts | 176 119 | 228 062 | 1 929 294 | 2 078 227 |
| Total of Electrical Goods and Apparatus | 1 477 997 | 1 545 122 | 15 348 914 | 15 248 588 |

# NEWS IN BRIEF.

DIRECT telephone communication between Hungary and the U.S.A. was commenced on Monday.

A power station is being erected at Karnap (Germany) which will use as fuel the mud of the River Ems.

It has been announced that the 60 000 ton liner which is being built at Belfast for the White Star Line will be electrically propelled.

The 1929 Conference of the Electrical Contractors Association will be held at Bournemouth from June 26th to 28th, inclusive.

An electrical exhibition organised by Swansea electricity department was held in the Drill Hall, Richardson Street, Swansea, during the past week.

According to a report of the California Railroad Commission the agricultural power sales in California for the year 1927 amounted to 719 830 660 kWh.

Sir Hamar Greenwood, M.P., will be the principal guest at the next luncheon of the Batti-Wallahs' Society, to be held at the Hotel Cecil on November 21st.

York Corporation has passed plans for alterations in the basement of the Technical School for the purpose of providing showrooms for the electricity department.

The annual conference of the Institute of Metals will be held at the Institution of Electrical Engineers on November 21st and 22nd, the president being Lord Melchett.

In view of its impending dissolution, a smoking concert has been arranged for 7 p.m., on November 24th, at the White Horse Restaurant, High Holborn, to commemorate the "exit of the M.E.T.A."

The average daily all-in cost of the Rugby wireless station, including the receiving stations worked in connection with it, was, from May 1st to September 30th, 1928, £383, and the average daily revenue was £397.

The number of wireless licences in force is over 2 500 000. It is not believed that there is any widespread evasion of payment of licence fees, nor that owners of portable sets are more prone to evade their obligations than other members of the community.

An electric "slimming" chair shown at the New Health Exhibition applies vibratory massage to the human body and is said to produce in 10 minutes more effect as regards reduction of superfluous flesh than would be secured by an hour's equestrian or other strenuous exercise.

The Scottish Tramways and Transport Association, representing the municipal tramways and kindred undertakings, has rejected the proposal of the Transport and General Workers' Union to establish a joint council for the regulation of wages and conditions of service for the employees.

The Manchester Electro-Harmonic Society will hold a smoking concert at the Manchester, Limited, to-day, Friday, while other concerts will be held at the same address on December 14th, January 18th, February 15th and March 15th. February 2nd will be a Ladies' evening.

An opportunity for past members of the Ex-National Telephone Company's Staff to meet together on December 10th has been arranged for 7 p.m. at the New Criterion Restaurant, London. Application for tickets should be sent to the Hon. Secretary, Mr. T. A. Prout, 17, The Chine, N.21. Lt.-Col. C. B. Clay will be in the chair.

According to the "Daily Mail," a device which will amplify the output of a small battery for power and lighting has been invented by Mr. W. Harrison and Councillor T. Ward, both of St. Helens. Inquiry at the Patent Office showed that the invention is the subject of Patent Application No. 8696, 1928. It is understood that the complete specification has been lodged with a view to acceptance.

We are informed by the Cable Makers' Association that nothing is known in this country of the negotiations which are said to have been taking place between high pressure cable makers in Great Britain and on the Continent, with a view to the establishment of a syndicate. It is believed that the rumour was copied by certain London papers from a paragraph which appeared in the German papers.

Lt.-Col. C. B. Clay informs us that the annual dinner of the London Army Troops Companies Group (Royal Engineers), will be held on November 23rd, at the Cafe Monico. Application for tickets from past members of the corps and also its predecessors, the Engineering Institutions Volunteer Corps; the Architects Corps and the L.C.C. Corps., may be obtained from Mr. C. E. Campbell, 25, Newman Street, Oxford Street, London, W.1.

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# PERSONAL.

MR. J. F. Aust has been re-elected unopposed a member of the Stoke-on-Trent City Council.

Counc. H. J. Galliers, of Brighton, was, on November 9th, unanimously elected Mayor of Brighton.

Mr. Alan Kirk recently terminated his engagement with Messrs. Wood and Ball, and has been appointed general manager of Engineering Works (Electrical and General), Ltd.

Miss Doris Cleaver and Mr. Frank Walker, both of Oxford, were presented with a barometer by the Post Office engineering department at Bournemouth on the occasion of their marriage.

Mr. H. J. Bousfield, engineer and manager to the Chatham and District Light Railways Co., has presented to the Chatham Museum a Cromwellian brass lantern clock on an oak bracket.

At Preston municipal elections, Coun. Heaney, chairman of the Electricity Committee and vice-chairman of the Mid-Lancashire Electricity Board, was defeated by a trade union official.

Mr. F. W. Prosser, sales manager and secretary of Bristol electricity department is to retire after nearly 48 years service. He will have a superannuation allowance of £326 per annum.

Mr. A. Pemberton, for nine years works manager for Mirrlees, Bickerton and Day, Ltd., is retiring through ill-health, and he has been presented by the staff and employees with a solid silver epergne.

Mr. E. E. Sharp is again leaving England early next month for a protracted business tour, embracing New Zealand, Australia and Tasmania. He will pass through the Panama canal on the outward trip, returning via Suez.

Mr. R. Nash, who has been on the staff at the Aylesbury Corporation electricity works, is leaving to take up another appointment, and has been presented by his colleagues with an oak chair.

The Council of the Institution of Mining Engineers has awarded the "Mavor and Coulson" Travelling Post-Graduate Scholarship of £300 for 1928-29 to Frederick Colin Swallow (Barnsley), Graduate (Diploma) in Mining of the University of Sheffield.

Mr. Thomas L. Miller will be retiring from active practice at the end of the present year. He has practised in Liverpool as a consulting engineer since 1890, and will continue to act on the panel of referees appointed by the Lord Chief Justice under the Rating and Valuation Act of 1925.

At the annual general meeting of the Junior Institution of Engineers on November 9th, Mr. S. H. Hole was elected chairman; Mr. S. Dunlop and Mr. E. D. Gill, vice chairmen; Messrs. R. H. Allen, F. C. Moore, G. A. Ogden, and E. T. Agutter, councillors; and Mr. W. M. Hurrell, treasurer. At the inaugural meeting at the Royal Society of Arts, on December 7th, medals and awards will be distributed by the retiring President, Sir Murdoch MacDonald, who will also induct as his successor Lt.-Col. J. T. C. Moore-Brabazon.

## Obituary.

MR. CHARLES GUTHRIE CONRADI, aged 50 years. He was managing director of Electromobile (Leeds), Ltd. He was also a director of the General Vehicle Co., Ltd., and a member of the Electrical Vehicle Committee of Great Britain.

SIR ALEXANDER BLACKIE WILLIAM KENNEDY, F.R.S., on November 1st, aged 81 years. In 1871 he became consulting engineer in Edinburgh with the late Mr. H. O. Bennett, as Bennett and Kennedy. In 1874 he was appointed Professor of Civil and Mechanical Engineering at University College, London, and in 1875 devised the Engineering Laboratory at the College. In 1889, owing to pressure of other work, he resigned his chair, but received the honorary title of Emeritus Professor of Engineering from the Council of the College. He at one time acted as engineer-in-chief to the Westminster Electric Supply Corporation, Ltd., and designed many of its stations; he also acted as engineer to the St. James and the Central Electric companies. Sir Alexander designed, among others, power stations which are at work for the Corporations of Manchester, Edinburgh and Kilmarnock. He was joint engineer with Mr. W. R. Galbraith on the Waterloo and City (Electric) Railway, and acted as electrical engineer to the London County Council in the initiation of the tramways. He was also associated with the electrification of the suburban lines of the L. & N.W. and L. & S.W. Railways and in the extension of generating plant for the L.C.C. He was a member of Lord Parker's advisory committee on Wireless Telegraphy appointed in 1913.

# AUTOMATIC LIGHTING.

## Demonstration of New Selenium Equipment —Its Application to Street Lighting.

WE were last week given a demonstration of the apparatus developed by Radiovisor Parent, Ltd., of 26, Coventry Street, London, W.1, for automatically controlling lighting systems, fire alarms, etc. The equipment is primarily dependent upon the properties of selenium, and it is claimed that the bridge employed is both robust and constant in action. A specially developed polarised relay, incorporating a mercury switch, is used with the apparatus, and though at the demonstration the reason for its sensitivity was explained, the constructional details were withheld pending the completion of patents. The general operation of the equipment is, of course, a sequence of events following upon the change in resistance of the selenium bridge as a result of light, or its absence. The small current passed operates the relay, and subsequent events are dependent upon requirements. The equipment may, for instance, be used for street lighting, when sunrise and sunset will operate the device, while periods of the daylight hours, such as darkness resulting from fog, will also ensure the lamps being switched on and off at the appropriate times. For obvious reasons the apparatus is also applicable to shop window or interior lighting. It is interesting to note that a number of these units have been in use at Barnes (London) for the lighting of street lamps, and we understand that the experiment has given satisfactory results over some nine or ten months test.

**An experimental unit, incorporating the new selenium device, fitted to a lamp standard at Barnes.**

Another application of the same device is in connection with burglar alarms, when by means of the resulting interruption of a filtered beam the relay is set in operation and the alarm given. The same device is also suggested as a means of operating a railway signalling system, the interruption of the beam by the passing of a train again setting in motion a number of predetermined actions.

In connection with the latter use, a model railway system has been installed at the offices of Radiovisor Parent, Ltd., and demonstrations of the device have been given before a number of railway signalling authorities. We understand that considerable interest has been shown and we are informed that the L.N.E.R. has expressed a willingness to experiment with the arrangement.

### ILLUMINATION DESIGN COURSE.

The fifth lecture of the 18th Illumination Design Course, entitled "Floodlighting and Electrical Advertising," was delivered by Mr. H. Lingard on November 7th at the E.L.M.A. Lighting Service Bureau. The lecturer commenced by reviewing the possibilities of the relatively new lighting science of light projection and by indicating the present fields of application. The constructional and technical details of floodlight projectors were then discussed, after which factors affecting the design of floodlighting installations were enumerated. In addition to the demonstration of floodlighting apparatus of all kinds, the lecturer also dealt with some of the fundamental factors of electric sign design, illustrating his remarks by the use of miniature and full-size equipment.

On Wednesday, Mr. W. J. Jones dealt with the subject of "General Lighting Problems."

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# LEGAL INTELLIGENCE.

## British Insulated Cables Ltd. and the Commissioners of Inland Revenue.

IN the House of Lords on November 9th, Lords Buckmaster, Sumner, Wrenbury, Carson and Warrington reserved judgment without hearing the company's counsel in the case the Commissioners of Inland Revenue *v.* British Insulated Cables, Ltd., the question arising in the appeal being in relation to assessments to corporation profits tax made by the Revenue Authorities upon the company, the point for decision being whether the profits of the company were assessible to the tax, or whether they were not so assessible by reason of the fact that the company carry on an electricity undertaking in addition to their other operations and are by their Acts of Parliament under which they carry it on, precluded from charging any price higher than that authorised by their Acts. The Special Income Tax Commissioners decided that in accordance with the provisions of Section 52 of the Finance Act, 1920, they were entirely exempt from this tax, a decision affirmed by Mr. Justice Rowlatt and upheld by the Court of Appeal. So the Revenue Authorities appealed to the House of Lords. The Attorney-General (Sir Thos Inskip, K.C.) and Mr. Reginald Hills submitted that these adverse decisions were wrong and should be reversed, as the electricity undertaking represented only an infinitesimal proportion of the rest of the company's business.

*THE whole of the decorative lighting fixtures for the Empire Theatre, London, were executed to the architect's designs by Metro-Vick Supplies, Ltd. The fixture in the main entrance foyer is a crystal electrolier, 6 ft. in diameter and weighing about half a ton. This fitting has plate glass mirrors arranged round the stem in such a manner that the lights are reflected and thrown in all directions. Other details of electrical interest will be given later.*

During the course of his address for the Crown, Sir Thomas Inskip said during the year 1920 the total sales of electricity amounted to £50 013, of which £8 166 represented sales of electricity to outside consumers, and £41 847 sales to the company's own works. During the same period the total sales of the company (excluding the sales of electrical current) amounted to £5 398 471, so that the proportion of the receipts—over a period from 1920 to 1924—from consumers, including the company itself, to the total sales of the entire business of the company was 1·142%, and a similar proportion of receipts from outside consumers only was 0·24%.

The company were represented by Mr. H. P. Macmillan, K.C., Mr. A. M. Latter, K.C., and Mr. W. Geddes, but they were not heard, Lord Buckmaster, who presided, remarking that in the event of their Lordships desiring to hear them they would be so informed. Judgment was, therefore, accordingly reserved.

## Birmingham District Power and Traction Co.

Mr. Justice Eve, in the Chancery Division on November 5th, confirmed an extension of the objects of the Birmingham District Power and Traction Co., Ltd. Mr. Uthwatt said there was no express power in the company's memorandum dealing with investments, and the proposed alteration was directed towards enabling the company to become an investment company. The company had in fact become an investment company, had £150 000 invested outside, and a large number of its undertakings had been bought up.

## Nuisance by Power Station.

In the Court of Appeal on Tuesday before Lords Justices Scrutton, Lawrence and Sankey, Mr. Arthur Farnworth, a farmer, of Bromyhurst Farm, Barton-upon-Irwell, appealed from the judgment of Mr. Justice Talbot, given at the Assizes, dismissing the action which he brought against the Manchester Corporation for an injunction to restrain the Corporation from so working the Barton power station as to emit sulphur-charged fumes to the damage of the property of the appellant. The Corporation admitted that a nuisance was created but contended that as the station was authorised by Parliament the plaintiff could not succeed in his claim. Mr. Justice Talbot accordingly gave judgment for the Corporation but without costs, and from this result Mr. Farnworth now appealed.

Mr. J. E. Singleton, K.C., for the appellant, said a nuisance had been existing since 1923 and twice the Corporation had raised the height of chimneys at the station twenty feet in order to lessen it. He submitted that no nuisance in fact was authorised by the Corporation's Act authorising the undertaking. It could not be said that Parliament authorised a nuisance to be committed. This sort of nuisance was not contemplated by Parliament. No compensation was given by the Corporation Act for damage of the sort which was being done and it was never intended to take away the rights of other people at the time the generating station was authorised. The case was proceeding when we went to press.

# L.C.C. REGULATIONS.

## Details of New Theatre Regulations Affecting Electrical Interests.

THE Theatres and Music Halls Committee recently submitted to London County Council a report which included proposals for the revision of the statutory regulations with regard to places of public entertainment, and a recommendation that such revised regulations shall come into force on January 1st, 1929. As the Committee states in the report, the proposed new engineering regulations preserve the main features of the existing engineering regulations, varied as necessary to give effect to the Council's special requirements in connection with developments in places of public entertainment. They also embody requirements which have for some years been standardised as conditions of approval of new or extended engineering installations. The only matters of importance to which the Committee considered it is necessary to call attention were the incorporation of the regulations of the Institution of Electrical Engineers (9th edition), and the omission of the " arbitration " clause included in the existing electrical, etc., regulations. A deputation representing the Entertainments Protection Association, the Society of West End Theatre Managers, the Cinematograph Exhibitors' Association of Great Britain and Ireland (London and Home Counties Branch), and the Hotels and Restaurants Association placed its views on the subject before the Regulations Sub-Committee on October 16th. The Council adopted the report and the revised regulations.

The following are amongst the provisions in the new regulations :—The relaxations permitted in the I.E.E. regulations for extra low pressure installations shall not apply to such premises and the I.E.E. regulations for low pressure installations shall be observed in all cases in which the pressure is below medium pressure ; except as provided for in rule 79 (*b*) (regarding protection of textile coverings or decorations), twin twisted flexible cords without protection shall be used only for pendant lights and for portable table lamps ; except as permitted in rule 79 (*a*) (in reference to exhibitions or bazaars to extend over a period not exceeding one month) only the wiring systems described in the following classes in 87 of the I.E.E. regulations shall be used :—Class R (armoured cables), class T 1 (conduits screwed), and class T 2 (metal conduits not screwed) ; switch lampholders shall not be provided ; the regulations shall apply to all resistances and machine control gear on the premises and the exemption for apparatus having a capacity of less than 60 W shall not apply ; pressures exceeding " low pressure " shall not be provided except with the consent of the Council in writing and in accordance with any conditions which may exist in connection with such consent.

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# BUSINESS ITEMS.

PHILIPS Lamps, Ltd., announce that they have opened a new trade counter at 82, Southwark Street, S.E.1.

Mr. A. S. Sayer, electrical engineer, has transferred his business from Merchants' Place to 157, Oxford Road, Reading.

The Newcastle office of the English Electric Co., Ltd., has been removed to Carliol House, Newcastle-on-Tyne, Phone, Central 30334.

A firm of agents in New Zealand wishes to secure the representation of British manufactures of electrical machinery and appliances. Electric lifts and cables are already handled. The Department of Overseas Trade has further particulars. (Reference No. 366.)

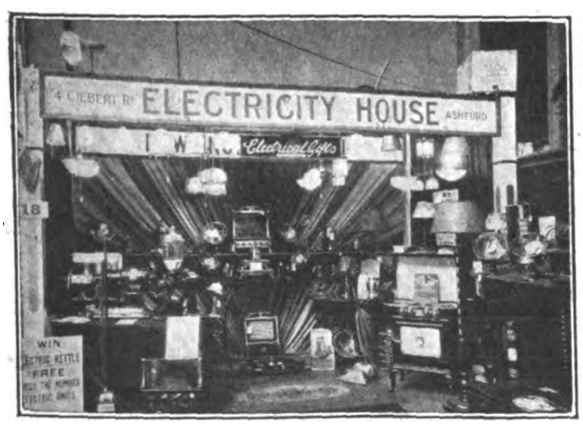
Electrical equipment to operate the machinery at the Manchester Textile Exhibition has been installed in the City Hall, Manchester, by David Rowan and Co., Liverpool. The installation comprises one 100 H.P. 400 V d.c. motor and one 100 kVA, three-phase, 50 period alternator.

A display of domestic electric appliances was recently made by Messrs. Dowling and Primavesi at an exhibition held at Ashford, Kent, and aroused good deal of interest. With the exception of the cooker shown in the foreground of the photograph reproduced below, which is a standard cooker hired by the local corporation, practically the whole of the material exhibited was supplied by the General Electric Co., Ltd.

Siemens Electric Lamps and Supplies, Ltd., announce that the branch offices in the northern area have been moved to 44A, Westgate, Newcastle-on-Tyne (Tele.: Central 6841). The whole of the building is occupied by the company and comprises offices, showroom, trade counter and stores. In addition to stocks of lamps, cables, wires, batteries, telephones, fittings, glassware, accessories, Zed fuse material, Xcel domestic appliances, etc., stocks of all B.R.V.M.A. wireless valves will be carried.

In connection with the Empire Exhibition which was held recently at Cardiff, the E.L.M.A. offered two 12 guinea prizes for the best effect obtained from additional electric lighting of any shop or premises in the central district and the suburban districts of Cardiff, respectively. Mr. J. W. Beauchamp acted as judge, and the central district prize was awarded to R. E. Jones, Ltd., Carlton Restaurant, Queen Street, Cardiff, while the prize for the suburban district was won by Mr. Philip A. Rees, Wellfield Café, Wellfield Road, Cardiff.

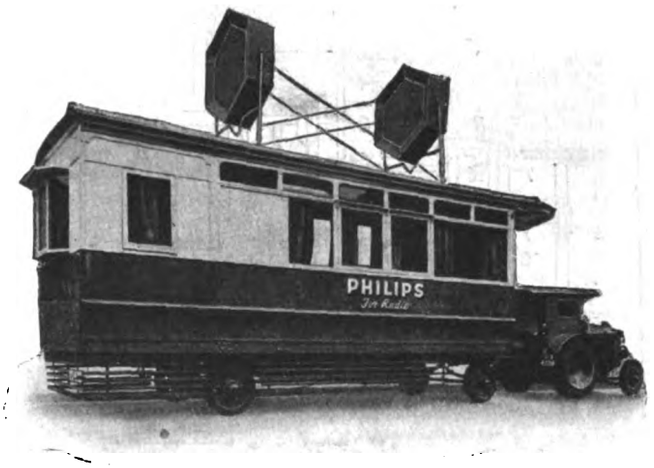
Some time ago Wild-Barfield Electric Furnaces, Ltd., announced that the Robert T. Pollock Co., of New York, had taken over the American patent rights of their furnaces. They now state that they were approached recently by the Hevi-Duty Electric Co., of Milwaukee, who desired to negotiate with them and the Robert T. Pollock Co., with a view to acquiring the sole rights for the United States and Canada. Arrangements have now been made for the Hevi-Duty Electric




**A general view of the exhibit of Messrs. Dowling and Primavesi referred to in the paragraph above.**

Co. to manufacture and sell in the countries named. The first public demonstration of Wild-Barfield furnaces on a large scale was given at the tenth annual metal exposition held at the Commercial Museum, Philadelphia, from October 8th to 10th, inclusive.

For some time past a large blue van bearing the slogan "Philips for Radio" has been touring the southern counties, for the purpose of demonstrating radio to isolated centres and to serve as a travelling trade showroom. The main interior of the van is arranged on the left-hand side with a counter for exhibiting Philips radio products wired for demonstration purposes. Opposite is a settee suitably upholstered in a shade of wedgewood blue, with which the curtains tone, and a carpet on the floor gives a distinctive appearance to the saloon. The entire colour scheme including van and tractor has blue for its motif. The rear portion of the van has been partitioned off and contains bunks for the crew. Beneath the aerial are two




**The Philips radio demonstration van which is now touring the country.**

loud speakers mounted in an angle framework which permits of their being laid flat when not in use. The van lighting installation is operated from the main battery and also from the Fordson electrical system. Storage batteries are fitted in a special well which has been built into the floor of the van and consist of 20 Edison cells, type A.8 designed for a 300 Ah capacity at the 5-hour rate. Charging plant is carried upon a specially designed platform on the tractor. A dynamo is fitted which has an output of 60 A at 40 V at 3 000 r.p.m. A motor alternator operating from 24 V on the input side is directly coupled to an alternator having an output of 220 V at 50 cycles at 3 000 r.p.m., the field excitation being obtained from the 24 V input side. The motor of this set is compound wound, and field regulators are available for maintaining a constant voltage and frequency over a comparatively wide range of battery input voltages. The motor generator is mounted upon a bedplate, the whole being enclosed within a well beneath the floor in a similar manner to the battery container, while a special feature of the machine is that a large number of commutator segments are used in order to keep the slot ripple frequency as high as possible. Both the main and auxiliary (charging) switchboards are enclosed in a cupboard beneath the amplifying equipment. By means of a special synchronising device it is possible to utilise an available a.c. supply to drive the alternator as a synchronous motor, the motor generator set in this case being started up from the motor side, and synchronised with the incoming supply, when the alternator is connected to the mains by means of a switch. Yet another convenience is a special circuit, to permit of the battery being charged if the van is taken to a central station. The three input sources for the "A" amplifier are taken by a small switch panel, and either a microphone or gramophone pick-up can be connected to the "A" amplifier input, or the wireless receiver to the main amplifier input.

## THE BOYS' BALLOT SHOP.

A display of some of the prizes in the John Benn Hostel Ballot is being made at 170, Fleet Street, where on Tuesday afternoon Miss Tallulah Bankhead sold tickets and photographs. The day was a financial record for the new depot, and scores of people anxious to win the saloon car, or one of the many other prizes in the £1 500 list brought their shillings to the famous actress. No time should be wasted in paying a visit to the shop, as very soon the ballot will be closing and all who have not bought tickets will have missed a great opportunity. The personal appearance of other notabilities is being arranged, and in addition to seeing the wonderful prizes you never know whom you may meet there next.

For all who cannot visit the Depot tickets may be obtained 1s. each, 10s. for a book of 11, from the Ballot Organiser, c/o Sir Ernest Benn, Bouverie House, Fleet Street, E.C.4.

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# SELLING LINES.

THE A.E.G. Electric Co., Ltd., has sent us particulars of two new lines which have been introduced. The first is a rental prepayment meter which has been developed to provide for automatic prepayment for supply of electricity in cases where the tariff charge is composed of a fixed charge or rental and a flat rate for energy actually consumed. The meter dial

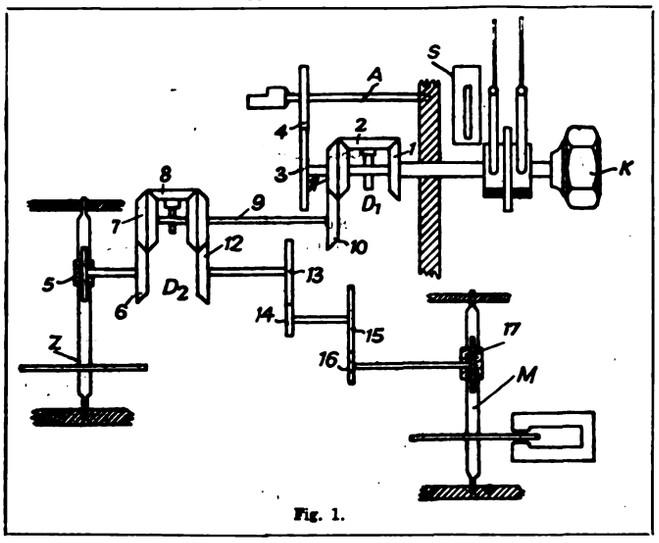


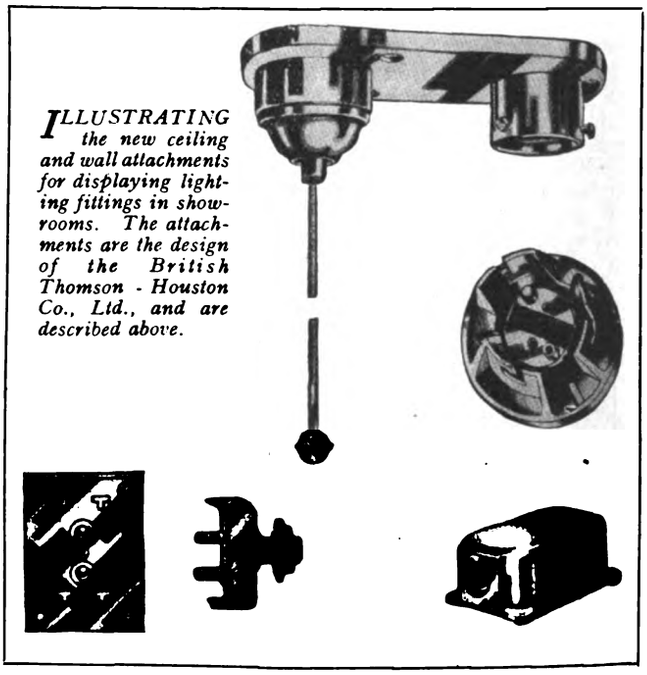

Fig. 1.

is for indicating the actual units consumed, while a dial on the coin mechanism is for indicating the total number of coins which have been inserted. Of the total sums prepaid a certain fixed amount dependent upon the rental to be charged will be automatically absorbed in payment of such fixed charge, and the remainder of such sums would go in payment for the energy consumed.

The meter can be supplied for any desired fixed rental and any desired rate per kWh, and for coin insertion of 1d., 6d., or 1s. Coins can be inserted in advance up to a total of nine coins, and the dial of the coin mechanism indicates at any moment the number of coins which have been paid in advance and not yet used up, either as rental or for energy. When the dial indicates the symbol O, the current is automatically switched off, and cannot be switched on again until another coin has been inserted. If, when the dial indicates O and with the current switched off no coin is inserted, the coin mechanism will continue to rotate, and in due course will show numbers in red, which indicate rental due but not yet paid. If, therefore, the installation is not used at all for a week or two, for instance, if the house is shut up and the consumer away on holiday, on his return the consumer will find on this dial indicated in red figures the number of coins due to be inserted in payment of his liability for rental during the period the installation has been out of use, and no current can be obtained until these arrears have been paid off. After a coin has been inserted in the slot S (see Fig 1), the sun-wheel 1 of the differential gear D1 can be turned by the knob K through an angle corresponding to the value of the coin. By this means the spindle A, the end of which is of a semi-circular shape, is correspondingly turned through the planet-wheel 2 and the pinions 3 and 4. As long as energy is being consumed the meter Z drives a sun-wheel 7 of a second differential gear D2 through worm-wheel 5 and the pinion 6. Planet-wheel 8 of the latter is thereby rotated on the sun-wheel 9 and drives through the pinion 10 the sun-wheel 11 of the first differential gear. By this means the planet-wheel 2 and with it the spindle A is rotated in a direction opposite to the rotation caused by the knob until the circuit is interrupted. The planet-wheel 8 is rotated, not only by the meter Z, but also in the same direction by a Ferraris motor M, running at constant speed, which drives the planet-wheel 8 through the sun-wheel 9 and the pinions 12, 13, 14, 15 and 16 and the worm-wheel 17. The spindle A is therefore rotated at constant speed by the motor M even after the meter is standing still. The speed at which the spindle is rotated is dependent upon the speed of the motor M and the double gear ratio from the worm-wheel 17 to the sun-wheel 9. This additional fixed charge rotation is so adjusted that it represents a predetermined weekly rental. In the course of each 24 hours the rotation will correspond to one-seventh of this weekly rental. When current is passing through the meter Z, the rotation of the meter corresponding to kWh used is added to the constant fixed charge rotation. The ratio between the pinion 6 and the sun-wheel 7 is chosen to correspond with the particular coin intended to be inserted and the tariff rate per kWh. The tariff rate can be altered by changing the gear ratio between the meter Z and the sun-wheel 7. The fixed charge can be adjusted by altering the gear ratio between the motor M and the sun-wheel 9, or by altering the speed of rotation of the Ferraris motor. It is claimed that the meter Z has no "creep" and that, accordingly, its counter indicates true kWh. The additional fixed charge rotation in the coin mechanism is effected not by the meter, but by the Ferraris motor.

The other new device by the A.E.G. Electric Co. is an electrically-operated a.c. time switch of 10 A capacity, and made with single, double and triple poles. The switch is driven by a small totally enclosed motor and is therefore suitable for alternating current only. There is no spring to wind or similar movement. Being synchronous the motor will run at a constant speed dependent on the frequency of the supply, and will not be affected by variations in voltage within very wide ranges. The consumption is 2·5 W. The terminal and apparatus covers can be sealed separately.

The British Thomson-Houston Co., Ltd., has designed special ceiling and wall attachments for the problems associated with the display and demonstration of electric lighting fittings. These attachments make it possible to fix or remove any pendant, ceiling or wall fitting within a comparatively short period of time, thus enabling the entire display of fittings to be taken down for cleaning, re-arrangement, or, when desired, substitution without disturbing any of the wiring or connections. The attachments consist in each case of two interlocking parts, the first of which is permanently fixed and wired at the lighting point, while the second is attached to the ceiling plate or back plate of the fitting. The simple locking together of these two parts enables the fitting to be firmly supported and the lighting circuit completed. The equally simple unlocking of the parts of the device permits a fitting to be taken down without delay and without the removal of screws. The ceiling attachment also offers a solution to the problem of cleaning fittings or replacing



*ILLUSTRATING the new ceiling and wall attachments for displaying lighting fittings in showrooms. The attachments are the design of the British Thomson-Houston Co., Ltd., and are described above.*

lamps in awkward situations in factories, shops, etc. A spare fitting can be kept ready mounted on the detachable portion of the device and fixed in place of the fitting requiring cleaning or other attention, so that no interruption of the lighting need occur.

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The following is an abstract of a letter received by the Mullard Wireless Service Co.:—"I fitted up a friend of mine with one of your h.t. units last January with the usual instructions how to work same. I called recently to "top" the l.t. batteries and discovered the h.t. unit on. I found out that this unit had never been switched off since first installed last January, which means that the DU/2 valve has been giving service for more than 4 300 continuous hours, and is still giving perfect results."

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when ava able.

FARNWORTH URBAN DISTRICT COUNCIL, November 16th.—Supply of l.t. cables. Specifications from Mr. A. J. Hutchinson, Electricity Department, Albert Road, Farnworth, Lancs.

LEEDS GUARDIANS, November 16th.—Supply of electric lamps for period ending March 31st, 1929. Specification, etc., from Mr. J. H. Ford, Clerk to the Guardians, 11, South Parade, Leeds. Stamped, addressed envelope to be sent.

ROCHDALE CORPORATION, November 17th.—Supply and installation of 12 000 kVA three-phase, 32 000/6 400 V transformer, with boosting transformers and necessary switchgear, at the power house, Dane Street, Rochdale. Specification, etc., from Mr. F. H. Rudd, engineer and manager, Electricity Department.

BAKEHOUSE AND SHOP, BALLATER, November 19th.—Electrical work in connection with rebuilding of bakehouse and shop, Golf Road, Ballater. Schedules, etc., from Mr. W. E. Gould, 19, Diamond Street, Aberdeen.

EDINBURGH CORPORATION, November 19th.—Supply of 1 000 kW motor converters for Cowgate sub-station. Specification (No. 95) from Mr. Edwin Seddon, engineer and manager, Electricity Department, Dewar Place, Edinburgh; deposit 10s. 6d.

LONDON COUNTY COUNCIL, November 19th.—Supply of (1) about 5 590 tons of tramway track rails, guard rails and fish-plates (Section A); about 150 tons of bolts and nuts (Section B); and about 450 tons of slot rails (Section C); and (2) about 1 025 tons of conductor tee rails. Specifications, etc., from General Manager, L.C.C. Tramways, Victoria Embankment, W.C.2; deposit £2 in each case (Nos. 1 and 2).

WOOLWICH GUARDIANS, November 19th.—Supply of electric cooking apparatus to the Institution, Plumstead High Street, London, S.E.18. Specification from the Master of the Institution.

WEST RIDING EDUCATION COMMITTEE, November 20th.—Electric lighting installation at Bentley New Middle School. Specifications, etc., from the Education Department, County Hall, Wakefield.

DUNDEE CORPORATION, November 21st.—Supply of l.t paper insulated, lead covered and double steel tape armoured cable, to B.E.S.A. specification, for 660 V working pressure. Specifications from Manager and Engineer, Electricity Department, Dudhope Crescent Road, Dundee.

FULHAM (LONDON) GUARDIANS, November 22nd.—Installation of two electric lifts at the Hospital, St. Dunstan's Road, London, W.6. Specification from the Clerk, 129, Fulham Palace Road, London, W.6. Stamped, addressed envelope to be sent.

GRAVESEND CORPORATION, November 22nd.—Electric light installation at Borough Sanatorium. Particulars from the borough architect, Mr. J. G. Bennett, 5, Woodville Terrace, Gravesend.

UXBRIDGE GUARDIANS, November 22nd.—Installation of electric lift, in connection with erection of new ward block and corridors at the Hillingdon institution. Specification can be inspected at the office of the architects, Messrs. A. S. Snell and Phillips, 9, Bentinck Street, Manchester Square, London, W.1.

PERTH COUNTY EDUCATION AUTHORITY, November 24th.—Electric light installation work in connection with erection of new academy at Perth. Contractors desiring to tender should apply to Mr. A. W. Allison, Education Offices, Perth. Schedules will be issued later; deposit, £2 2s.

BELFAST IMPROVEMENT COMMITTEE, November 27th.—Supply and erection of four motor-driven centrifugal pumps, with automatic switchgear, overhead travelling crane, etc. Specifications from the City Surveyor.

BOLTON GUARDIANS, November 27th.—Conversion of hydraulic lift at Townley's Hospital into an electric lift. Specifications from Mr. J. Ward, 24, Mawdsley Street, Bolton.

METROPOLITAN ASYLUMS BOARD, November 28th.—Electric light installation at St. Anne's Home, Herne Bay. Particulars from Mr. T. Cooper, engineer-in-chief, Victoria Embankment, London, E.C.

CENTRAL ELECTRICITY BOARD, November 30th.—Supply and erection of 33 000 V transformers, in connection with South East England Electricity Scheme, 1927. Specification (No. S.E.E.-S.T.1) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, November 30th.—Extra high tension link kiosk and transformer switch and distribution kiosk (contract 42). Specifications from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

PORTADOWN URBAN DISTRICT COUNCIL, December 1st.—Electric light installation in connection with the reconstruction of the Shambles. Specification may be seen and form of tender obtained at the office of Mr. H. Sewell, town clerk, Town Hall, Portadown.

*A NEW milk boiler by the Electric Heating Co., which offers considerable opportunities for window display as a Christmas gift. It is made in 1 and 2 pint sizes with loadings of 250 and 300 W respectively.*

STOKE-ON-TRENT CORPORATION, December 5th.—Supply and erection of natural draught cooling tower, at central power house, Hanley (Contract 2 833). Specification, etc., from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

STEPNEY (LONDON) GUARDIANS, December 6th.—Electric light installation at Bromley House Institution. Specification, etc., from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1; deposit £1.

HALIFAX CORPORATION, December 7th.—Supply and erection of 6 500 kW M.C.R. turbo-generator and auxiliaries, at Foundry Street generating station, Halifax. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall Street East, Halifax; deposit £2.

HALIFAX CORPORATION, December 7th.—Supply and erection of two water-tube boilers, with superheaters, mechanical stokers, economisers, air heaters, and feed pumps, and steel building for housing same. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall Street East, Halifax; deposit £2.

SURREY COUNTY COUNCIL, December 10th.—Electric wiring and fitting for Brookwood Mental Hospital, Woking. Particulars from the engineer, Mr. E. L. Burne, 28, Victoria Street, Westminster, S.W.1; deposit, £3 3s.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2.; deposit £2 2s.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

EGYPTIAN STATE RAILWAYS.—Electrification of Cairo-Helouan Railways (about 20 miles).

JOHANNESBURG MUNICIPALITY, November 17th.—Supply of electrically-driven pump and motor and automatic starting gear (contract 71). (Reference A.X. 7 055.)

WINNIPEG MUNICIPALITY, November 19th.—Supply of two 10 000 kVA and two 450 kVA generators for Slave Falls, Manitoba. (Reference B.X. 4 791.)

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New Zealand Government, November 20th.—Supply of electric motor driven centrifugal pump. (Reference A.X. 7117.)

Postmaster-General's Department, Melbourne, November 20th.—Supply of relays (schedule C. 367). (Reference B.X. 4 749.)

Cape Town Municipality, November 21st.—Supply of a.c. house service meters. (Reference B.X. 4 809.)

New Zealand Posts and Telegraphs, November 21st.—Supply of 200 lb. of ½ in. bituminous tape. (Reference B.X. 4 737.)

Johannesburg Municipality, November 22nd.—Supply of tramcar axles and gear wheels (Contract No. 67). Reference A.X. 6 985.)

Johannesburg Municipality, November 22nd.—Supply of electric lamps (Contract No. 65). Reference B.X. 4 794.)

Johannesburg Municipality, November 22nd.—Supply of ten miles of copper trolley wire. (Reference A.X. 6 990.)

India Store Department, November 26th.—(1) Supply of steam engine generator sets; and (2) insulated cable, insulators, etc. Specifications (5s. each) from the Director-General, Belvedere Road, London, S E.1.

New Zealand Posts and Telegraphs, November 28th.—Supply of dry cells.

Turkish Railways and Ports Department, November 28th.—Supply at Haidar Pacha of a steam driven, a.c., 600 kW generator. (Reference B.X. 4 842.)

Postmaster-General's Department, Melbourne, November 29th.—Telephone apparatus. (Reference B.X. 4 757.)

Salisbury (Rhodesia) Municipality, November 29th.—Supply of electrically-driven pumping plant. (Reference A.X. 7 089.)

India Store Department, November 30th.—Schedule 1.—66 000 V transmission line equipment. Sechdule 2.—500 kVA, 6 600 V transformers; and 66 000 and 6 000 V outdoor and indoor type switchgear. Schedules (5s. for each) from the Director-General, Belvedere Road, London, S.E.1.

Ixelles Communal Authority, November 30th.—Removal of present turbine and supply and erection of a 5 000 kW, 3 000 r.p.m. turbine (to be connected to existing generator). (Reference B.X. 4 856.)

South Indian Railway Co., Ltd., November 30th.—Supply of l.t. transmission line materials. Specifications, etc. (10s.) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

Egyptian State Railways, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500. Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264, 3/34.)

South African Railways and Harbours, December 6th.—Supply of five four-wheeled electrically-driven traversers and one five-ton hand crane. (Tender No. 1 344.) (Reference A.X. 7 023.)

South African Railways and Harbours, December 6th.—Supply of five ton Diesel electric caterpillar crane (contract 1 350.) (Reference A.X. 7 015.)

Victorian Electricity Commission, December 10th.—Supply etc., of one 65-ton electric overhead travelling crane (specification 28/103). (Reference A.X. 7 116.)

Postmaster-General's Department, Melbourne, December 11th.—Supply of instrument cords (schedule C. 374). (Reference B.X. 4 811.)

Postmaster-General's Department, Melbourne, December 11th.—Supply of telephone generators (schedule C. 375). (Reference B.X. 4 812.)

South African Posts and Telegraphs, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 709.)

South African Railways and Harbours, December 13th.—Supply of seven-ton electrical overhead travelling crane (tender No. 1 347). (Reference A.X. 6 989.)

South African Railways and Harbours, December 13th.—Supply of one electrically-driven, geared, maximum service, double housing planing machine (tender No. 1 356). (Reference A.X. 7 064.)

Victorian Electricity Commission, December 17th.—Supply of metal clad switchgear and accessories (specification 28/69.)

Victorian Electricity Commission, December 17th.—Manufacture and supply of electrically-operated deep dredger, for Yallourn Brown Coal Works (specification 28/94.) Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

Angora Posts, Telegraphs and Telephones, December 18th.—Supply of 50 000 metres of rubber covered field telephone wire. (Reference A.X. 4 849.)

Postmaster-General's Department, Melbourne, December 18th.—Supply of lamps, lamp caps and lamp sockets. Schedule C. 378.) (Reference B.X. 4 819.)

Postmaster-General's Department, Melbourne, December 18th.—Supply of motor generating sets (schedule C. 377). (Reference B.X. 4 810.)

Johannesburg Municipality, December 20th.—Supply of tram tracks and electrical equipment for tramcars (contract No. 80). (Reference A.X. 7113.)

New Zealand Government Railways, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

State Electricity Works, Montevideo, December 22nd—Supply of 15 715 electric meters and spares.

New Zealand Posts and Telegraphs, January 15th.—Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

New Zealand Public Works Department, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

## Tenders Accepted.

Portsmouth Corporation.—Johnson and Phillips, Ltd., supply of cables, £628 5s. (Recommended.)

Chesterfield Corporation.—British Insulated Cables, Ltd., supply and erection of overhead equipment, £5 042.

Postmaster-General's Department, Melbourne.—British Insulated Cables, Ltd., supply of underground and aerial cables, £92 500.

War Office.—General Electric Co., Ltd., supply of Pearl Osram internally frosted gasfilled electric lamps, for use in home service stations.

Stretford Urban District Council.—W. T. Glover and Co., Ltd., new transmission lines from Barton power station to Trafford power station.

Chesterfield Corporation.—British Insulated Cables Ltd., equipment in connection with extension of the railless vehicle service to New Whittington, £5 042 10s.

London County Council.—Metropolitan-Vickers Electrical Co., Ltd., supply of five turbine diaphragms; Electromotors, Ltd., supply of motor generator set and switchgear.

Islington (London) Borough Council.—D.P. Battery Co., Ltd., supply and installation of two lead batteries, for driving two Edison refuse collecting vehicles (Nos. 29 and 30), of 2½ and 3 tons carrying capacity.

General Post Office.—Alton Battery Co., supply of battery plant required in connection with the conversion of the telephone system in Manchester to automatic working. The batteries, exceeding 10 000 Ah capacity, will be the largest in which groups of plates in each cell and between individual cells are interconnected by the special system of bolted joints designed by the Post Office Engineering Department.

Leeds Corporation.—Supply of cables: W. T. Henley's Telegraph Works Co., Ltd., £865; Enfield Cable Works, Ltd., £1 395; Mackintosh Cable Co., Ltd., £1 260; and Greenwich Cable Works, Ltd., £1 581 11s. 3d. Yorkshire Switchgear and Engineering Co., Ltd., supply of four sub-station kiosks, £609. Supply of sub-station switchgear: H. J. Fuller and Sons, £174, less 2½%, and Yorkshire Switchgear and Engineering Co., Ltd., £298 2s. 6d. Ferguson, Pailin, Ltd., switchgear for Kirkstall power station, £74 452.

Glasgow Corporation.—Requirements in connection with reconditioning of 300 tramcars (total cost about £183 125): Electrical equipments, Metropolitan-Vickers Electrical Co., Ltd.; air brakes, Consolidated Brake and Engineering Co., Ltd.; electro magnets, Metropolitan-Vickers Electrical Co., Ltd., and Electro-Mechanical Brake Co., Ltd.; roller bearings, Ransome and Marles Bearing Co., Ltd., and British Rock Bearings, Ltd.; upholstered seats, Bennett Furnishing Co., Ltd. Felten and Guilleaume (per W. F. Dennis and Co.), supply of round trolley wire, £1 106 (lowest tender.) Recommended). An amendment for acceptance of the tender of Frederick Smith and Co. for British wire (£1 262 12s. 6d.) was rejected. Wm. Thomson and Co., Ltd., pulley block with trolley; General Electric Co., Ltd., spare armatures; Joseph Cookson, Ltd., trolley cord; Manchester Armature Repair Co., Ltd., armature coils; Malleable Steel Castings Co., Ltd., gear cases; Titan Trackwork Co., Ltd., and Edgar Allen and Co., Ltd., special trackwork.

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# AFFAIRS AT NEWPORT.

## Brief Details of Report on Working of Electricity Department at Newport.

THE report prepared by Mr. John Adamson, chartered accountant, of McClelland, Ker and Co., who was called in to assist the Reorganisation Sub-Committee on the question of reorganising Newport (Mon.) Corporation departments, contains a number of suggestions bearing upon the Electricity Department, and we give below certain details of the report in so far as it interests the undertaking. It will be remembered that our views of the subject were given in our last issue.

The Electricity and Tramways Department are run as one, though they are virtually two separate departments. There is one general manager and one borough electrical and tramways engineer. The activities of the department are centred at (a) the East power station, (b) the Llanarth Street power station, which is out of date, and is gradually ceasing to generate electricity, and (c) the Town Hall building, in which the general staff is housed. These offices are unsatisfactory, and the difficulties of the department have been further increased by the fact that recently some of the staff have had to be housed in Dock Street in a building temporarily rented for the purpose. The use of the Town Hall building will be discontinued when the new offices are available, and this will simplify matters. The report then deals with the personnel of the department, the salary list being given as £15 866, apart from staffs at the two power stations named above. The relative positions of Mr. N. J. Young, general manager, and Mr. Nichols Moore, borough electrical and tramways engineer, give rise to some difficulty. As nearly as possible it may be said that Mr. Young deals with the traffic end of the tramways and 'bus section, while Mr. Moore deals with the engineering end. The latter also virtually deals with the whole of the Electricity Department. There is also a chief clerk. Any information which the borough electrical and tramways engineer wishes, affecting the clerical side, he seems to obtain from and discuss with the chief clerk and not with the general manager. There is no need for all three. The policy of the department seems never to be sufficiently far-sighted. It is impetuous. The Electricity Department as such is undoubtedly expensive. Every official position which would appear in an undertaking of larger dimensions exists in the present instance. In addition, the general staff is larger than is necessary. There is too much decentralisation.

### The I.M.E.A. Presidency.

While it must be gratifying to the Corporation that their electrical engineer has been appointed to the office of President of the Incorporated Municipal Electrical Association, and also as a member of other Committees, it must be kept in mind that these appointments entail a considerable amount of time. Owing to these meetings and various visits—including two to Switzerland in connection with installation of new machinery—the actual days on which Mr. Moore was away from Newport last year, apart from holidays, represented the equivalent of six or seven weeks.

There are several causes which have militated against a low cost per unit and a cheap current to the consumer. These may be stated as follows :—(1) The delay in closing Llanarth Street as a generating station ; (2) the delay in making the East power station a first-class station. Another feature militating against good results is that for some years the programme of the department has never been a complete one. There has always been capital expenditure in excess of actual requirements and not immediately revenue producing.

One of the difficulties in showing a small cost per unit is due to the large amount of capital expenditure and consequent heavy borrowings by the department. Owing to the various systems of a.c. and d.c. in operation, full benefit has not been received from the money expended. The charge for coal includes a toll of 5d. per ton for shunting and for the right to pass over a certain section of rails. For the last year a considerable quantity of coal purchased has been of a very high class quality, costing from 6d. to 2s. 6d. per ton more than the other bituminous small coals. The class of coal seems too expensive to be used only for boiler purposes. The equipment for handling coal is neither satisfactory nor up-to-date, and in the future it will have to be modernised. One item which appears to account for a certain amount of the increase in the cost per unit is the too frequent opening of roads, it being the custom frequently to run branch connections across the street for one consumer instead of having a cable along one side of the street when there are sufficient consumers or possible consumers to justify such a course. The programme at present seems to be mapped out for a day whereas it should be mapped for at least a week ahead. The showroom should be self-contained. It should carry all its own stock (including radiators), and presumably will have accommodation for this when it is transferred to the new premises where there is also a good basement. It should be treated as a separate trading entity, and should be charged with all its purchases and the cost of repair work carried out by the works on its behalf. It should be credited with all sales, and the entries between the showroom and the stores for requisitioning stock will therefore disappear. It should do all its own book-keeping, including the invoicing to customers and the collection of all accounts. It should submit monthly an estimated trading account showing sales, purchases, estimated stock on hand and estimated profit for month.

Part of the criticism and some of the recommendations applicable to the Electricity Department also apply to the Tramways Department. There are one or two separate points in connection with the latter which, however, call for special attention. It does not appear that either the general manager or his traffic superintendent spend sufficient time on the routes or at the power station. The question of whether the tramways and 'buses can be made to pay in the future is a difficult one. But for the large amount of capital involved, £229 000 of which represents borrowed money at March 31st, 1928, less sinking fund provision, Mr. Adamson would have recommended the scrapping of the tramway system. On each of his visits the whole of the tramway section of the East power station gave the impression that there was a lack of supervision.

At the Council meeting on November 5th it was decided, on the motion of Coun. F. J. Humphries, to defer a decision on the matter, pending its discussion by the Committees affected.

# FACTORY LIGHTING.

## Progress of the Factory and Workshops Lighting Campaign.

THE latest report issued by the E.D.A. with respect to the Factory and Workshops Lighting Campaign indicates that 111 lecture demonstrations to industrial consumers in all parts of the country have been or are being organised, 51 having been held. The towns covered by these lectures include Amersham, Abertillery, Aylesbury, Bath, Bedford, Berwick-on-Tweed, Birkenhead, Birmingham, Blackburn, Blackpool, Blyth, Bolton, Bournemouth, Bristol, Burnley, Burton-on-Trent, Cambridge, Carlisle, Cardiff, Colchester, Coventry, Croydon, Derby, Dundee, Edinburgh, Farnworth, Chester, Falkirk, Bingley, Gainsborough, Glasgow, Gloucester, Greenock, Hackney, Halifax, Hebden Bridge, Hereford, Harrogate, Hull, Huddersfield, Kilmarnock, Kidderminster, Lancaster, Leeds, Leicester, Leigh (Lancs), Lincoln, Liverpool, London, Manchester, Middlesbrough, Middleton, Motherwell, Newcastle, Nottingham, Newport, Norwich, Oldham, North Shields, Paisley, Portsmouth, Preston, Radcliffe, Ramsbottom, Rawtenstall, Redcar, Rotherham, Scunthorpe, Sheffield, South Shields, Stoke-on-Trent, Stourbridge, Sunderland, Swansea, Tamworth, Tipton, Trowbridge, Warrington, Wakefield, West Hartlepool, Whitley Bay and York.

Lectures have been arranged at the following places at the dates given :—November 16th, Newcastle and Birmingham ; November 19th, West Hartlepool ; November 20th, Dundee and South Shields ; November 21st and 22nd, Tipton ; November 22nd, Manchester and Birmingham ; November 23rd, Sunderland ; November 24th, Cardiff ; November 27th, Chester ; November 29th, Ramsbottom, Carlisle and Birmingham ; December 6th, Birmingham ; December 18th, Edinburgh.

The lecture-demonstration on November 22nd, arranged by the Manchester E.D.A. Electric Circle, will be held in the new switchgear works of the Metropolitan-Vickers Electrical Co., at 4.30 p.m. 6 000 invitation tickets are being circulated.

The attendances at the lectures generally have been very satisfactory ; 162 people were present at the lecture given at the Motherwell Town Hall on October 25th, a large number of influential residents, including the Provost and Lord and Lady Selhaven, being present. The Association is receiving daily much evidence of considerable business arising out of the lectures and the direct mail propaganda. A number of E.D.A. Circles are carrying out trial installations in works.



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# ELECTRICITY SUPPLY.

## Sheffield Mains Extensions—Scarborough's Plant Additions—Electricity Supersedes Gas for Maidstone Street Lighting—Big Consumers at Stretford—Hydro-Electric Scheme for Galloway District—Harnessing the Wash.

HASTINGS Electricity Committee has obtained sanction for a loan of £10 000 for meters.

Oldham Electricity Committee seeks an Order to supply electricity to premises in the parish of Alt.

Gillingham (Kent) T.C. has applied for a loan of £10 000 for mains and £500 for consumers' domestic apparatus.

Sheffield Corporation has received the formal sanction of the Electricity Commissioners to a loan of £500 000 in respect of distributing mains.

Manchester Cleansing Committee has asked the electrical engineer to prepare a specification in regard to the electrical installation at the Oldham Road depot.

A motion for the division of the Liverpool Tramways and Electric Power and Lighting Committee into two separate committees, was rejected by the Council last Friday.

The Electricity Commissioners have granted a Special Order applied for by Brighton Corporation in respect of electric lighting for Telscombe, the maximum price of current to be 8d. per kWh.

Oldham Electricity Committee is to seek sanction for a loan of £70 000, the estimated cost of the tie and inter-connecting mains between the new generating station and the existing e.h.t. distribution system.

The Surveyor to Finchley U.D.C. estimates that a capital expenditure of £5 000 will be necessary in connection with the provision of further lighting on sections of the North Circular and Barnet bye-pass roads.

At a meeting of Scarborough T.C. last Friday, the mayor (Mr. Abraham Moore) announced that sanction had been received from the Electricity Commissioners for the borrowing of £50 000 for the extension of the present generating station.

Maidstone T.C. has decided that all street lamps in the borough shall be lighted electrically, and that the present agreement with the Gas Company be terminated. The charge to be made for electricity will be the same as that now made by the Gas Company.

Leeds Electricity Committee is to seek sanction to borrow £400 000 for mains and £50 000 for sub-station equipment. The Committee has obtained sanction to borrow £50 000 for buildings and works at Kirkstall power station, £150 000 for plant and £35 000 for the assisted wiring scheme.

Plymouth Electricity Committee has asked the Electrical Engineer to prepare for consideration proposals for the adoption of a flat rate for lighting and power, with a view to the simplification of the scale of charges.—The Committee has authorised cable extensions at a cost of £3 800.

Stretford Electricity Committee reports that Charles Bingham Industrial Gases (England), Ltd., are coming on to the Council's supply, with a probable consumption of 1 000 000 kWh per annum, and that there is a probability of an agreement with the Southern Oil Co. for the consumption of about 2 750 000 kWh per annum.

Leyton T.C. has approved a schedule submitted by the Borough Electrical Engineer for improving the existing lighting in 41 side roads, at an estimated cost of £764. The Council has authorised the Engineer to experiment with various types of reflectors and the replacement of old lamps by lamps of increased power.

Penmaenmawr Council has adopted a scheme for house-wiring installations, including plain lamps and shades. The payments, spread over ten years, range from 2s. 0¾d. per quarter for three lights to 5s. 6d. per quarter for eight lights. The Council is not responsible for maintenance. The charge for current for lighting is 8d. per kWh.

In view of the attitude of West Lancashire R.D.C. on the question of electricity supply for the parish of Aughton, and its determination to proceed with the Order for a supply, Aughton Parochial Council has placed on record its strong disapproval of the action of the Council in proceeding with such Order, which, in the opinion of this committee, is not in the best interests of the parish, and has declined to act in its present unsatisfactory capacity as a parochial committee any longer.

Rotherham Electricity Committee is to discuss with the Yorkshire Electric Power Co. the question of the provision of supplies to the Moorgate and Herringthorpe districts, which are outside the Corporation supply area.—The Town Clerk and Electrical Engineer have reported upon an interview with the Electricity Commissioners with regard to the proposed pumping scheme of condensing water, *via* the river and canal, and it has been decided to seek sanction for a loan of £15 000 for the scheme.

In the Hungarian Chamber last week the Minister of Commerce, M. Hermann, said the establishment of the Talbot central power house brought the electrification of the Budapest-Vienna railway line into the stage of realisation, and this was of world significance. The loan for the establishment of the power house was granted on condition that work was given to British industry. Only such orders were placed in Great Britain as must in any case be placed abroad. Negotiations were now proceeding on the question of whether the plant in whole or part, in accordance with the fixed quota, should be obtained from Great Britain.

A syndicate has been formed to establish a hydro-electric power undertaking for the Galloway district of South-West Scotland. A Bill is being promoted to authorise the scheme, which will involve a capital expenditure of several millions. It is stated that the undertaking will include five power stations. The River Dee will be the principal waterway to be harnessed, but all the lochs, including Loch Doon (famous as the retreat of King Robert the Bruce), and tributaries are to be utilised. This will involve miles of tunnelling and the construction of immense dams and reservoirs, while a few lochs are to be raised in level. The current generated will be at the disposal of the Central Electricity Board.

The balance sheet of the Shannon Electricity scheme to March 31st, 1928, shows that out of the estimated total of £5 200 000, just over two and a-half millions has been expended, and appropriations have provided a further £600 000. The main works at Ardnacrusha and O'Brien's Bridge absorbed nearly £900 000 during the past year, against £300 000 up to 1926-27, and the distribution system took over half a million, against nearly £600 000. The Irish Free State Electricity Supply Board is carrying on propaganda to habituate people to the idea of the use of electricity. The Ministry for Agriculture favours the establishment of an experimental farm to demonstrate how readily electricity can be utilised in saving labour in husbandry.

Reporting to Brighton Corporation on a visit paid to Paris with Coun. Galliers with the object of reporting as to the best means of obtaining a decorative effect in the lighting of the Aquarium, Mr. D. Edwards, borough engineer, states that whilst there are important firms in England who specialise in this class of work and who have recently introduced more modern and artistic effects in lighting in a few public places in London, the French, particularly in Paris, have for many years been foremost in this direction. The main issue is really the production and utilisation of decorative glass, in a variety of designs. He has supplied several firms with sketch ideas, and asked them to let him have designs and estimates, and he hopes to submit schemes to the Corporation at an early date.

A scheme for harnessing the Wash and providing hydro-electric power for the whole of Southern England was brought before a crowded public meeting at Hunstanton Town Hall on Saturday by Mr. Leonard Weaver and other engineers, representing the Dynamic Electric Co., Ltd. The scheme is to run an embankment from Gore Point, Holme, on the Norfolk Coast, out to sea in a north-westerly direction for about eight miles, sweeping round to the west and south till it reaches the coast again up the Wash near Snettisham, and enclosing about 35 000 acres, and impounding the waters over that area at a level which would never be lower than two feet below the ordinary high tide, and to construct a further basin of a lower level extending as far as Wolferton to take the water running through the turbines. It is estimated that with 15 ft. fall of tide 105 000 kWh of electricity can be produced per hour, at a cost of about 1d. per 12 kWh. Mr. Weaver said the machinery would practically cost nothing to work, for the sluice gates would automatically open and close with the tides. The work was estimated to cost £4 600 000.

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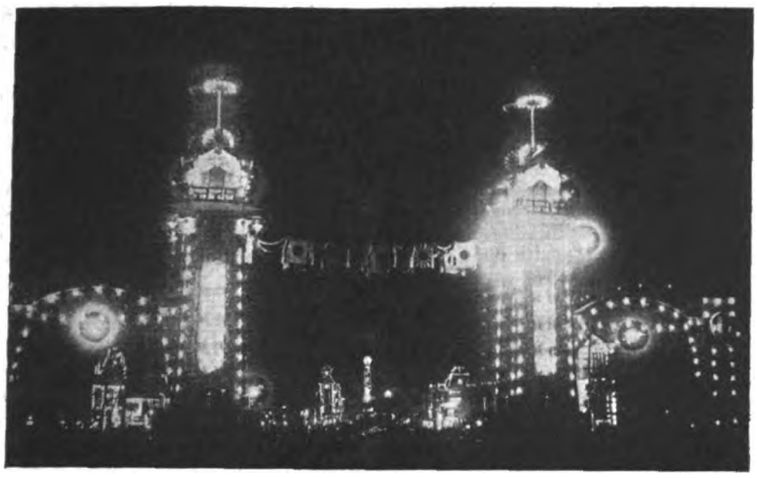
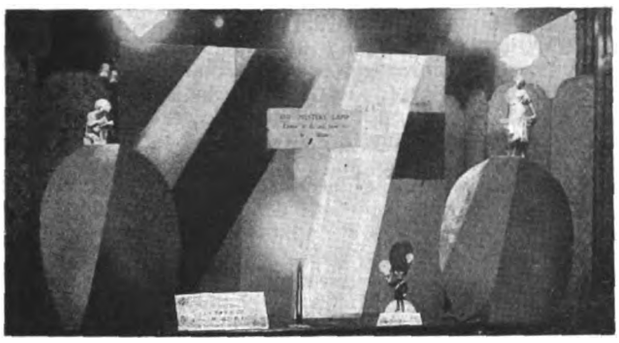
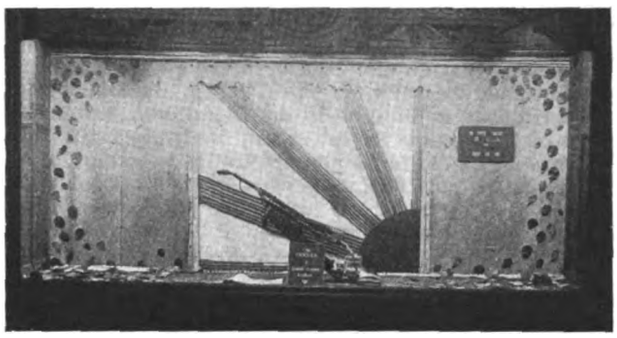
## ELECTRICAL PICTURES.



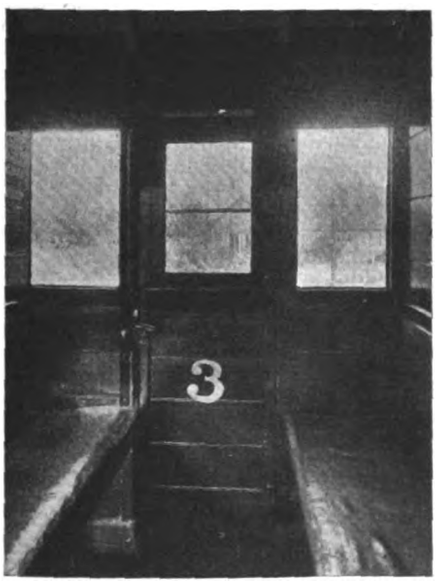
An example of the elaborate illuminations now in progress in Japan in connection with the Coronation. Streets, public buildings, tramcars, etc., are all tastefully decorated with flags and festoons of electric fairy lamps. The celebrations will conclude during next week.

L'Arc de Triomphe, Paris, beneath which is the tomb of France's Unknown Soldier, illuminated during the Armistice celebrations. Public buildings were also illuminated.





Futurist colours arranged in curious shapes were a feature of a recent display in the window of the Bradford Electricity Showrooms. This was literally a mystery window, and is seen in the left-hand photograph. A lighted lamp glowed on the top of a glass support with the lamp plug, without connections, pointing upwards. A showcard stated that electricity transmitted by wireless was a dream of the future but cables were a reality. "Why not use them?" the spectator was asked. An invitation was given to anyone interested to come inside and ascertain how the lamp was lighted. Another window of the same undertaking is shown on the right, featuring a Hoover sweeper. In view of the American Presidential election use was made of a showcard with the words "Mr. Hoover 'sweeps' the U.S.A.—Let the Hoover sweep for you."



The London "Underground" Company marked the occasion of the Diamond Jubilee of the District Railway by introducing a new train. Its introduction took the form of an exhibition of types of rolling stock which have been used on the railway since 1868. The exhibit was shown at South Kensington station for a week commencing November 5th, and we show in the left-hand picture an interior view of a third-class compartment of a passenger train in 1868, with the same view of a coach first put into use in 1920. The exhibition was made up, in addition to the examples illustrated, of a steam locomotive of 1868, a "Southend" electric locomotive (1905), all-wood and all-steel electric cars (1905 and 1920 respectively) and the latest type of electric car.

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# PATENT REFORM.

## Report of Committee Appointed to Consider British Patent System.

CONSIDERABLE alterations in the existing methods of granting and maintaining patents are recommended in the report, issued last week, of the committee appointed by the British Science Guild last year to consider the reform of the British patent system. The committee recommends: The issue of short-term patents, promptly and cheaply, for "new and useful variations" which are not qualified for a full-term patent. A restricted Empire patent for Great Britain, the Colonies, and the Protectorates, to which India and the Dominions might become parties if they wished. Extensions of definition with regard to the "subject matter" of patent applications. Wider investigation for novelty, to give British patents an equal status with those of Germany and America, and a speeding up of Patent Office business.

The report points out that, although the yearly specifications have increased since 1912 by 26·2%, the examining staff is now smaller by 9·9%. It is urged that, whatever increased expenditure is incurred by these reforms, the Patent Office is at present contributing a yearly surplus to the national revenue, and that this surplus constitutes a tax on invention, contrary to the purpose of the patent system.

On the methods of the Patent Office the report comments to the effect that the delay occurring before the taking of the first official action on a complete specification may in some cases involve financial loss for the applicant, and the importance of the prompt dispatch of Patent Office business is emphasised. The maximum term for the British short-term patent, it is suggested, should be seven years. The provision of a less expensive tribunal, in addition to the High Court, to enforce the rights of patentees is recommended. It is suggested that the Comptroller should be empowered to act as a court, subject to a definite limit of damages and the consent of both parties, and that appeals from his decision should be heard by a special judge in chambers, instead of the Law Officers of the Crown. The question of fees was considered by the committee and they are of the opinion that the present is not the time to ask for reduction.

# THE NATIONAL REGISTER.

## Large Number of Contractors' Applications Under Investigation.

FURTHER evidence of the continued progress of the National Register of Electrical Installation Contractors is furnished by the statement of the secretary, Mr. T. Trimnell, to a representative of THE ELECTRICIAN, that between 40 and 50 applications from electrical contractors desirous of having their names added to the National Register are now in course of investigation. As these applications are considered individually by the Local Advisory Committees, as well as by the Registration Board in London, it is not always possible for applications to be accepted during the month in which the application is made. This delay, which is inevitable if insufficiently qualified candidates are to be excluded, is responsible for the small number of applications accepted at the meeting of the Executive Committee held on November 9th.

The names of the seven contractors added to the Register at this meeting are: Burden, John, and Son, Swan Street, Alcester; Dome Electric Co., 150, Stretford Road, Manchester; Fisher, Cecil C., 18, Bridewell Alley, Norwich; James Bros., The Parade, Trowbridge; Southwood, John T., 49, Tavistock Place, Plymouth; Thorpe and Bosco, Ltd., 38, Broad Street, Golden Square, London, W.1; Woodgate and Elsworth, Ltd., Summerhill, High Halden, Kent.

In view of the large number of applications now under consideration it is anticipated that the December list will be larger than usual.

Already the advertisements of the National Register, which now appear regularly in the electrical Press are bringing many inquiries, not only from potential candidates for registration, but also from borough electrical engineers and others responsible for the placing of contracts for installation work.

It is also understood that Registered Contractors in many parts of the country are keenly interested in the proposal of the National Register to supply them at cost with localised lists of Registered Contractors, with appropriate wording, suitable either for distribution in leaflet form or for co-operative advertising in local newspapers.

# ELECTRIC TRACTION.

## New Equipment for Glasgow Tramways—Large Order for Metropolitan-Vickers.

AN important order for tramway equipment, probably the largest ever placed by a British undertaking, has been placed by the Glasgow Corporation with the Metropolitan-Vickers Electrical Co., Ltd. It covers the supply of electrical equipments for 300 tramcars which are being reconstructed. Faced with omnibus competition, Glasgow Tramways Committee, acting on the recommendation of Mr. L. Mackinnon (general manager of the undertaking) has, during the last few years been engaged upon an extensive scheme of improvement, of which this re-equipment is a part. Recent developments include the provision of a large number of complete new cars, which are now being put into service. Eighty of these cars are fully equipped, and a further twenty partially equipped, with Metropolitan-Vickers apparatus similar to that covered by the new contract. The new equipments will include motors of the light-weight box frame type, with a nominal rating of 50 H.P. 500 V, 910 r.p.m. They have full load efficiency through gearing of 85%, and exert a tractive effort at full load of 1 220 lb. per motor. The acceleration given on a car on the level is 3 ft. per second. The motor frame is of soft steel of high permeability, cast in a single piece, and arranged for bar suspension, the projections of the frame to which the axle caps are bolted extending over the axle, relieving to a large extent the axle cap bolts of the weight of the motor. Ventilation is obtained by a malleable iron fan, cast in one piece and mounted on the armature shaft so that two parallel streams of air are drawn respectively over the commutator, and through the air gap and axially through the commutator bush and the core of the armature. The armature bearings are of the roller type, and require lubricating only once in two or three months. It is of interest to note that in a recent inspection of the roller bearings of Metro-Vick motors on the Glasgow Corporation Tramway system were found to be almost entirely free from wear, though the motors were reported to have done about 100 000 miles. The new order will bring the total of motors supplied by this company for the Glasgow tramways to well over three thousand. The controllers for the new equipments are to be of the Metropolitan-Vickers cam-operated contactor type in which all the current rupturing is done by contactors mounted in a horizontal group and operated by cams on a horizontal shaft, which is driven by means of cut-steel bevel gears from the main controller handle. Power and brake connections are made, without arcing, by a quadrant which is arranged horizontally below the contactors, and driven from the cam shaft.

A Reuter's message states that the Pennsylvania Railroad intends to electrify 1 300 miles of lines between New York and Wilmington at a cost of £20 000 000.

Darlington Corporation is applying to the Minister of Transport for a Provisional Order to authorise additional routes for trolley vehicles in the borough, etc. Any objections must be sent to the Ministry of Transport by January 15th.

# A "UTILITY FRAME."

## A Device Whereby an Electric Iron Can Be used as a Hotplate.

WE have received from the South Shields Electricity Department, blue prints of a specially designed utility frame which is so arranged that an electric iron can be inserted in the cradle in an inverted position so as to form a hotplate for cooking or boiling purposes. The frame can also be made with a guard in circular form so that the iron can operate with a tier of pans. We understand that actual tests with the device resulted in a 4½ lb. joint being cooked in a roasting tin at a charge slightly under 1d. at 1d. per kWh. We are informed that an independent test consisting of the cooking of two chops and three sausages weighing 1¼ lbs., resulted in a meter charge of ½d. In order to use the iron for the purpose of cooking, an asbestos pad is placed on the face of the appliance by way of preventing the food from burning. At an endurance test, an iron was switched on for 13 consecutive hours without damage, meanwhile heating the contents of a two-gallon pail. The iron used for the test is still in service and is seemingly in as good order as before. We understand that the apparatus is provisionally protected, and final patents are expected to be completed at an early date, when it is hoped to place the device on the market forthwith.

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# COMPANY NEWS.

## Quiet Electrical Share Market—Further Rise of Marconis—Callender's Share and Investment Trust's Increased Dividend—Cape Electric Tramways' Growing Traffic—Electrical Manufacturers' Combine—Directors' Reports.

THE market for electrical shares—lighting and power supply, transportation, telegraph and manufacturing—has been quiet during the past week, and few changes are shown by our contrast of quotations. An active spot has been provided by Marconi's Wireless ordinary, which, as the result of buying, have risen a further half-crown to 78s. 9d. Underground Electric Railways ordinary shares at 27s. are 1s. up, as also are County of London Electric Supply shares at 44s. Ever Ready shares are 6d. to the good, but Siemens have eased off a little.

| Last Annl. Divd. % | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord.. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 44/- | 43/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 44/4½ | 45/- | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | ,, ,, Elec. Sup. Ord. .. | 27/6 | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P... .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B. Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 37/- | 37/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk... | 126 | 125 | 152½ | 24 |
| 6 | ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb... .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb... | 77½ | 77½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk... | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb... | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 60½ | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 69 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 65 | 65 | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79 | 79 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 80½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/- | 26/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 62 | 62 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P... | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb | 103 | 103 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P... .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref... | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf | 19/- | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 29/6 | 29/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord... .. .. | 42/- | 42/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 30/-† | 35/- | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/1½ | 28/9 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25/- | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 255½ | 257 | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 78½* | 80½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 28½ | 28½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 78/9 | 76/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 55/- | 55/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7½d. per share. (*b*) £8 8s. 6·66 per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
* Ex dividend. † Ex rights. ‡ Including 1s. bonus.

JOHNSON AND PHILLIPS, LTD.—Intm. div. of 5% actual less tax, on ord. shs. (same rate as last year) is announced.

DUBILIER CONDENSER CO. (1925), LTD.—Usual half-yearly div. on 7½% cum. pref. shs. will be payable on November 30.

CAWNPORE ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. of 3% on ord. shs. (same rate as last year) will be payable on November 23rd.

MADRAS ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. on ord. shs., of 2½%, tax free (same rate as last year) will be payable on November 24.

BRITISH ELECTRIC TRACTION CO., LTD.—Intm. div. 3% on 6% cum. participating pref. stk. and 4% on 8% non-cum. pfd. ord. stk., payable on December 15th.

JAMES BOOTH AND CO. (1915), LTD.—During the present week this co. (manufacturers of Duralumin wire, etc.) invited subscriptions for 160 000 7% cum. pref. shs. of £1 each, at par.

AMAZON TELEGRAPH CO., LTD.—Gross rev. for year ended June 30th, 1928, £56 680; working exes. £35 968. After providing £304 for income tax, and £5 098 for deb. int., placing £17 782 to snkg. fd. and bringing in blce. of £3 412 from last year, £940 is carried fwd.

CALLENDER'S SHARE AND INVESTMENT TRUST, LTD.—Rev. from all sources for year ended August 31st, 1928, £35 156; net pft. £27 681 (agst. £18 841). To res. £500. Div. at rate of 15%, less tax (agst. 10%) including intm. div. of 1s.p. sh., less tax, paid on April 27th; leaving £7 332, plus £21 778 brt. in. Fwd. £29 110.

A. J. STEVENS AND CO. (1914), LTD.—Loss for year ended August 31st, 1928, £47 409. Directors propose to pay full year's div. on £200 000 pref. cap., requiring £12 000. Last year net pft. was £17 287, and carry fwd. £15 728, reducing the loss to £31 677. Since August 31st the directors have disposed of the radio department.

CANADIAN POWER COMPANIES' AMALGAMATION.—An amalgamtn. of the Northern Canadian Power Co. and Northern Ontario Land and Power Co. has been agreed upon between the directors. A meeting of shldrs. will be held in Montreal on Dec. 10. These companies are subsidiaries of Canada Northern Power Corporation, which owns over 90% of the outstandg. common stk. in each case. The amalgamtn. plans provide for the formatn. of a new co., the Northern Ontario Power Co., with a cap. of 25 000 shs. ($100 par) of 6% cum. pf. stk. and 500 000 shs. of no par value common stk. and the exchange of securities of the new co. for those of the amalgamatg. co. on the basis of one sh. of pf. for each pf. sh. held and two shs. of no par common for each share of common now held by stkhldrs. of Northern Ontario Light and Power Co. and three shs. of common stk. in the new co. for each two shs. of Northern Canada Power stk. outstandg.

CAPE ELECTRIC TRAMWAYS, LTD.—Pft. for year ended June 30, 1928, £38 347, agst. £70 210; and after provisn. for deb. int. and redemptn. of debs. and addg. blce. brt. in, blce. carried fwd. is £38 625. To res. £10 000, leavg. £28 625. Motor bus competitn. has become more acute, and has brt. about serious losses. Certn. regulatns. have been promulgated, but until they are adequately enforced the board consider it inadvisable to make any distributn. by way of div. During year tramways carried 30 803 751 passengers, with gross receipts £315 431, against 23 532 080 passengers and gross receipts £388 378 in 1926-27. Co.'s motor-buses in Cape Town also carried 10 689 580 passengers, with gross receipts of £122 639, as against 3 179,585 passengers, with gross receipts of £43 008. In spite of fact that combined tramway and motor-bus services show an increase of 5 791 666 passengers, and an increase of £6 683 in receipts, reduction in fares, with increased expenditure, to meet motor-bus competition, have made serious inroads into the profits.

### Electrical Manufacturers' Combine.

Particulars are given in the "Financial Times" of the terms upon which the Metropolitan-Vickers Electrical Co., Ltd., is acquiring the control of the British Thomson-Houston Co., Ltd., the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd.

The terms on which the shares acquired and to be acquired are based are as follows:—The Metropolitan-Vickers Co. is acquiring 1 920 000 fully-paid £1 ord. shs. of the British Thomson-Houston

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Co., Ltd., out of a total issue of 2 000 000, ranking for dividend as from January 1st last, in consideration for £1 152 000 payable in ordinary shares at par ranking for dividend as from January 1st, 1929, or at the rate of 12s. per share; 887 214 4s. ordinary, fully paid, in the Edison Swan Electric Co., Ltd. (out of a total issue of 957 177), ranking for dividend as from July 1st, 1927; 59 637 £1 7% cum. part. pref., fully paid, in Ferguson, Pailin, Ltd. (out of a total issue of 60 000), ranking for dividend as from January 1st, 1928; and 89 730 £1 ordinary, fully paid (out of a total issue of 90 000), ranking for dividend as from January 1st, 1928, for a sum of £969 186, payable in cash.

In order to provide the last portion of the purchase consideration and for additional working capital the directors have decided to issue a further 1 136 950 £1 ordinary shares at a premium of 5s. per share. The new shares, which will rank for dividend as from January 1st next, will be offered to existing ordinary shareholders in the proportion of one new share for every share held, provided the terms of the offer are complied with on or before December 3rd next. The whole of the issue has been underwritten for a commission of 7½d. per share.

An offer will be made to acquire the remaining 80 000 British Thomson-Houston ordinary shares on the same terms as those acquired, and if accepted in full will entail the issue of a further £48 000 of ordinary shares, making the total issued ordinary capital £3 498 900.

It is further proposed to convert the whole of the existing 500 000 1s. deferred shares into 25 000 fully paid £1 ordinary shares, and voting rights are to be modified so that all shareholders will be entitled to one vote for every share irrespective of class. It is also proposed to increase the number of the directors from 11 to 15 to enable Mr. W. C. Lusk and Mr. Norman B. Dickson to join the Board. Sir Philip Nash will join the Board of the British Thomson-Houston Co.

The agreement provides for the cash payment of £969 186 and the issue of 1 152 000 £1 ordinary shares of the Metropolitan-Vickers Co., ranking for dividend as from January 1st next. In view of its enlarged activities, it is proposed to alter the name of the company. In order to preserve goodwill, it is intended to carry on the business through an existing subsidiary under the proposed title of Metro-Vick Electrical Products. While the identities of the four companies are being preserved, it is intended that they should actively co-operate under the general guidance of a central Board. Reduction in manufacturing costs as a result of economies and co-ordination is expected to place the company in a better position to meet foreign competition, both at home and abroad, thus enlarging its turnover and offering increased employment in its workshops.

## Company Meeting.

ATLAS LIGHT AND POWER CO., LTD.—Sir George A. Touche presiding at the general meeting on November 8th, said they were reaching a position of some size and importance in the realm of electrical investment. They now held controlling interests in nine companies operating in South America—seven in the Argentine Republic and two in Uruguay. The general situation in those two countries had shown undoubted improvement. The electricity supply business throughout South America was attracting much attention. The growth in demand for electrical energy and the fact that if they did not defend their interests in the districts which they served others were prompt to intervene made it necessary to maintain a progressive policy. The Santa Fe area was the field of their most recent and considerable extensions and expenditure. As to their business in that city, they had again to report a record in gross receipts and net profits, after provision for depreciation in both the electricity supply and the tramway departments. In the city of Parana they now held the whole of the capital of the companies operating the light and power supply services and tramways. The business in Parana continued to make good progress. In Cordoba the results of the operations of their tramway business during the year constituted a fresh record in gross receipts and net profits. In the light and power department also they were able to report a record in the gross and net profits. Their tramways business in Montevideo continued to be affected adversely by motor-omnibus competition. Unfortunately, the municipality had encouraged competition rather than co-operation. In time a better order of things would be evolved, and this company would do everything in its power to hasten its arrival. In Tucuman the results of last year's operations showed a decided improvement. After making provision for depreciation and other charges, the revenue brought into the Atlas accounts from subsidiary companies and other sources was £484 328, an increase of practically £101 000. An interim dividend of 2% had been paid on the Ordinary shares, and the directors recommend the payment of a final dividend of 3%, making 5% for the year. The report and accounts were adopted.

### LEAD MARKET REPORT.

James Forster and Co. announce that the lead market last week was consistently weak.

Closing prices on November 9th were £21 1s. 3d. for November, £21 3s. 9d. for December, £21 5s. for January, and £21 6s. 3d. for February, a fall of 13s. 9d. to 7s. 6d. on the week according to position.

## Coming Events.

**Friday, November 16th.**

ENGINEERING AND SCIENTIFIC CLUB (WOLVERHAMPTON).—Annual dinner.

INSTITUTION OF ELECTRICAL ENGINEERS (STUDENTS' SECTION OF THE NORTH-WESTERN CENTRE).—Engineers' Club, Albert Square, Manchester. Lecture by Dr. S. P. Smith on "Ignition Systems in Automobiles." 7.15 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—Welfare Hall, Renfrew. Lecture to the Babcock and Wilcox Staff Association, on "Principles of Good Lighting." 7.30 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Paper by Mr. A. H. Croucher on "Some Applications of Time and Remote Control Switches." 7.30 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Modern Lighting Designs for Domestic and Business Interiors." 7.30 *p.m.*

**Saturday, November 17th.**

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (WESTERN SUB-BRANCH).—60, Wind Street, Swansea. Paper on "Cable Layout," by Mr. J. A. B. Horsley.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS.—Visit to Tooting Bec Hospital, Metropolitan Asylums Board, to inspect the heating and hot water services. Meet outside Trinity Road Underground Station. 2.15 *p.m.*

**Monday, November 19th.**

INSTITUTION OF ELECTRICAL ENGINEERS (MERSEY AND NORTH WALES-LIVERPOOL-CENTRE).—Laboratories of Applied Electricity, The University, Liverpool. Paper by Prof. G. E. Scholes on "Combustion." 7 *p.m.*

ROYAL SOCIETY OF ARTS.—John Street, Adelphi, London. Cantor Lecture II by Dr. Franklin Kidd on "Refrigeration." 8 *p.m.*

CROYDON WIRELESS AND PHYSICAL SOCIETY.—5, Altyre Road, East Croydon. Mr. A. J. Webb on the results of his experiments on volume control. 8 *p.m.*

**Tuesday, November 20th.**

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.—Town Hall. Lecture by Mr. J. S. Kilpatrick on "Heating by Electricity." 7.30 *p.m.*

**Wednesday, November 21st.**

RUGBY ENGINEERING SOCIETY.—Benn Buildings. Paper by Mr. F. L. Ballard on "Modern Welding Practice."

ELECTRICAL CONTRACTORS' ASSOCIATION (SUSSEX BRANCH).—Midland Bank Chambers, Brighton. Ordinary meeting.

BATTI-WALLAH'S SOCIETY.—Hotel Cecil, Strand, London. Luncheon. Address by the Rt. Hon. Sir Hamar Greenwood, M.P. 1 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—46, Kensington Court, London. Lecture-demonstration on "Electric Cooking Methods," by Mrs. E. Barnett. 3 *p.m.*

OVERHEAD LINES ASSOCIATION.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Paper by Mr. C. W. Marshall on "Insulators." 5.30 *p.m.*

UNIVERSITY OF LONDON, KING'S COLLEGE, STRAND, LONDON.—Lecture VI (course of nine lectures), by Prof. E. V. Appleton, F.R.S., on "Electrical Communication and Its Indebtedness to Physics." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SHEFFIELD SUB-CENTRE).—Royal Victoria Hotel, Sheffield. Paper by Mr. W. D. Sheers on "Electric Trams *v.* Motor Buses." 7.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (TEES-SIDE SUB-CENTRE).—Cleveland Technical Institute, Middlesbrough. Address by Mr. C. W. Salt (Chairman of the North-Eastern Centre). 7 *p.m.*

**Thursday, November 22nd.**

INSTITUTION OF MECHANICAL ENGINEERS (MIDLAND BRANCH).—Birmingham. Annual dinner.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. L. G. H. Sarsfield on "The Electrical Equipment of X-ray Apparatus." (Joint meeting with the British Institute of Radiology.) 6 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—20, Trongate, Glasgow. Eighteenth Illumination Design Course. Lecture on "Floodlighting and Electrical Advertising." 7.30 *p.m.*

**Friday, November 23rd.**

ASSOCIATION OF ENGINEERING AND SHIPBUILDING DRAUGHTSMEN.—Chamber of Commerce, New Street, Birmingham. Lecture by Mr. F. H. Boden on "Bearings." 7.30 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN (MANCHESTER DISTRICT BRANCH).—Corporation Electricity Showrooms, 28, St. Ann Street. Lecture by Mrs. Flack on "Electric Appliances and Their Uses in the Home." 2.30 *p.m.*

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. G. Temple on "The Physical Interpretation of Wave Mechanics"; Mr. A. Monkhouse on "The Effect of Superimposed Magnetic Fields on Dielectric Losses and Electric Breakdown Strength"; Mr. A. Campbell on "A New Potentiometer of Larson Type"; Prof. E. F. Herroun and Prof. E. Wilson on "Ferromagnetic Ferric Oxide." 5 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row, Birmingham. Lecture by Mr. P. E. Erikson on "Some Aspects of Long Distance Cable Telephony." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Lt.-Col. C. H. Sylvester Evans on "Searchlights and Their Applications." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—Engineers' Club, 17, Albert Square, Manchester. Paper by Mr. R. Brooks on "Electric Traction on Railways." (Joint meeting at invitation of the Manchester Association of Engineers.) 7.15 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Paper by Mr. C. F. Moore on "A Survey of Cadmium." 7.30 *p.m.*

**Saturday, November 24th.**

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—Visit to Cardiff Engineering Exhibition.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ASBERY, Harold Stuart, 107, Hinde House Lane, Sheffield, wholesale electrical factor. £10 4s. 6d. October 4th.

BALLARD, J., 445, New Cross Road, S.E., wireless dealer. £15 15s. 6d. September 28th.

BENNETT, Leslie Norman, 9, East Street, Herne Bay, wireless engineer. £34 3s. 4d. September 22nd.

ELECTRICAL INSTALLATION CO., 25, St. Mary's Row, Moseley, Birmingham, electrical engineers. £12 18s. 10d. October 3rd.

HAYLINGS, Mr. W. J., Burton Buildings, Whitcombe Street, Aberdare, electrical contractor. £17 15s. 5d., May 24th; and £16 18s. 10d., May 24th.

HILLSWORTH, Desmond, 51, Southern Road, Basingstoke, wireless agent. £17 17s. 9d. October 3rd.

HORTON AND MARCHANT, 9, South Street, Tarring, West Worthing, electrical engineers. £16 15s. 6d. October 11th.

JANSON, Oscar, 1, West Street, Regent Street, W., electrical engineer. £19 9s. 2d. October 3rd.

KYNASTON, Mr. R. E., 52, Seel Street, Liverpool, electrical engineer. £38 11s. 7d. October 4th.

MANSFIELD, George, 196, Parrock Street, Gravesend, wireless dealer. £13 0s. 7d. October 2nd.

SHAPLAND, Mr. A. E., 13A, High Street, Budleigh Salterton, electrical engineer. £17 12s. 1d, October 2nd; and £14 19s. 8d., October 3rd.

VICTORIA ELECTRICAL CO., 31A, Warwick Street, S.W., engineers. £32 3s. 6d. October 5th.

WHITEHEAD, Mr. B. J., 31, Queen Street, Exeter, wireless engineer. £11 6s. October 2nd.

## Receivership.

PERANNE AND CO., LTD. G. P. Taylor, of 5, John Street, Bedford Row, W.C.1, was appointed Receiver and Manager on October 26th, 1928, under powers contained in debenture dated October 3rd, 1924.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

AMAC, LTD. By special resolution, October 12th, confirmed November 1st. G. Norton, Lion Works, Witton, Birmingham, appointed as liquidator.

BROADFIELD RADIO CO., LTD. By reason of its liabilities. October 30th. R. Warren, incorporated accountant, 3, Victoria Place, Haverfordwest, appointed as liquidator.

BROWN AND BARLOW, LTD. By special resolution, October 12th, confirmed November 1st. G. Norton, Lion Works, Witton, Birmingham, appointed as liquidator.

### Bankruptcy Information.

ANGERS, Arthur, trading as A. ANGERS AND CO., 19, Bristol Road, Wavertree, Liverpool, electrical engineer. First meeting, November 21st, 11 a.m., Offices of the Official Receiver, Government Buildings, Victoria Street, Liverpool. Public examination, December 11th, 10 a.m., Court House, Government Buildings, Victoria Street, Liverpool.

HANBURY, Cyril Kay, 20, Padiham Road, Burnley, electrical engineer. First meeting, November 19th, 3 p.m., Official Receiver's Office, District Bank Chambers, Blackburn. Public examination, December 4th, 11 a.m., County Court House, Bankhouse Street, Burnley.

SAVORY, Harvey, 7A, Hill Street, Shaw, Lancashire, electrical engineer. Receiving order, November 9th. Debtor's petition.

WARMINGTON, Robert Harold, 26, Stackpool Road, Southville, Bristol, electrical engineer and contractor. First meeting, November 21st, 12 noon, Official Receiver's Office, 26, Baldwin Street, Bristol. Public examination, December 14th, 11 a.m., Guildhall, Bristol.

WHEELER, Frederick George, Wynchwood, Broadlands Avenue, Shepperton-on-Thames, Middlesex, electrical engineer. First meeting, November 21st, 11.30 a.m., 29, Russell Square, W.C.1. Public examination, December 11th, 2 p.m., Assize Courts, Kingston, Surrey.

YEEND, Reginald, 19, Victoria Avenue, Lynn Road, Wisbech, Cambridge, electrician. Receiving order, November 6th. Debtor's petition.

### Notices of Intended Dividends.

HILL, Clement Sanderson, trading as SANDERSON HILL AND CO., Waltham Chambers, Waltham Street, Kingston-upon-Hull, electrical factor. Last day for receiving proofs, November 24th. Trustee, W. B. Hall, National Provincial Chambers, Silver Street, Hull.

LAWRIE, Andrew, trading as HOUCHIN AND LAWRIE, 9, Melbourne Parade, Palmers Green, London, electrical engineer. Last day for receiving proofs, November 24th. Trustee, T. Gourlay, 29, Russell Square, London, W.C.1.

### Applications for Discharge.

BROWN, William Lewis, carrying on business in co-partnership with another as SEWELL AND BROWN, at 6A, The Exchange, Muswell Hill, Middlesex, electrical and radio engineer. Hearing, November 27th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

HODGE, Wilfred Percy, 92, Cannon Street, London, E.C., wireless salesman. Hearing, November 30th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

### Partnership Dissolved.

STANDARD ELECTRICAL ENGINEERING and the STANDARD ELECTRIC SIGN AND METAL WORKS CO. (John AKERS and Ernest Arthur GALLOWAY), electrical engineers and contractors, 39, Eastcheap, E.C.3, on April 7th, 1928, by the death of J. Akers.

## Bankruptcy Proceedings.

GRIGSBY, William Reginald (trading as the WENHAM LIGHTING CORPORATION), late of 184, Gray's Inn Road, London, W.C., electrical factor. This debtor was adjudged a bankrupt in June, 1925, and his affairs came before Mr. Registrar Francke in the London Bankruptcy Court on November 9th, on the hearing of his application for an order of discharge. The Official Receiver estimated the total of the unsecured indebtedness at £2 635, and said that according to the report of the trustee in bankruptcy the assets which were valued by the debtor at £909 had realised £657, and £122 was recovered from other sources chiefly in respect of money in the hands of the trustee under a deed of assignment executed by the debtor on behalf of his creditors in general. A dividend of 4s. 6d. in the £ had been paid. In August, 1911, with the consent of his father's creditors, the debtor took over his business of a gas lamp manufacturer carried on at the above address under the above style. He added £147 cash which he had saved to the existing assets, and eventually paid the creditors 5s. in the £, which they agreed to accept in full discharge of their debts. Later he added to the business that of a factor of electrical goods. In March, 1924, the debtor entered into partnership with a Mrs. Clark for the purpose of carrying out electrical work at Wembley Exhibition, and to execute orders for materials to be obtained by Mr. Clark. The profits of such business were to be equally divided between Clark and the partnership, and the partnership business was carried on until the date of these proceedings under the style of Clark and Co. On April 1st, 1925, the debtor executed a deed of assignment to a trustee on behalf of his creditors in general, and he was afterwards employed by the trustee. He attributed his insolvency to lack of capital, to bad debts and to depreciation of stock. He said that he first realised insolvency in November, 1924, but he continued to trade in the hope of improving his business, and this he gradually did, and although he afterwards incurred a number of debts, the majority were with persons who were old creditors. The total amount due to them was in fact reduced. The Official Receiver opposed the application on the grounds that the debtor's assets were not of a value equal to 10s. in the £, and that he had omitted to keep proper books of account, and his Honour granted the discharge subject to a nominal suspension of four weeks.

## METAL AND CHEMICAL PRICES.

TUESDAY, November 13th

| | | Price. | Inc. | Dec. |
|---|---|---|---|---|
| *Copper*— | | | | |
| Best Selected | per ton | £72 10 0 | £1 0 0 | — |
| Electro Wirebars | ,, | £75 5 0 | 0 5 0 | — |
| H.C. Wires, basis | per lb. | 10 ⅛d. | — | — |
| Sheet | ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | | |
| Wire (Telephone) basis | per lb. | 1s. 1⅛d. | — | — |
| *Brass* 60/40— | | | | |
| Rod, basis | per lb. | 8¼d. | — | — |
| Sheet ,, | ,, | 10¼d. | — | — |
| Wire ,, | ,, | 10¼d. | — | — |
| *Pig Iron*— | | | | |
| Cleveland Warrants | per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. | ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | | |
| English | per ton | £22 10 0 | — | 5 0 |
| Foreign or Colonial | ,, | £20 17 6 | — | 10 0 |
| *Tin*— | | | | |
| Ingot | per ton | £230 15 0 | £1 5 0 | — |
| Wire, basis | per lb. | 3 0 | — | — |
| *Aluminium Ingots* | per ton | £95 0 0 | — | — |
| *Spelter* | ,, | £24 7 6 | 5s. od. | — |
| *Mercury* | per bottle | £23 2 6 | — | — |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
,, Roll, ,, £10 15 0 *Boric Acid* (Crystals) ,, £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
*Sodium Bichromate*—Per lb. 3¼d.

*Rubber*—Para fine, 11d; plantation, 1st latex, 8⅞d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

280 534 BRITISH THOMSON-HOUSTON Co., LTD. Methods of and apparatus for sound recording. (13/11/26.)
291 775 E. SCHRACK and R. ETTENREICH (trading as RADIOWERK E. SCHRACK). Electrode arrangement for electron discharge tubes. (10/6/27.)
299 215 H. H. BERRY. Advertising and the like signs. (3/12/27.)
282 734 BRITISH THOMSON-HOUSTON Co., LTD. Electric-switch structures. (30/12/27.)
282 092 SIEMENS-SCHUCKERTWERKE AKT.-GES. Means for automatically compensating the voltage drop in alternating-current transmission lines. (11/12/26.)
299 230 R. BAIN, and J. FENTON. Electro-magnetic key clutch or ratchet clutch. (24/12/27.)
299 231 G. VIARD. Methodical connection of the telephone cable circuits with pupin coils. (28/12/22.)
282 801 P. NAUMANN and K. WEBER. Electric soldering irons. (29/12/26.)

*ILLUSTRATING the lighting of the cocktail bar at the Royal Palace Hotel, Kensington. This system of lighting was designed by the G.E.C. in collaboration with Mr. Oliver P. Bernard, and strikes a new note in hotel lighting.*

299 232 STEATIT MAGNESIA AKT.-GES. Hanger or coupling for use in connection with electric insulators. (26/10/27.)
283 220 SIEMENS AND HALSKE AKT.-GES. Regulating apparatus. (7/1/27.)
299 100 F. G. MARTIN and W. RAMSAY. Heat exchange apparatus comprising tubes having an electrolytic deposit of metal on the interior thereof. (22/4/27.)
299 240 SIEMENS AND HALSKE AKT.-GES. Train-controlling systems. (27/1/28.)
284 610 BRITISH THOMSON-HOUSTON Co., LTD. Control systems for electric generators. (31/1/27.)
299 247 W. B. GOOD. Electrical measuring instruments. (14/12/28.)
290 562 DR. G. SEIBT (trading as DR. G. SEIBT FABRIK ELEKTRISCHER APPARATE) and A. SALOMON. Excess voltage safety devices. (14/5/27.)
286 720 H. A. GILL (STEATIT MAGNESIA AKT.-GES.). Electric resistances. (5/3/28.)
288 294 ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Tripolar circuit breakers. (9/4/27.)
299 264 F. QUAST and A. F. V. EICHERT (trading as BERKO-WERKE QUAST AND Co.). Multiple bar magnets. (23/1/28.)
288 578 RHEINISCHE METALLWAAREN-UND MASCHINENFABRIK. Direct current motors operating on the Ward-Leonard system. (12/4/27.)
290 202 SOC. D'ETUDES POUR LIAISONS TÉLÉPHONIQUES ET TÉLÉGRAPHIQUES A LONGUE DISTANCE. Amplifying or detecting relays. (9/5/27.)
299 286 KOCH UND STERZEL AKT.-GES. Electrical transformers. (23/1/28.)
294 483 INTERNATIONAL GENERAL ELECTRIC Co., INC. Rectifiers. (23/7/27.)
297 320 SCHLOEMANN AKT.-GES. Roller arrangement for conveying magnetisable articles. (17/9/27.)
299 335 A. E. WHITE (SARGENT AND LUNDY, Inc.). Armour-insulating the busbar networks of high-tension alternating-current power stations. (20/4/27.)
299 346 BRITISH THOMSON-HOUSTON Co., LTD., and R. D. PARRY. Electric regulating-devices. (16/5/27.)
299 402 J. L. BAIRD and BAIRD TELEVISION DEVELOPMENT Co., LTD. Exploring-devices for use in television, photo-telegraphy, and like systems. (26/5/27.)
274 870 SIEMENS AND HALSKE AKT.-GES. Picture-telegraph system and transmission-scanning arrangements therefor. (20/7/26.)
299 379 H. S. COOKE. Electric switches. (20/7/27.)
299 338 IGRANIC ELECTRIC Co., LTD., P. W. WILLANS, and F. J. H. CHARMAN. Thermionic radio receiving sets. (21/7/27.)
274 891 LOEWE AUDION GES. Voltage-amplifier valve unit. (21/7/26.)
274 895 INTERNATIONAL GENERAL ELECTRIC Co., INC. Electric transformers. (23/7/26.)
299 491 F. W. HIGHFIELD and HIGHFIELD ELECTRICAL Co., LTD. Wattmeters. (22/7/27.)
299 381 A. H. MARKS and P. RUSSELL (legal representatives of E. C. R. MARKS (deceased)). (Batterien- und Elemente-Fabrik System Zeiler Akt.-Ges.) Production of insulating and sealing material for electric cells and batteries. (22/7/27.)
299 351 TELEFONAKTIEBOLAGET L. M. ERICSSON, and C. A. W. HULTMAN. Selector switches for automatic telephone systems. (23/7/27.)

## Applications for Patents.

### October 16th.

29 904 R. P. A. ANDERSON. Arrangement for incandescent lamps.
29 923 AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., and H. S. WOODHEAD. Electromagnetic relays.
29 927 E. BARKER. Wireless receiving apparatus.
29 877 BRITISH POWER RAILWAY SIGNAL Co., LTD. Route indicators.
29 880 BRITISH THOMSON-HOUSTON Co., LTD., J. H. BUTCHER and A. P. YOUNG. Sound reproducing devices.
29 828 A. P. CASTELLAIN. Electron emission devices.
29 829 A. P. CASTELLAIN. Electrical sound reproducing devices.
29 830 A. P. CASTELLAIN. Ultra-violet devices.
29 900 W. J. HANNAH and ROTHERMEL CORPORATION, LTD. Electric switches.
29 871 W. HENSCHLER. Frame aerial.
29 872, 29 873 T. M. INMAN and RELAY AUTOMATIC TELEPHONE Co., LTD. Fire alarm systems, etc.
29 916 H. KÖNEMANN. Apparatus for recording alternating currents. (29/10/27, Germany.)
29 825 J. KYNASTON (B. H. J. KYNASTON). Apparatus for transmitting and recording radio signals.
29 874 C. L. LIPMAN and NALDER BROS. AND THOMPSON, LTD. Electric time selective relays.
29 840 H. LLOYD. Apparatus for recoil mounting of high pressure fuses.
29 931 A. A. T. NEWMAN. Wireless receivers.
29 895 R. A. SALAMAN. Control of theatre lighting, etc.
29 870 L. SIEGL. Electric switches for vehicles. (22/10/27, Austria.)
29 885 SIEMENS-SCHUCKERTWERKE A.G. Electric switches. (15/11/27, Germany.)
29 915 L. SZILARD. Electric condensers. (17/10/27, Germany.)

### October 17th.

30 000 BRITISH THOMSON-HOUSTON Co., LTD. X-ray tube. (18/10/27, U.S.)
30 002 BRITISH THOMSON-HOUSTON Co., LTD., and C. STEWART. Dynamo electric machines.
30 005 D. F. CAMPBELL and ELECTRIC FURNACE Co., LTD. Electric melting furnaces.
29 968 FABRIK ELEKTRISCHER ZUNDER GES. and J. SCHURMANN. Electric blasting fuzes.
30 012 H. HARDY. Electric circuit breakers.
30 014 H. HARDY. Electromagnetic actuating mechanism for reproduction of sound.
30 001 INTERNATIONAL GENERAL ELECTRIC Co., INC. Reducing eddy current losses in windings of a.c. machines. (19/10/27, Germany.)
30 003 C. KIEL. Radio receiver. (17/10/27, U.S.)
29 949 H. LEITNER. Accumulators.
30 040 MEASUREMENT, LTD. Electricity meters. (17/10/27, France.)
29 996 W. G. PATTERSON and SIEMENS BROS. AND Co., LTD. Telephone systems.
30 068 J. R. ROBERTSON and J. VIELLE. Vacuum tube electric discharge devices.
30 069 J. R. ROBERTSON and J. VIELLE. Luminous vacuum tube devices.
29 981, 29 982 STANDARD TELEPHONES AND CABLES, LTD., and R. ST. G. TERRY. Electromagnetic relays, etc.
29 980 STANDARD TELEPHONES AND CABLES, LTD. (A. L. H. VAN DER STRAETEN). Multi-conductor ribbon cables.
29 947 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. High frequency telephone systems. (17/10/27, Germany.)
30 044 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Thermionic valve transmitters. (17/10/27, Germany.)
30 067 L. THURM. Alternator. (18/10/27, France.)

### October 18th

30 112 F. ARCHER. Automatic lighting switch control.
30 184 AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., and G. A. BURNS. Electric signalling systems.
30 096 R. W. BILL and H. HEATH. Boxes for electrical apparatus.
30 173 BINDPHAST PRODUCTS, LTD. Insulating material.
30 123 E. F. CLARK and F. H. ROYCE. Control of output of variable speed dynamos. (18/1/28.)
30 126 W. E. CLIFTON and CLIFTOPHONE AND RECORDS, LTD. Electrical pick-ups.
30 157 A. A. CLOKEY. Telegraph systems.
30 176 CIE GENERALE D'ELECTRICITE. Electric cables. (31/10/27, Germany.)
30 131 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Arrangements for amplifying electric oscillations.
30 132 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Means for regulating phase displacement in electric systems.
30 185 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes.
30 148 DYNAMIC UNIT CORPORATION OF AMERICA. Electromagnetic driving unit. (28/5/28, U.S.)
30 099, 30 100 A. C. AND C. A. GARDNER. Moving coil loud speaker.
20 128 B. J. HALL. Apparatus employing mercury vapour lamps.
30 138 L. LEVY. Connections for electron discharge tubes. (22/10/27, France.)
30 163 LUDERSWERK GES. and G. SLUPINSKI. Ignition testers.
30 158 METROPOLITAN-VICKERS ELECTRICAL Co., LTD. Control systems. (20/10/27, U.S.)
30 194 N. V. PHILIPS' GLOEILAMPENFABRIEKEN. Thermionic valves, etc. (11/7/28, Holland.)
30 196 A. PREEN. Thermionic valves.
30 177 J. J. RAWLINGS and RAWLPLUG Co., LTD. Wall plugs.
30 217 E. R. RITTER, A. SCHERBIUS, and SCHERBIUS AND RITTER. Heat-operated safety fuse. (14/4/28, Germany.)
30 215 ROCKBESTOS PRODUCTS CORPORATION. Insulated conductors. (19/6/28, U.S.)
30 170 SIEMENS-SCHUCKERT A.G. Synchronising synchronous machines. (19/10/27, Germany.)
30 180 SIEMENS AND HALSKE A.G. Inductances for high frequency circuits for radio receiving sets. (18/10/27, Germany:)
30 157 STANDARD TELEPHONES AND CABLES, LTD. Telegraph systems.
30 156 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRICAL Co.). Cathode ray oscillograph tubes.
30 179 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Direction finding aerials for aircraft.
20 213 F. W. THOMPSON. Electrically heating metals.
30 102 C. WHITTIER. Theatrical effect lamps.

### October 19th.

30 333 AUTOMATIC TELEPHONE MANUFACTURING Co., LTD., and S. R. SMITH. Push-button keys for telephone systems, etc.
30 338 H. B. DAVEY. Means for electrical reproduction of music, etc., from gramophone records.
30 398 A. BATTAGLIA-GUERRIERI. Relays.
30 247 F. A. LINDEMANN. Apparatus for reproducing fluctuations in radiations corresponding to audible sound.
30 313 SIR G. C. MARKS (TOLEDO SCALE Co). Dash-pot damping devices.
30 224 N. MARTIN and J. SANKEY AND SONS, LTD. Radiators for cooling oil of a.c. transformers.
30 319 METROPOLITAN-VICKERS ELECTRICAL Co., LTD. Electric measuring control systems. (20/10/27, U.S.)
30 320 METROPOLITAN-VICKERS ELECTRICAL Co., LTD. Adjustable brackets for supporting lighting units, etc. (20/10/27, U.S.)

### October 20th.

30 421 C. BELLANCA and C. T. CAMARGO. Current saving device for electric motors etc.
30 423 W. E. BETHELL and N. E. PAINE. Incandescent lamps, etc.
30 436 D. L. CHANDLER. Electric bread toaster.
30 437 D. L. CHANDLER. Electric switch.
30 405 A. S. AND C. W. CLARKE. Thermionic valve holders, etc.
30 381 I. H. PARSONS. Electric switches.
30 366 R. PEARSON. Electric lamp holders.
30 407 J. J. RAWLINGS and RAWLPLUG Co., LTD. Wall plugs.
30 435 G. SCHAROWSKY and SIEMENS-SCHUCKERTWERKE A.G. Rectifying units for electric current. (14/11/27.)
30 420 SIEMENS-SCHUCKERTWERKE A.G. Point of connection for wires of aluminium alloy, etc. (22/10/27, Germany.)
30 417 S. B. SMITH and G. M. WRIGHT. Picture, etc., telegraphy.
30 389 G. H. WAKE. Means for supplying electric power for wireless receivers, etc.

### October 22nd.

30 494 I. H. ABELSON, C. GARDNER and [illegible] THORNTON-NORRIS. Time control mechanisms for electric switches
30 541 AKT.-GES. BROWN, BOVERI ET [illegible]e cap insulators. (21/10/27, Germany.)
30 525 BERGMANN ELEKTRICITATS-WERKE [illegible] driving mechanism for spinning machines. (20/10/27, [illegible]

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# THE ELECTRICIAN

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# Current Topics.

## Modern Lighting.

THE E.D.A. London "Salesmanship" Conference last Friday might almost have been described as a gala night. With Mr. J. W. BEAUCHAMP in the chair again, and with Mr. H. T. YOUNG expounding his interesting and admirable views on modern lighting design, it was not surprising that the audience approximated to those of the earlier times when the E.D.A. Conferences were more of a novelty than they are now. It was not surprising, either, that no fewer than nineteen speakers took part in the discussion which followed Mr. YOUNG'S remarks, for the subject is one which provokes striking differences of opinion. Several people seemed to be worried rather unnecessarily over the naming of the form of lighting which has been called "modern" by some, "cubist" by others. If a label is so necessary, we cannot envisage a better than "architectural lighting," first made public by Mr. W. E. BUSH in an article which appeared in THE ELECTRICIAN some months ago. But whatever name we may give to this new development of lighting, it seems to us important to get busy selling it to the public. As an industry, we have in the past paid too little heed to the æsthetic aspects of design, and have been content to produce lighting fittings which have been mainly derived from gas fittings and chandeliers. In the early days of electric lighting it was a good selling point to say that the electric wires could be run through the existing gas fittings, but since that time public taste has improved, and at times it seems to have progressed at a rate far greater than we, in our engineering groove, have realised. Mr. BUSH did not exaggerate when he said last Friday that the new lighting represented the emancipation of the electric light. Freeing it from the shackles of mere copyist tradition, it provides a fitting setting for the proper use of the modern electric lamp. Mr. H. T. YOUNG, whose paper is dealt with elsewhere in this issue, certainly has the courage of his convictions, for he has not only established what must surely be the first showroom in this country to be devoted entirely to modernist lighting, but has engaged artist designers to develop and improve upon the designs which we have so far been getting mainly at second-hand from Continental sources. When we feel a trifle despondent at the way in which so many electrical contractors are allowing ironmongers, drapers, and others to enter into active competition with them on the retail sales field, it is comforting to think that the contracting side of the industry still has such enterprising people as Mr. YOUNG. We can only hope that others will profit by his example.

## Mass-Produced Fittings.

ALTHOUGH Mr. YOUNG was right in his condemnation of the commonplace mass-produced lighting fittings which are so generally used in this country to-day, we do not think he intended to convey the impression that mass-production as such was to be deplored. One of the great advantages of many forms of the new glassware fittings is that they lend themselves admirably to mass production. The term mass-production is too commonly associated with the cheap and meretricious, but there is no reason why properly designed articles should not be produced by machine in large quantities in entirely satisfactory æsthetic lines. The old-time hand craftsmanship for which this country was deservedly held in high esteem, is no longer available to the average member of the public. But that does not necessarily mean that we in this machine age must be deprived of craftsmanship in the fashioning of articles for personal use. Rather let us look to, and develop, the craftsmanship of the machine, which is in many ways more suited to the times in which we live. Certain forms of architectural lighting will, if properly exploited, provide the masses for the first time with really suitable lighting fittings at a reasonable price; others, of course, will never get beyond the "luxury" stage, and thus the entire field of lighting requirements will be covered with adequate means for making proper use of electric light.

## Contractors and Shopkeeping.

IN our correspondence columns this week Mr. L. C. PENWILL, general secretary of the Electrical Contractors' Association, takes us gently to task for our reference last week to the enterprise of a Colchester ironmongery firm which, he points out, has a proper electrical department, is enrolled on the National Register of Electrical Installator Contractors, and is a member of the E.C.A. Although we thought we had made it plain, we have no complaint against an ironmonger who sets up a proper electrical department with a properly qualified electrical man in charge. If electrical contractors are unenterprising enough to allow them to do this it is not for anyone else to say a word against them. We do, however, desire once more to emphasize in the strongest possible manner the danger, which many electrical contractors are inviting by neglecting to go after the retail trade in the proper way. The potential outlets for domestic electrical appliances are continually and

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rapidly expanding, and future sales of this equipment will be greatly in excess of anything yet visualised. Are these sales to be made through the electrical contractor-retailer, or are they, like radio, to pass almost entirely to some other class of trader? This is a question that manufacturers must, even now, be considering, and unless electrical contractors, generally, go wholeheartedly into the business of shopkeeping, the manufacturers cannot be blamed for directing their production into the most effective sales channels.

### Taste in Advertising.

THE newspaper advertising campaigns of the Telephone Development Association have so often attracted criticism that we are reluctant to lead an attack on the first of the new series of "Unrecorded 'Phone Calls," for which this Association is responsible. In deference, no doubt, to those critics who found the earlier publicity deficient in "pep," the Association has gone to the other extreme. At the outset we are told that Henry VIII. was not on the telephone "though, in the matter of wives, he may sometimes have thought that he'd been given the wrong number." We are then invited to "think what a man like Henry might have done with the 'phone. The telephone bell in the divorce court would never have been silent . . . But Henry had to rub along without the 'phone; because he was only a poor old Tudor, and couldn't do any better." Now, though we are in favour of brighter and better advertising, this strikes us as being just a shade too bright for the advertising of a public utility. The references to wives and divorce courts are not in the best of taste, and the whole effort suffers from too much "smartness." We hope that further items in this series will be less open to criticisms of this kind.

### The "Outlet" Campaign.

WE are glad to learn of the success which is attending the Electrical Outlet Campaign which is being carried out in a characteristically vigorous manner by the Electrical Association for Women. Meetings have already been held in most of the principal cities and towns of the country, and it is significant that these meetings have attracted prominent architects and builders, as well as electrical engineers and contractors. The "Women's National Specification" has been criticised in some quarters on points of detail, but we feel that even if the specification does ask for a few more outlets than some electrical engineers consider to be absolutely necessary, this is a good fault. It represents an ideal and a standard to aim at. If the campaign only increases the average number of convenient outlets installed in new houses by 100 per cent. it will have done good, both to the women and to the electrical industry. Already, we are told builders and architects in several places have definitely promised to include a better provision of outlets in new houses, and the number of requests that have been made for copies of the specification suggests that the results of this excellent scheme will be of measurable proportions.

### The Lure of Light.

OUR readers have seen and heard time and time again of the advantages of late-hour shop window lighting. As an idea for use in electrical showrooms and shops, its claims have been frequently emphasised in these columns, while we have also been careful to recommend vigorous local campaigns to get shops in other trades to adopt the practice. At times it has seemed to us that the non-electrical traders have needed little persuasion, while many electrical premises remain in darkness during the important evening hours. Our excuse for returning to the charge is provided by an account in "The Daily Mail" of the dense throngs of people observed in the shopping streets of the West End of London last Sunday night gazing into the brightly lit shop-fronts which have recently become so gay a feature of Sunday-night London. People were packed three or four deep in front of some of the more attractive displays in Oxford Street, and one shopkeeper expressed the opinion that firms who do not light their windows on Sunday night must lose hundreds of pounds' worth of business as a result. It is unnecessary for us to stress the moral behind this story, but we may add that we have a shrewd idea that Mr. F. SELLEY and Mr. E. E. SHARP are, in their different ways, very largely responsible.

### Consumers in the Pillory.

BINGLEY U.D.C., we learn, is considering a proposal that any electricity consumer found using for lighting purposes electricity supplied for domestic power shall be called upon to make a public apology in the Press. This we assume is intended to replace the procedure by summons which is commonly adopted, and as a remedy is, perhaps, to be preferred. The whole question, however, is one worthy of general attention. The crime of "stealing" or "unlawfully abstracting" electricity is an artificial one, created entirely by the supply authorities concerned. A person living in a certain place may become accustomed to an all-in charge, enabling him to use his supply in any way he may think fit or convenient. He moves into another district and becomes a criminal for doing something which had the full approval of his former supplier. Of course, we know that many of the prosecutions for this offence follow undoubted intention to transgress regulations which are fully understood, but this is only a further argument for the abolition of the multi-meter, multi-rate tariff. Replace this and most of the criminals automatically disappear.

### Electrical Christmas Gifts.

FULLY alive to the opportunities of increased trade which the Christmas season affords, the E.D.A. Calendar Selling Campaign, of which details were given in an earlier issue, includes in its December activities provision of special copy for local advertisements, Christmas window displays, and publicity appropriate to the season. The national dailies and monthly magazines devoted to the home will carry advertising pointing out the merits of electrical goods as Christmas gifts, while a number of publications suitable for circulation at Christmastide have also been prepared. The E.D.A. is deserving of congratulation in the design of the special window displays, and in each of the three arrangements available a really happy note is struck. Not too ornate, not too drab, these trims should form the basis of many an outstanding window during the next few weeks, and will undoubtedly do much to further the electrical gifts idea. The fittings are such that they may be used in windows of practically any size. Following upon our earlier suggestions for the Christmas trade, the special efforts of the E.D.A. should do much to increase business over last year. The trade at that time was not so favourably assisted, but nevertheless reports from all over the country indicated that the general public saw in electrical gifts a solution of their problems of what to give. This year, with the advance information which we have already given and the propaganda which the E.D.A. has prepared, the Christmas trade in electrical goods of domestic interest should exceed all previous records.

### Bathroom Dangers.

THE evidence at a Greenwich inquest on a young man student who was accidentally electrocuted in his bathroom emphasises the need, frequently pointed out in these columns, for electrical installation contractors to exercise great care in planning the electrical equipment of bathrooms. The fact that electrical fatalities are so rare does not absolve us from taking every reasonable step to make such tragedies still more rare. We do not propose to enter into the merits of earthing or non-earthing of domestic electrical appliances, for, apart from such considerations, the case in point furnishes sufficient reasons to show that portable appliances are potentially dangerous in bathrooms and should not be installed there without special precautions, and that switches should be placed in positions where they are inaccessible to any person who may happen to be in the bath or in contact with it.

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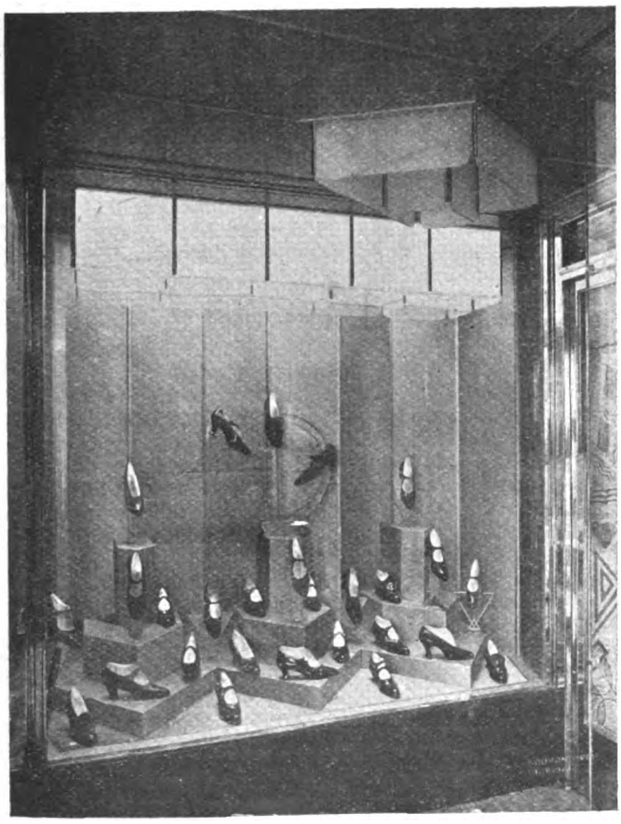
# MODERN LIGHTING DESIGNS.

## Decorative Applications of the New Glassware Fittings—Lighting as Part of the Architectural Scheme—The Need for Creative Designers—Commercial Implications.

AT the E.D.A. Salesmanship Conference held at the Royal Society of Arts on November 16th, Mr. H. T. Young read a paper in which he described and illustrated by means of lantern slides the modern system of lighting which had its beginnings in France, has already been adopted to a considerable extent elsewhere on the Continent, and is making some headway in this country. Mr. Young showed illustrations of many premises in Paris, Berlin and London, in which the new forms of cornice, frieze and panel lighting are being used, and generally dealt with the new style of decoration by means of lighting that is being developed, and which he himself has demonstrated in such a remarkable manner in his own new showrooms at Knightsbridge, London. Mr. J. W. Beauchamp, the late Director and Secretary of the E.D.A. presided, and was given an extremely hearty reception.

Mr. H. T. YOUNG said his subject was new to an E.D.A. Conference and one that had been studied closely by only a few people in this country. No description could convey, even to the imaginative person, unless he had studied it closely, a full conception of what modern lighting design really was. Glass was the chief material or medium through which modern lighting effects were achieved, and this material could be cut, bent, etched, moulded, sand blasted and coloured. We could now have ceilings, cornices, friezes, panels, architraves, mouldings, pelmets, partitions, columns, doors and outside walls of light, as well as ceiling fittings, wall lights, etc.

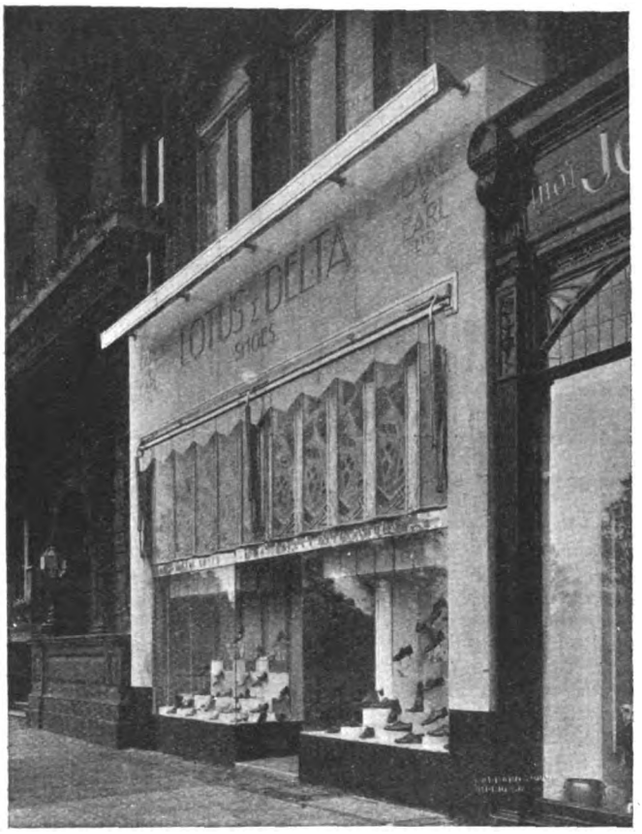
His first modern lighting inspirations came from Mr. Beauchamp and Mr. Bush after the Decorative Arts Exhibition in Paris in 1925, and he had them to thank for directing his thoughts along the lines he had travelled slowly in the past two or three years. These two gentlemen set him thinking seriously of the modern art of lighting, and then, in journeying abroad in pursuit of his hobby, to see for himself architecture as created and comprehended by many people and races over



One of two examples of modern Edinburgh shops incorporating "architectural" lighting. The window lighting is obtained from reflectors and lamps above vertically hung sheets of glass suspended from the ceiling.

thousands of years, he was led to consider the possibilities of this art in lighting and to look for examples. Most of it he found in France, particularly in Paris.

Having seen fittings and methods of lighting that were original, he was led on further to study cause and effect. "We have entered upon an era or epoch of modern creative design in architectural decoration, furnishing and lighting," said Mr. Young. "This has been brought about by modern




This window front is particularly attractive since the space above the transom bar is rendered luminous from lamps placed behind ornamental glass. An interesting feature is the very neat method of incorporating fascia lighting from a carefully designed trough. We are indebted to the E.L.M.A. Lighting Service Bureaux for permission to reproduce these pictures.

inventions, the necessity for working with new materials (such as reinforced concrete in building), a desire for everything we use to be suited to and consistent with its purpose, an intelligent interest of the individual in equipping and furnishing his or her home, a knowledge of the value of electric light as an attraction to, or advertisement for, an interior, a desire to dispense with excessive ornamentation, and last, but by no means least, a sincere and virile attempt of the twentieth century people to establish a style or system suitable to the times in which they live; to use only that of the past which is of value to the present, and to add to it only what is necessary to bring together those elements of utility, comfort and beauty that we human beings require."

If variations in style and design were necessary in architecture, decoration and furnishing, how much more was it necessary with such a wonderful modern commodity as electric light? Did anyone know or could anyone imagine to-day the part that light would play in our lives in, say, another ten years? From observations he had made of the progress even in the last twelve months, he ventured to say that the interiors of our large public and business buildings and the homes of most people would be transformed and beautified by light—and that meant electric light—even beyond our dreams.

Until 1925 there was not much that could be called real creative design in fittings or housings for electric lamps. There were a few bright examples, but very few. Nearly everywhere we went to-day we saw the same kind of hemispherical ordinary common place bowl enclosing a high candle power gasfilled lamp. We had adopted stereotyped methods and produced masses of fittings all of the same type just to house a gasfilled lamp.

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Practically all the supply authorities and companies desired to sell more current and were encouraging consumers to use more of it. What the electrical industry lacked was creative designers. The designer of our fittings of the past would find it hard to unlearn and forget his work of the past; few had been trained in the school that understood line, form and colouring as required to-day. We must face these solid facts and look for new creative designers; where were we to find them? He thought chiefly in the architectural schools.

There was in some of the lighting schemes and fittings he had shown a style that had been named Cubist, and there was no doubt that the beauty of the cubes, triangles, circles and other geometrical designs would play a more important part in constructional decorative art in the near future than they had ever done before.

There was a growing appreciation on the part of a large and discriminating section of our British people for the work of the real craftsman. Manufacturers might well give more consideration to this subject where it concerned lighting design. On the scientific and engineering sides of lighting, the scientist and engineer must link hands more closely with the artist and possibly the craftsman, to enable the people of this country to appreciate and enjoy their work to the fullest extent.

Touching on the strictly commercial side, Mr. Young described what modern lighting meant to the electrical industry. Briefly, more fittings and lamps, and more current, at least multiplied by four. More cables, switchgear, generating plant, and all these brought more employment for the workers. In his own case, after studying modern lighting design for over two years and taking the opinions of eminent architects and others whose training and experience qualified them to judge, he decided to scrap all the decorations and practically all the fittings in his firm's own showrooms, to add to the premises considerably, to spend a sum of money on designing and installing a modern setting not only for lighting fittings, but everything else they displayed, and to obtain the services of the finest designer he could get, and to instal the necessary equipment. The showrooms were not finished, but the mere display of a few modern fittings in the window for the first seven days brought in more inquiries than he had had in the previous seven months. The results so far were very gratifying, but it was not an easy business.

In his remarks accompanying the showing of lantern slides, Mr. Young mentioned that the ceiling and canopy lighting in the case of the shop of the Galeries Lafayette in Paris represents an aggregate of 625 kW or 1¼ kW per foot of frontage of the premises.

## THE DISCUSSION.

The Chairman said that although it was impossible for everybody to admire all the designs that had been shown, he felt that anybody who endeavoured to give expression to an idea without slavishly copying Georgian or Elizabethan ideas should be encouraged.

Mr. R. C. FRANCIS, whilst commending the underlying principles that had been enunciated by the author, said he regarded the design in which a building was shown as being supported by columns of light an architectural monstrosity and artistically untrue.

Mr. W. E. BUSH said this was a real gala night for E.D.A.-ism, because there was Mr. Beauchamp in the chair, and Mr. Young giving a paper on a subject which undoubtedly represented the emancipation of electric light. For years we had copied designs that had been used for older illuminants but at last there was a real development in the design of electric lighting fittings which represented a complete breakaway from tradition. The new movement had been criticised during the past year somewhat severely even in the electrical industry but he felt that the critics had been judging the new movement on the work done by the extremists in this particular school. Modern art, however, had been the means of expressing the value of electric light as a decorative medium.

The electrical industry should be made to realise the danger of this new work getting into the hands of decorators. Already in Paris they spoke of "decorator's terms" in dealing with the trade, and the same thing would happen on this side unless the electrical industry took the matter in hand. He congratulated Mr. Young in starting up his new showroom and wished him every success.

Mr. W. E. ROGERS asked what the position with regard to mains was going to be with the enormously increased lighting loads foreshadowed by the paper. Judging from what had been said at a meeting mostly of mains engineers that week, the position in this respect especially in the West End of London was appalling. Some of the designs that had been shown rather reminded him of Epstein's work in Hyde Park and he felt they ought to be painted green!

## A Manufacturing Point.

Mr. L. E. BUCKELL did not agree that the new style would be permanent, although from the manufacturer's point of view that was not to be deplored, perhaps, because it would mean that in a few years' time they would be busy replacing the styles that had been described with something new.

Mrs. FRITH suggested a difficulty in persuading people to scrap their old installations in favour of the new, and added that the E.D.A. home lighting competition had rather shown how the public regarded electric light as a necessity rather than a luxury.

Mr. HAYES regretted Mr. Francis's objection to pillar lighting because it could be made use of by electrical contractors and supply authorities for attracting people to their showrooms.

Mr. PATMORE said that there was a window in a shop at Wood Green lighted by the methods shown by the author. This was next to another shop owned by the same people but lighted in quite an efficient manner by ordinary methods yet the public were much more attracted to the window with the modern lighting which, by the way, in this particular instance, cost 15s. per hour.

Mr. J. G. RITCHIE disagreed with Mr. Young as to the dearth of designers and said there were five men to his knowledge in the room that evening who, during the past year, had turned out some magnificent work very much on the lines indicated in the paper. He contended that we were quite as able to originate in this country as other countries.

Mr. W. F. T. PINKNEY suggested that the new methods of lighting would have the result that supply authorities would be encouraged to change over from d.c. to a.c. in crowded central portions of their areas because of the extra revenue which would come along.

Mr. CALVERT urged that greater use should be made of colour, and foreshadowed the possibility of the lighting in restaurants, for example, being under the control of the musical director who could vary the colour of the lighting according to the music that was being played. In view of the large amount of this new method of lighting that existed in this country now, he suggested the compilation of full details, with photographs, with a view to publication in the form of a brochure for the purpose of creating still further interest among manufacturers, supply authorities, and the public generally.

Mr. F. W. LEEVERS said it seemed to him from the paper that the real field for pushing these new methods was for large public and commercial buildings rather than in the domestic sphere. To attempt it in ordinary homes would have the effect of killing it, because of the necessity for a change in design of furniture to fit in with the new designs that had been illustrated.

Mr. GILLENDER did not think so much progress would be made as should be the case until the illuminating engineer was taken more into collaboration with the architect and made less subordinate to the architect.

Mr. EVERTON said that architects must now recognise the necessity for including a much larger sum in their estimates for the electrical installation.

Mr. V. W. DALE did not think the new art would last because it was contrary to nature. At the same time, there would be a considerable vogue for this new form of lighting for a long while, as was to be seen in the manner in which new installations were being put in.

Mr. YOUNG, replying to the discussion, said the methods he had described were not only for the wealthy because the glasswork he had shown did not cost a great deal, but unless manufacturers introduced a new craftsmanship we should find people making up their own electric lighting effects in the same way that they made their wireless sets. As sportsmen we must concede to France the credit of having started these new designs; we now wanted creative designers of our own. He did not think there would be much trouble from the point of view of mains to deal with the increased load, and he knew of one store in London where a change had been made from d.c. to a.c. to deal with ten times the demand. Far from experiencing difficulties with architects, his own work in this matter had been instigated by them, and had been done more or less on their persuasion. As to the source of the glass, his own firm now purchased from British makers ten times the quantity it had ever imported, and manufacturers here knew that he did not buy from abroad if he could get what he wanted here.

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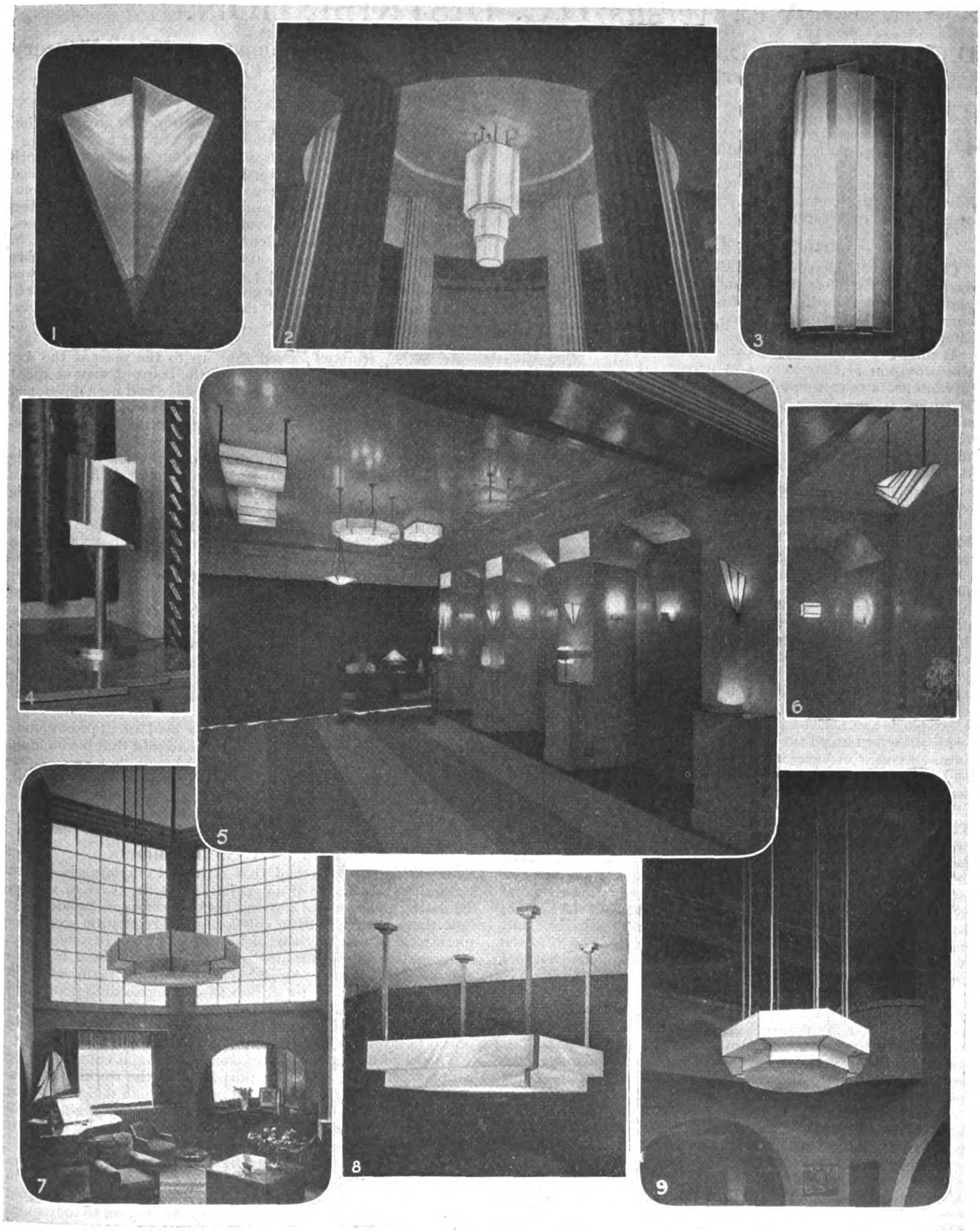


## MODERN LIGHTING DESIGN.

*THESE pictures indicate the continued development of lighting fittings design to which this journal was the first in this country to give encouragement. Figs. 5 and 6 show portions of the interior of the new lighting showrooms which have just been opened at Knightsbridge, London, by Messrs. Troughton and Young, and the remaining pictures illustrate recent French designs, mainly by Jean Perzel. Recent illustrated articles on the new trend in lighting appeared in our issues of March 25th, 1927, and March 30th, 1928.*



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# A.C. *versus* D.C. DISTRIBUTION.

## D.C. Described as a Disease—The Consumer's View point—Development of the Mercury Arc Rectifier—Expense of Housing Transformers in the City Areas—D.C. For Small Towns.

FACTORS underlying the relative efficiency of a.c. and d.c. distribution for town and urban areas were the subject of discussion at a meeting of the London Local Technical Group of the Electrical Power Engineers' Association on November 13th, held in the rooms of the Junior Institution of Engineers, at Westminster.

### Change-over Difficulties.

Captain J. M. Donaldson, M.C., who presided, opened the discussion. He referred to d.c. supply as a disease—accidental perhaps, but still a disease. If one were starting to produce current in the simplest form, one would undoubtedly produce alternating current.

It might be contended that where regulations insisted upon the provision of two sources of current, d.c. supply was of advantage, in that it enabled batteries to be used as a reserve. Batteries were extraordinarily expensive, however, and did not last for ever, and the greatest trouble was that if they were to be of any use at all, they must be so big that one could not find the space for them. When contemplating a change from d.c. to a.c. distribution, many difficulties had to be met, and the characteristics of each different area must be considered very carefully. The problem was very difficult when one already had a considerable copper mine underground. Again, in the congested areas, space was extraordinarily valuable, and that factor influenced one's decision to a large extent.

If a change were to be effected, however, the sooner it was done the better. If the existing mains, which had been laid a number of years, had become unsuitable for meeting present conditions, it was wise to replace them. One of the problems to be faced when contemplating a change was that of dealing with the single-phase motor, and the policy of his company generally was to replace the bigger single-phase motors by three-phase motors. Their method of getting over the difficulty of using 3-core mains was to use what was practically a six-phase system.

Mr. BOWDEN urged the necessity for considering the problem from the point of view of the consumer as well as that of the supplier of electricity. When all things were considered, it would appear that there was little difference between a.c. and d.c., there being a slight advantage perhaps, in d.c. supply. If one had to start a new system in an isolated urban area, with a more or less fixed load, a simple sort of a.c. system would be adopted, but there were difficulties in towns where a mixed load had to be dealt with. He did not think the advocates of a.c. could show that there was any advantage from the point of view of the cost of the network. The problem of the amount of copper required was worked out in the text books, but only on the basis of unity power factor. Again, in the towns it was difficult to obtain space for the installation of transformers, and the cost of the space was high.

The argument that d.c. involved heavy wages costs no longer applied. Whilst agreeing that expensive rotary machinery was used, he pointed out that remote control enabled undertakers to dispense with operators at the rotary stations; there was no reason why a man should not control a large number of rotary stations from a central point. Transformers were not so economical and convenient as they were sometimes stated to be, because, when varying power factors had to be dealt with, it was necessary to use fancy gadgets, power factor correctors and a perfect museum of instruments. Another point to be considered was the rapid development of the mercury arc rectifier by Messrs. Brown Boveri; he believed enormous sets of 16 000 A were being built, capable of dealing with an enormous amount of power relatively cheaply and quite satisfactorily. When the big electricity schemes were in operation, and various undertakings would have to take electricity in bulk instead of generating it, they would be penalised for power factor and load factor. They would pay on a kVA basis, and it seemed to him that those who had a.c. transformers over which they had no control, and power factor over which they had no control, would have to pay through the nose for energy taken at times of peak load. The d.c. suppliers would be in a better position because, by that time they might be spending their money on big batteries, or something equivalent, to deal with peak loads. Finally, he said he was unable to find any indication that any reduction of price had resulted from the adoption of the a.c. system.

Mr. J. D. SPARK saw no reason why an area supplied with a.c. should be at a disadvantage as compared with one supplied with d.c. One London company, operating on a d.c. system, and having a little copper mine under the ground, had been driven to adopt a.c. distribution. With regard to cables, the cost was largely dependent upon the weight of copper in them, and it made little difference to the cost whether the cables were of 2, 3 or 4 cores. The bugbear of power factor was counteracted largely by the lighting load, and, given careful supervision, there should be no difficulty, particularly if a tariff were adopted which took charge of power factor.

Mr. W. E. ROGERS agreed that up to the present the d.c. motor had had the advantage from the point of view of speed control, but pointed out that recently there had been developed an a.c. motor, details of which he hoped would be published shortly, having a minimum speed regulation of 7 to 1 with absolute squirrel cage characteristics.

Mr. W. J. JEFFERY said that if d.c. distribution was a disease how was it to be cured? It was all a matter of finance. In his company's area there were miles of 0·1 sq. in. single-core distributors, and one could not think of scrapping all that. Assuming that the increase in demand would develop as it had developed in recent years, it was obvious that in 7 or 8 years' time the company would be distributing double the quantity distributed to-day, and if one had 0·1 sq. in. distributors and 0·1 sq. in. feeders at approximately every 300 yards along important thoroughfares, a.c. distribution could not help a bit. The only solution he could think of was to adopt a house-to-house system, using high tension a.c. mains with local transformers. A difficulty, however, was that the value of sites in central London was very great, and land and floor space were bought or let on the basis of a fixed amount per sq. ft.

Recently a large consumer with a load of approximately 1 000 A at 200 V was offered a.c. He had said that his building had been designed for certain purposes, and that every cubic foot of it had been allocated before the foundations were laid, and no allowance was made for transformer space. One could not instal transformers in the streets in an area within three or four miles radius of Charing Cross.

### Rebate to A.C. Consumers.

Mr. A. F. HARMER said that although emphasis had been laid on the advantage of d.c. supply from the point of view of regulating the speed of motors, his experience in London was that there was very little call for speed regulation except in special cases. A method of supply adopted in one rather congested area was to super-impose a high-tension house-to house distribution system. A 6 000 V ring main was run round the area from one station to another feeding point, and the owners of the large buildings were offered a rebate of 10 per cent. if they would buy a.c. If an undertaking could afford to do that there must be something in it.

The large buildings already using d.c. would continue to be supplied with d.c. for power purposes, for the working of lifts, circulating pumps and other things for which d.c. was better fitted. The cost of transformer sites was very high, and in one building in London the value of a space 8 ft. by 8 ft. was said to be £600 per annum.

Mr. H. W. COUZENS pointed out that those who had emphasised the difficulty of writing off the capital expenditure on mains in the event of a change over, seemed to have overlooked the fact that that had already been done in regard to the capital expenditure on generation. Those undertakings which had been supplying d.c. had effected a change and commenced the generation of a.c., scrapping the old plants; the position in regard to mains was similar, and no doubt would be solved in the same way.

Mr. JEFFERY said the statement that consumers were offered a rebate if supplied with high tension a.c. had been accepted as demonstrating that a.c. distribution was cheaper than d.c., but he personally considered it more or less a bribe to get the transformers housed.

Mr. GILBERT referred to ease of transformation as one of

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the advantages of a.c. over d.c. When a.c. had been distributed at high tension to the districts in which it was to be supplied, he asked, why change it to d.c., and increase capital costs? Big sub-stations were required for changing over from a.c. to d.c., and the difficulties of acquiring sites arose; the cost of the site might be £1 200 a year. In his view, we had to get away from d.c. supply.

Mercury arc rectifiers were very good in their particular spheres. In connection with d.c. supplies, they filled a long-felt want, but one had still to use transformers. The rectifiers cost about £4 per kW, and they needed a certain amount of maintenance, whereas with a.c. supply, rectifiers could be dispensed with. With regard to high-tension supply, and the installation of local transformers, he said he believed that before long about 10 or 15 kW would be needed in nearly every house, and if 10 or 15 kW transformers were to be installed, it would be necessary to have duplicate supplies down the streets. His conclusion was that in every street of about a quarter of a mile long it would be necessary to have a sub-station, and preferably two (one on each side of the road), each to be big enough itself to supply the whole street.

Mr. L. R. LEE, in a written communication, expressed the view that d.c. distribution should have been stopped by the Board of Trade at least 20 years ago. Where 3-core d.c. cables had been laid for distributors for lighting and heating purposes, provided all the cores were of equal size, as they should be, a change to a.c. on the same cables was not difficult. The supply to many hundreds of consumers in the suburbs of Manchester was being changed over at present.

Mr. J. H. C. BROOKING, commenting on the practical nature of the discussion, said it set an example to the Institution of Electrical Engineers. He hoped the Institution would reform, and provide opportunities for the discussion of such practical matters.

Mr. F. FERNIE pointed out that in small towns and villages the cost of distributing d.c. was lower than that of distributing a.c., because with d.c. one could use overhead cables heavily loaded, whereas with a.c. one could not do that, owing to the impedance. As illustrating the economy of d.c. supply in small communities, he mentioned the system of an undertaking in a certain small town or large village, supplying d.c., with overhead distribution. Current was generated by two or three oil engines in a galvanised iron shed, and one man looked after the whole concern—generation, meter reading, and so on. He started an engine in the morning, and then locked up the shed and went away. In the evening he started another engine, and late at night he returned to shut down one of them. It would be difficult to find a system much cheaper than that, even with transformers.

The owners of the undertaking, through no fault of their own, would have to shut down their generating station and instal transformers and obtain a bulk supply, and the cost to them per unit would be greater than the present cost, though the price charged to consumers would not necessarily be greater.

Mr. A. G. HILLING suggested that the difference in the efficiency of an undertaking generating a.c. and distributing d.c., and one generating and distributing a.c., was about 6 per cent. Dealing with the speed control of motors, he said his experience was that very few factories used speed control. He asked whether, if an undertaking had a d.c. rotary sub-station, with all the plant working to capacity and all the feeders possible run from it, and the distributor fairly heavily loaded, it would pay to instal a static transformer at that sub-station (assuming there was room) and run a 4-core cable along the main road for use principally for the shop-lighting load. He did not believe many distributors were working to capacity, and the fact that the provision of another feeding point would almost double the capacity of a distributor was often overlooked.

## Saving Copper.

Mr. BENNETT emphasised the tremendous saving of copper to be effected by installing a 3 000, 6 000 or possibly an 11 000 V feeder. An 11 000 V 3-core feeder, about 0·1 section, would carry easily 3 000 kVA. He was of opinion that Mr. Jeffery had suggested the right solution of his problem, i.e., to effect the change-over in the large hotels and big business buildings and to supply through high-tension mains. If rebates were offered, a demand would be created in other buildings as well. With regard to the regulation of motor speeds, he referred to a large printing works in London, carrying out most delicate processes, supplied with a.c. and using variable speed motors satisfactorily.

Mr. FOSTER, dealing with the noise arising from the operation of rotary converters, said that one of the Newcastle supply companies which had contemplated the provision of an automatic converter sub-station, had had to alter the plans and provide a sound-proof station, at an extra cost of £2 000, owing to the representations made by residents near the station.

Mr. BOWDEN pointed out that the latest German super-station had the whole of its auxiliary plant operating on d.c.

## Capt. Donaldson Replies.

The CHAIRMAN, summing up the discussion, said he had purposely adopted a somewhat partisan attitude at the opening of the discussion. He recognised that all was not gold on the a.c. side; the gold was more pure on the a.c. than on the d.c. side, but there were difficulties, and the problem of power factor was one of them. At the same time, if it were tackled courageously it ceased to be a worry. With regard to sub-stations, he pointed out that far less room would be needed for a transformer sub-station than for any form of rotary sub-station. Also, transformers could be installed in the open, and the problem of providing a.c. transformers was easier than that of providing rotary plant. The rectifier was not really efficient except on h.t. It had power factor troubles of its own, and under certain circumstances its regulation was bad. It was also expensive. The steel tube rectifier particularly had extraordinarily complicated gadgets and the amount of space it occupied was greater than was sometimes appreciated. The glass tube rectifier had an enormous field and seemed to have advantages over the steel tube rectifier, but at present it was made in rather small units.

As to efficiency of a.c. and d.c. systems, he believed that if figures relating to pure a.c. systems and pure d.c. systems were compared, it would be found that the difference in efficiency was greater than 5 or 6 per cent., but it was difficult to select truly comparable undertakings. With the 4-wire a.c. system, energy could be transmitted over the same distance at the same economy as with the 3-wire d.c. system, and with a.c. less room was needed, there was no noise trouble, capital cost was lower, and more efficient transformation was secured. The development of the automatic sub-station had perhaps changed the position somewhat; such stations had reached a high pitch of perfection, but that had to be paid for. The cost of the equipment was probably a fair percentage of the cost of the rotary, and more supervision of such stations was needed than in the case of a.c. sub-stations.

# BOILER DESIGN.

AT the November meeting of the Junior Institution of Engineers a kinematograph film showing the construction, erection and operation of the watertube boiler was exhibited.

Mr. J. K. Muir, of Babcock and Wilcox, Ltd., in some prefatory remarks, briefly reviewed the history of the early application of steam, and the type of boilers used in its generation, and said that in 1917 marine engines were still using steam at 5 lb. pressure, which current opinion considered the maximum for safety.

The advent of the watertube boiler and its present method of construction enabled pressures of 600 lb. and a final temperature of 800 deg. F. to be used, and there were in existence boilers steaming at still higher pressures. The present day tendency was towards large units.

The increase in pressure had necessitated increased thickness of plates, and led to riveting difficulties—the Continental practice of welding steam drains had not yet found favour in England. The superheater portion of the modern high pressure boiler called for great care in the selection of material, and the rapidly increasing steam temperatures now asked for indicated the near approach of the point where ordinary mild steel could not be used. Metallurgists were well aware of the limitations of the ordinary materials, and at the recent World Power Conference it was predicted that through their researches appropriate material for still higher temperatures and pressures would be forthcoming.

## ALTERNATING CURRENT BRIDGE METHODS.

The following typographical error appeared in the article entitled "Alternating Current Bridge Methods" by B. G. Churcher, which was concluded in our last issue.

On page 546, col. 2, equation should read

$$\cos\varphi = \frac{[R_4 + \omega M(\delta_3 + \delta_{34} - \delta_4)]}{(R_4^2 + \omega^2 M^2)^{\frac{1}{2}}} \doteq \frac{R_4}{(R_4^2 + \omega^2 M^2)^{\frac{1}{2}}}$$

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# THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

## Surprises at the Annual Festival Dinner—Splendid Work of N.E. Coast Committee—Further Increase in Numbers of Applicants Assisted—Sale of "The Electrician's" Silhouette Portraits.

THE annual Festival Dinner of the Electrical Trades Benevolent Institution was held at the Trocadero, London, on November 14th, Mr. L. G. Sloan presiding over a company of some 200, including many ladies.

Proposing "The Electrical Trades Benevolent Institution," the President said it was a proud moment of his life that he, a Scotsman, should be chosen to preside at a Festival Dinner for the purpose of extracting money from the pockets of Englishmen! They were, however, drawn together in a common cause, and everybody would agree that it was a good thing for members of the same trade to meet together from time to time in a happy social way for the purpose of gathering in funds to help those who were in less prosperous circumstances.

It was well known that if two substances were rubbed together, they would become electrified, and would be attracted to each other. He hoped that as the result of that gathering, those present would be attracted to one another, and would form new friendships; at the same time it was also to be hoped that old friendships would be renewed, and that they would all be attracted in a newer and a better way to the Electrical Trades Benevolent Institution.

We lived in a wonderful age, and belonged to a wonderful industry, of which we must be proud, because there was no industry which had such a variety of activities as the electrical industry, from heavy machinery to the most delicate electric lamp. This year was the jubilee of the invention of the electric lamp, but we were so modest that no fuss had been made about it. At any rate, he had not noticed it, and yet in that time the electric lamp had been brought almost to perfection.

It was 40 years ago that he saw on the Embankment the beautiful new white light of the arc lamp. Things, however, had changed since then. The beautiful white light of the arc lamp had turned to the yellow light of the incandescent lamp; then the light of the incandescent lamp, which had started by being yellow, had turned to white. Now everybody seemed to be using the white light; and that was where the trouble came in in the electrical industry. Changes were happening every day, and so we found people out of work or in distress. Styles changed, and something which it was thought was going to be good for all time was found to be useless the next day. It was because of this that some far-seeing men a few years ago started the Benevolent Institution. The way it was administered must appeal to everybody because it was done in such a way that nobody receiving assistance lost his self-respect.

### Growth of Institution's Activity.

Dealing with the affairs of the Institution, the President expressed thanks to the stewards in different parts of the country, and the various Committees, for the splendid work they had done. He specially mentioned the North-East Coast Committee, which, with the help of Mr. R. Robson, had raised £400 by means of an "electric hare" competition, and, further, was going to hold a dance on St. Andrew's night, November 30th, with the object of still further augmenting the funds of the Institution.

That the work of the Institution was growing was shown by the fact that whereas in 1925 help was given in 57 cases, last year 221 cases had been dealt with, and already this year the number assisted was over 300. In addition, the Executive Committee had been able to grant seven pensions. Was not that a wonderful thing?

"Consider," said Mr. Sloan, "the case of a man who had worked all his life in the industry, and in his old age found himself deaf and perhaps partially blind, without funds, and compelled to live in a common lodging house. Imagine his feelings when he was suddenly told he was going to have a pension and would be able to go out into the country and spend the rest of his life in peace and comfort. Is not that something worth while?" He therefore asked everybody to open their purses and provide those men who were willing to give even more time to the affairs of the Institution with the necessary money to carry on the good work. When they themselves were in prosperity, that was the time to help their brothers who were in adversity. The Institution had invested funds amounting to £35 000, but it should not be very difficult to increase that to £50 000, and then to £100 000, because the day was coming when it would be badly needed, not through the fault of the unfortunate people who were being helped, but simply through force of circumstances. The members of the Committees were willing to give more time and work in extending the activities of the Institution, and he felt it was everybody's duty to help this very good cause.

### A Point for Employees.

Employers, too, should make it known to their staffs that they could become Associates for the modest subscription of 5s. per annum, a subscription which carried with it the right to call on the Institution for help in time of sickness or distress. In calling attention to cheque forms with fountain pens attached that were being distributed, the President asked that small subscriptions should not be withheld just because they were small. He also mentioned in connection with a small filing case with the appearance of a book, that was distributed to everybody present, and containing chocolates in the case of the ladies, and cigars and cigarettes in the case of the gentlemen—and, by the way, generously provided by the President—that this should be used for filing the various reports relating to the Institution.

The Secretary later announced that the amount of subscriptions collected at the dinner was £220, and that the total for the year was £2 788. Some details of the various collectors' lists were given as follows:—

Mr. L. G. Sloan, £1 307; Mr. J. Y. Fletcher, £453; Mr. E. Wilson, £225; Mr. J. M. Sims, £150; Mr. J. N. Stephens, £143; Mr. C. Wilson, £120; Mr. A. G. Beaver, £83; Mr. Ll. B. Atkinson, £38; Mr. P. Rosling, £36; Mr. C. H. Cox, £36; Cardiff and District Branch, £35; Mr. H. Howitt, £34; Mr. F. A. B. Lord, £32; Mr. L. C. Penwill, £26; Mr. W. B. Esson, £25; Mr. A. J. Cridge, £20; Mr. F. H. Nalder, £12 12s.; Mr. A. H. Allen, £10.

The only other toast was that of "The President," which was proposed by Sir William Noble, and acknowledged in a few words by the President. Sir William related several instances of the generosity of the President in connection with Scottish societies, to which both he and the President belonged, although he discovered that Mr. Sloan's generosity was generally anonymous. As a Rotarian, the President had also gone to great trouble and expense in promoting Anglo-American relations.

A number of silhouette portraits cut in paper by the well-known silhouette artists, Baron Scotford and Peggy Newall, were completed during the evening, and a selection was on view before the departure of the guests.

These silhouettes were specially done for THE ELECTRICIAN, and are being offered for sale in aid of the funds of the Electrical Trades Benevolent Institution.

No particular price has been fixed for these portraits—except that purchasers are expected to give not *less* than 2s. 6d. for each copy—and as the entire proceeds of the sale will be handed to the Electrical Trades Benevolent Institution, it is hoped that readers desirous of purchasing copies of silhouettes, either of themselves or of friends, will make a generous estimate of the worth of these portraits. Arrangements have been made to supply duplicates of the portraits in the form of calendars, and the additional receipts on this account will also go to the E.T.B.I. fund.

On the opposite page we reproduce a selection of the silhouettes secured during the evening. Space does not permit us to reproduce the entire collection, but we may mention that the subjects of other portraits not represented here include Messrs. P. Millns, G. E. Riley, E. G. Batt, A. G. Beaver, F. B. O. Hawes and Miss C. Haslett.

Already a considerable number of orders has been received and we hope to be able to announce at an early date the amount realised by this sale.

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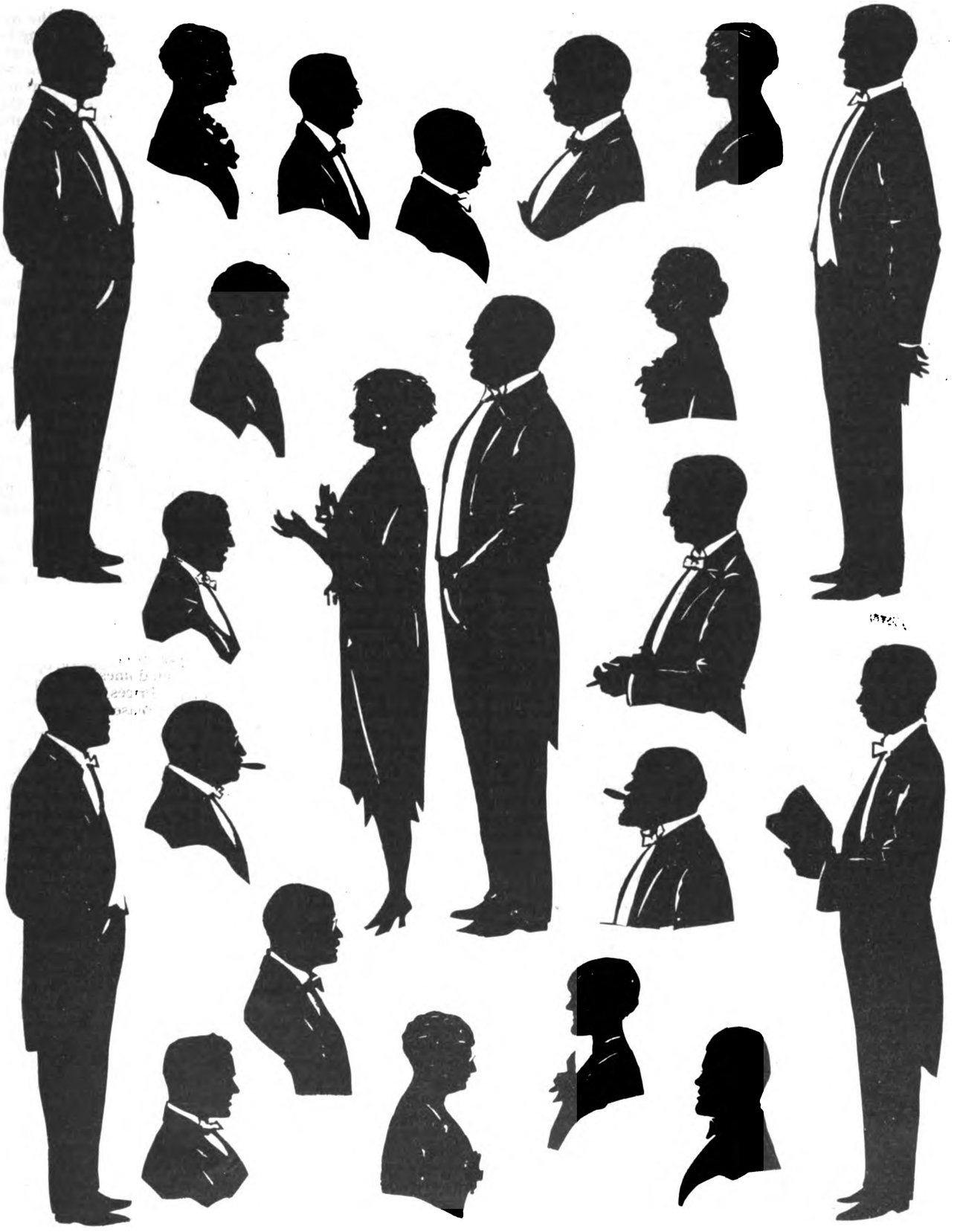

## SOME E.T.B.I. SILHOUETTES.

*WE reproduce on this page a selection from a large number of silhouette portraits of notabilities at the annual festival dinner of the Electrical Trades Benevolent Institution, specially cut for* THE ELECTRICIAN *by Baron Scotford and Peggy Newall. Copies of these and other silhouettes completed during the dinner are being sold in aid of the funds of the E.T.B.I., and readers desiring copies, either of themselves or of friends, should send their orders to the Editor of* THE ELECTRICIAN. *There is no fixed charge, but it is hoped that orders will be accompanied by not less than 2s. 6d. for each copy.*

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# CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

## "A Lesson for Contractors."

[To the Editor.]

Sir,—You are right in what you say about contractors avoiding the sale of electrical fittings and appliances. Honestly I think that many of these men look down upon shop sales as being rather undignified—they like to be considered as engineers, and not as tradesmen. The hardwareman is not the only trader catering for electrical wants; we have the drapers, cycle dealers, toymen, and many others—including undertakers. I have for many years tried to get this home to members of the E.C.A., but we still have contractors hiding themselves upstairs in offices, with their entire stock in a Tate's box.

It is the future that we must look to, for the children of these electrical "non-shopkeepers" will curse them for allowing other trades to take away what should be their livelihood. It will be a repetition of the visitation of the sins of the fathers upon the children.

The electrical contractor who has no shop or stock to show his customer, is on a par with a wholesaler who is rated as a discount snatcher, because he gets the orders and sends them to the maker, and does not deliver from his own stock.

I am a shop keeperand I am proud of the fact; moreover, it is quite a profitable side of my business.—I am, etc.,

Richd. A. Parsons.

49, Westgate and Bull Lane.
Gloucester.
November 17th.

[To the Editor.]

Sir,—I was very interested to read your article "A Lesson for Contractors" in the Current Topics of your issue of November 16th, and while my Association strongly deprecates the entry of ironmongers into the electrical contracting industry unless they are electrically qualified, the case which you cite does not fall within this category.

Being in possession of a copy of "The Essex County Standard" to which you refer, I can only conclude that the firm of ironmongers in question is Messrs. Joslins, Ltd., of 108 and 109, High Street, Colchester.

It may interest you to know that Messrs. Joslins, Ltd., was established in Colchester in the 1890's, and although it is true that they have an Ironmongery Dept., it is equally true that they carry on a comprehensive business as *electrical*, hot-water, sanitary and agricultural engineers, motor and cycle agents, builders' merchants, cabinet makers, furniture dealers, upholsterers, china and glass warehousemen, etc.

Messrs. Joslins, Ltd., claim to be the first electrical contractors in Colchester, and if further examination had been made of the advertising propaganda in "The Essex County Standard," it would have been obvious that they have been established as electrical contractors for a considerable period of years, as a very large proportion of their advertisement space was devoted to outstanding contracts which they had carried out.

Messrs. Joslins have a definitely established electrical department, and a qualified electrical manager, are members of the Electrical Contractors' Association (Inc.) and are also registered by the National Register of Electrical Installation Contractors.

May I add that these publicity efforts by contractors are substantially on the increase, as evidenced by the considerable amount of propaganda which I receive from them from time to time.—I am, etc.,

L. C. Penwill,
General Secretary, The Electrical Contractors' Association.
15, Savoy Street,
London, W.C.2.
November 16th.

[As we clearly pointed out in our note, we have nothing but praise for the enterprise of Messrs. Joslins. Furthermore, we commended such big ironmongery firms as are taking the trouble to set up proper electrical departments operating under properly qualified electrical management; these we cannot avoid regarding as legitimate electrical businesses. The main point of our remarks was to emphasise our repeated warnings to electrical contractors of the very real competition that is coming from ironmongers of all classes, and not merely from the large and properly equipped organisations such as that at Colchester. Although, as we have pointed out, the average ironmonger is not properly equipped to sell and "service" domestic electrical appliances, it is a perfectly natural thing for members of the public who go to the ironmonger primarily for a box of tintacks or some gardening tool to show interest in a display of electrical goods. It is unfortunate that while people quite naturally call in at the ironmonger's shop for almost any ordinary domestic requirement they do not so readily call at the electric shop—when there is one—for their electrical requirements. If Mr. Penwill could persuade all his members to establish proper electric shops and showrooms, he would go far towards meeting the menace of non-electrical competition on the retail side of our industry.—Ed.]

## A Suggestion for the E.D.A.

[To the Editor.]

Sir,—Now that the annual electrical "push" is beginning again, I wonder whether some comments would be of value, from one who, although in touch with the question of domestic electricity supply, is not taking part in the actual work, and, therefore, less likely to be confused by too much detail.

To my mind there are four problems which go to make up the whole—namely: (1) generation and transmission; (2) distribution; (3) domestic appliances; (4) consumers' wiring. I would deal with them seriatim as follows:

(1) *Generation and Transmission.*—For the purposes of my remarks I have assumed that under the national schemes of the Central Electricity Board, the supply authorities will receive energy at about as low a figure as they could themselves reach, and that, furthermore, as they will know in advance their actual price, they can estimate the selling figure much more accurately than when depending solely upon known generation.

(2) *Distribution.*—Many supply authorities have laid down distribution systems in recent years to cater for the domestic supply, and it is only in the minority of cases that the domestic supply has not been encouraged because of the consequent expenditure on the distribution system which would be rendered necessary.

(3) *Domestic Appliances.*—These have been improved in every way lately, and there is practically no domestic operation which cannot be dealt with electrically. Prices of appliances are on the high side, but no doubt the increased demand will see a corresponding reduction in price.

(4) *Consumers' Wiring.*—Here's the rub! It appears to me useless to concentrate on the first three points and to neglect the most important—*i.e.*, the user. There must be thousands of premises being wired for lighting only all over the country, and in how many cases are ample power plugs being installed generally throughout the house? To go on increasing the lighting load simply means reducing the load factor, and, hence, increasing the overall cost to the supply authority of the bulk supply, and, therefore, to the consumer. To assume people will, of course, use electricity for lighting but for no other purpose to begin with, seems to be proceeding on the wrong basis.

May I say I have an electrically operated house myself, and when visitors stay there they say to my wife, "How delightful it is to have things run so simply; but, of course, your husband is an electrical engineer." Again, the wrong idea; for, surely, it would not be taken for granted that because one used a gas cooker, geyser and copper that the husband was, *ipso facto*, a gas engineer!

Nevertheless thousands of pounds are being spent on "assisted wiring" schemes and in new houses built by building contractors up and down the country; and this expenditure is going to be of small value to the supply industry.

It will be said that criticism which is destructive is of no help, and I now come to my proposal of better things. First of all, it must be remembered that the average householder knows very little of the uses of electricity except for lighting, and, in spite of the E.D.A. and similar advertisements, he is not attracted, because he has heard that electricity is expensive. What is far more important, however, is that he has no idea where to go to get reliable advice. The supply authority is suspect because it desires to sell him energy, and the contractor is similar placed because he wants to sell appliances.

My suggestion is, therefore, that the E.D.A. should draw up a comprehensive wiring specification both for lighting and ample power use, and from that ascertain the approximate cost per joint for each class of supply. This could outline the number of lights and lighting plugs which would be of permanent value (don't overdo it, of course), and also the number

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of power plugs on the basis of the rooms in the house. An estimate could be made of the number of units used for each purpose during a year, and so enable the prospective consumer to appreciate beforehand the extent of his liabilities.

Lastly, the E.D.A. could provide the consumer with the name of his supply authority and the names of such registered contractors as are in his immediate neighbourhood.

To carry out this plan, the various steps would appear to be:—

1. Advertise in the Press that anyone who is interested in having his house wired should send a postcard to the E.D.A.
2. On receipt of the postcard the E.D.A. should send him a pamphlet giving the approximate cost of operation of an electric house at (say) 1d. per unit.
3. Follow this up after a few days with a letter stating they will be pleased to provide him with a general outline of how many lights, plugs, etc., should be installed for convenience of working, together with a wiring specification for such, and the names of the local registered contractors, the whole being paid for at the cost of (say) 2s. 6d.

To my mind this is the only way I can see in which you will get the consumer to take serious interest in the domestic supply, and it is certain he will not do so until there is some body which can be looked upon as impartial to a great extent.

I am, etc.,

November 12th. "INTERESTED."

## "Hot Spot Temperatures."

(TO THE EDITOR.)

SIR,—In my opinion the advice on the safe loading of transformers given by the Hackbridge Electric Construction Co., Ltd., in the letter published in your issue of November 16th, would, if put into practice, wreck most power and lighting transformers working under normal service conditions.

In the latter half of the letter they reiterate their claims that "the hottest oil temperature is a very satisfactory indication" of the true loading of a transformer, and that a hottest oil temperature of 90 deg. C. is "the test of how much load to put on any individual transformer."

Under most operating conditions it is highly dangerous to allow the oil temperature of any oil-immersed transformer, either of good or of bad design, to reach 90 deg. C. The whole matter is fully explained in the paper published in the August issue of the "Journal" of the Institution of Electrical Engineers, where it is shown not only that under quite common operating conditions oil temperatures of 60 deg. C. and 70 deg. C. may be excessive, but also that the oil temperature is no guide to the safe loading of a transformer.

As a simple example, consider a 250 kVA British Standard rated transformer of good thermal design supplying a typical residential load when the surrounding air temperature is 15 deg. C. (i.e., 59 deg. F.) If the oil temperature were allowed to reach 90 deg. C. the load on the transformer would be somewhere between 400 and 600 kVA. Such a load in these circumstances would do serious harm.

The hottest spot temperature indicator, or the safe load indicator, far from permitting an oil temperature greater than 90 deg. C., would protect the transformer, by preventing such a high temperature from being reached.

The Hackbridge Electric Construction Co., Ltd., agree that every transformer must have a "hottest spot," but say that their transformers have no "hot spots." They avoid the obvious contradiction in terms by giving a definition to "hot spots" other than the simple meaning of the words, viz., by restricting the term to those "hot spots" only which the designer did not know about or allow for in the design. So far as I am aware, no instruments have ever been suggested for dealing with such unnecessary "hot spots."

It is better to use only the term "hottest spot" since it is self-explanatory. Every transformer must have a "hottest spot" or maximum temperature. Since this hottest spot temperature determines the maximum safe load a transformer will carry thermally, hottest spot temperature indicators are valuable in showing when the transformer is fully loaded. The safe load indicator shows, in addition, what proportion of its maximum safe loading the transformer is actually carrying at any time. With this instrument the true safe load capacity of the transformer (which under all normal operating conditions is considerably greater than the British Standard rating) is indicated and may be utilised. The instruments can, however, only be used on transformers of good thermal design where the "hottest spot" has been located and its temperature accurately predetermined.

The Hackbridge Electric Construction Co., Ltd., mention some writings which they say bear out their claims, but they do not give their reference or any details. Since, however, they state that these are of American origin, it will be relevant if I repeat the quotation, given in my previous letter, from the official, considered statement of manufacturers and users of transformers in America that "loading apparatus on the basis of oil temperature alone as a guide is not recommended."

Finally, as further evidence of the real value of the hottest spot temperature indicator and safe load indicator, it may be stated that one of these instruments has been specified for every 132 kV transformer being built for the National Electricity Scheme.—I am, etc.,

E. T. NORRIS.

Chorlton-cum-Hardy.
November 16th.

## "A New Description of 'j'."

[TO THE EDITOR.]

SIR,—The correspondence on this has had little reference to the point which I have tried to make, that there are advantages in considering $j$ as a root of 1 rather than of $-1$. As a further illustration, we may extract the cube roots of $-1$. Seeing that $(-1)^2=1$, we may write $-1=1^{\frac{1}{2}}$ and also $=1^{\frac{3}{2}}$ and $1^{\frac{5}{2}}$.

Hence $(-1)^{\frac{1}{3}}=1^{\frac{1}{3}}$, $1^{\frac{3}{3}}$ and $1^{\frac{5}{3}}$.

Drawing the vector diagram and taking the co-ordinates of the three points $P_1$, $P_2$ and $P_3$ we get the cube roots in the other form as $\frac{1}{2}+j\frac{\sqrt{3}}{2}$, $-1$, and $\frac{1}{2}-j\frac{\sqrt{3}}{2}$.

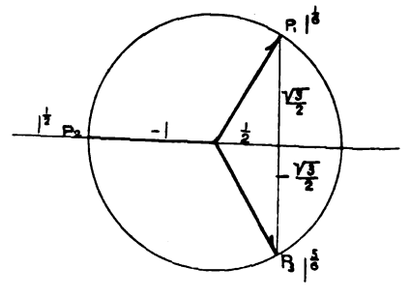


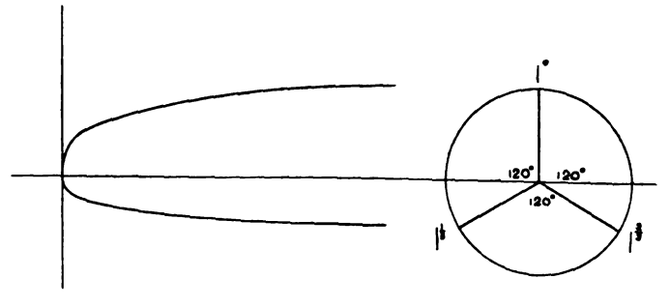

**Diagram showing extraction of the three cube roots of −1 by rotating vectors.**

The subject may be further extended to give the unreal curves which are usually treated as if they could not be graphed. Take the curve $y=x^{\frac{1}{3}}$.

This may be written $y=x^{\frac{1}{3}}1^{\frac{0}{3}}$, $y=x^{\frac{1}{3}}1^{\frac{2}{3}}$, $y=x^{\frac{1}{3}}1^{\frac{4}{3}}$.

The first curve is, of course, the ordinary one. To draw the two second curves we have to go into the plane at right angles to the plane of the paper. The diagram shows the vectors at angles of 120 deg. in the plane at right angles to the paper and the two curves drawn in perspective.

Whether this has been done before or not I do not know, but it is not set out in the text books, and there seems to be no reason why it should not be. It is certainly new to the great mass of students, and this is sufficient reason for its publication. The equation to a circle written $y=(1-x^2)^{\frac{1}{2}}$ has unreal roots when $x$ is greater than 1, but by this method the curve may be graphed in the unreal parts quite simply.




**Graph of the three curves of $y=x^{\frac{1}{3}}$, two displaced into the third dimension.**

When one deals with such a curve as $y=x^x1^x$, the number of unreal roots becomes bewildering, but it is not impossible that if graphed in the third dimension—as many as convenient—something might appear in the nature of a law for their formation. Whether these methods are useful for electrical and physical calculations I do not know, but it is quite likely that they may be found to be of use in this direction.—I am, etc.,

C. TURNBULL,
Borough Electrical Engineer.

North Shields.
October 29th.

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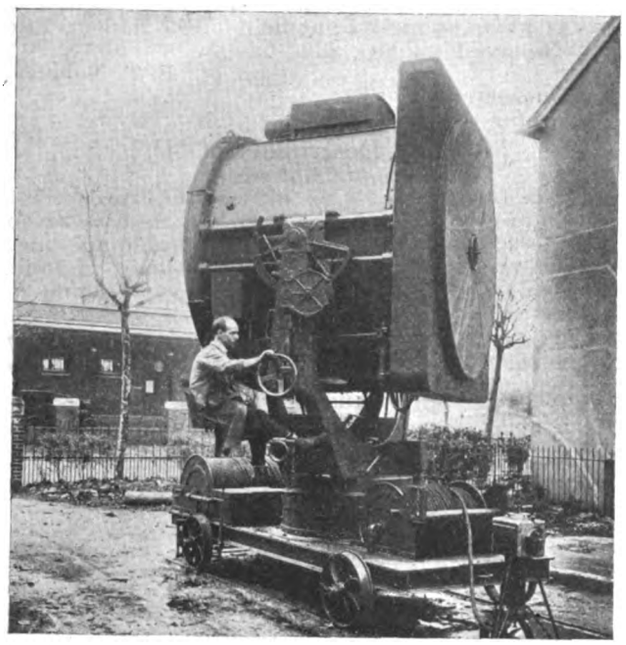
# LARGE SEARCHLIGHTS.

## British-made Projector Ordered by European Power.

A NUMBER of very large searchlight projectors for coast and frontier defence purposes are now being produced by the London Electric Firm, Croydon. The equipment illustrated below, which is one of two projectors ordered by a



One of two 200 c.m. diameter searchlights produced by the London Electric Firm.

European Power, has a mirror of 200 c.m. diameter. The mirror is parabolic in shape, with wire and lead back and copper bonding ring very carefully supported and centred in the projector, the weight being taken by strong flat springs housed in gunmetal castings arranged to give just sufficient resiliency to allow for the necessary contraction and expansion likely to be experienced.

The projector has a high intensity lamp burning with a current of 200 A, and requires a line voltage of 90 or 100. A motor-driven extractor ventilator is fitted to the top of the lantern with supplemental outlets which may be opened or closed as desired. Ventilators are also arranged in the lower part of the barrel with an adjustable internal louvre, so that the ventilating aperture may be restricted or closed at will. Further ventilation is arranged through a suitable baffled opening at the rear of the mirror.

A venetian signalling shutter is provided, and this also carries the front closing glass, which is in sectors. The sectors are held in place at their periphery by removable spring brass clips, and at their centre by a rotatable rose possessing the unique feature of a gate. The gate may be turned to any position in the plane of the glass, enabling any sector to be readily removed independently without disturbing the remainder.

All usual accessories are furnished, including observation windows, an optical focus finder, sighting tube, illuminated degree indicators and pointers, and sliding doors in the lantern; an ammeter and voltmeter are fitted within the base with glazed observation windows and three hinged doors for access to the ring and brush connections, motor elevating gear box, etc.

The high intensity lamp is of very robust construction, having a rotating positive carbon and automatic and hand-feed gear for each carbon, the latter being brought outside the lantern for easy manipulation. The lamp is designed to avoid any shadows being cast on the mirror, and its small bulk causes practically no obstruction.

Three different systems of control are provided, namely, local hand, pan handle and distance electric. The shutter may also be worked from the controller at a distance, and may be thus worked more quickly than by hand. The vanes will open even when the lantern is pointing vertically.

As equipped in the photograph, the projector is mounted on a four-wheeled truck, together with the necessary cable drums, which have ring and brush connections, brakes and check pins.

# BATTI-WALLAHS' LUNCH.

## Sir Hamar Greenwood Emphasises the Importance of Overseas Trade.

SIR HAMAR GREENWOOD, M.P., was the principal guest at a luncheon of the Batti-Wallahs' Society, held at the Hotel Cecil, London, on Wednesday, when Mr. R. W. Hughman presided over a gathering of about 120 members and guests, the latter including Lord Drogheda, Major-General Sir Philip Nash, Sir E. Montague Hughman, Lieut.-Colonel K. Edgcumbe, Mr. S. T. Allen, Mr. W. McClelland, and Mr. V. Watlington.

Sir Hamar Greenwood—who, Mr. Hughman explained, had beaten that other celebrated "galloper," Lord Birkenhead, in the race to the City—said he was glad to be one of the few passengers on the good ship "Batti-Wallah," the vessel which had the biggest crew in history. Although he disclaimed any pretensions to authoritative knowledge of electrical matters, he had, he said, done his best, in the House and outside, to further the interests of the British electrical industry.

Referring to Sir Philip Nash as the king of the electrical world in England, employing, as he did, some 35 000 people, he said he thought the electrical industry was one of the most hopeful of all the trades in this country. He desired, however, to draw attention to the fierce and determined competition with which we were faced from the U.S.A. and its new President, who were now going into some of our best export markets.

Although about one-quarter of the entire population of the world was comprised of British subjects, the vast majority of whom were governed by, and had their tariffs controlled from, Westminster, we were not taking full advantage of our opportunities. We had peoples in various stages of development—some changing from beads and grass to trousers and silk stockings—and we had, under the British flag, a vast number of people who could assimilate every kind of article we could make or sell.

Yet we were not holding our own in export trade, and though the electrical industry was doing well in the home market, the export position at present was not too good. If we could only see that our future prosperity was absolutely bound up with the development of our own Empire, many of our present problems, including the serious one of unemployment, would readily be solved.

### Encouraging Industry.

Real improvement in conditions could only result from the active Government encouragement of industry. The electrical industry had done a great deal to help itself, but it was beyond the power of individuals to do it all. It must be remembered that the success of this country depended, not on local government, but on industrial output, besides which other considerations were of minor importance.

The rest of the markets of the world, he said, were gradually closing against us, and tariff walls were growing ever higher. If we had some sort of tariff wall he thought the electrical industry would have a better chance.

During the war we lost many of our best overseas markets, and since the war, he regretted to say, we had not won them back. The trouble was due not so much to ourselves as to the development that had taken place in other countries. If we all thought in terms of employment and industry we would go far towards the full development of our great Empire.

Mr. W. McClelland proposed a vote of thanks to Sir Hamar Greenwood, who, in reply, mentioned that he was able to speak in another place on the Government's wireless and cable merger. The scheme, he said, was a great one, and represented one of the few matters in which the whole Empire was as one.

Finally, he recalled that, even as a boy in Canada, he had been brought up to regard electricity as the hope of the world, and as a Canadian he liked to think that the telephone was invented by a Canadian, although the inventor happened to have been born in Scotland.

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The Postmaster-General announces instructions for official redirection of fully addressed telegrams, due to a change of address, are now recorded free of charge for three months (and for a fee of £1 1s. per annum if continued beyond three months), unless redirection involves transmission of the telegram to another town or other additional service, in which case the telegraph charges at present applicable will continue to be payable.

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# NEWS IN BRIEF.

## Leeds and the National Register—Annual Dinner of Birmingham Electric Club—The British Industries Fair—Chesterfield Contractors to Hold Annual Dinner.

THE average gross receipts per telephone kiosk per annum are about £40.

The new electric traffic control system in Manchester, at the junction of Cross Street and Market Street, was put into operation last week.

Shipley Electricity Committee has met local electrical contractors and agreed upon arrangements as to commission to be allowed in cases where contractors introduce customers to the showroom.

A scheme for converting premises in James Street, Burnley, for use as electricity showrooms, has been adopted by the Corporation. The estimated cost is £2 800, exclusive of wiring and electrical fittings.

Coventry's new system of police telephone boxes was put into operation last week in the central portion of the city, part of Radford and the whole of Stoke, which districts are served by the A division.

The electricity department of Milnrow U.D.C., acting in conjunction with Rochdale Corporation electricity department, recently held, at the Council Offices, an exhibition of electrical appliances for domestic use.

London County Council has been informed that the result of the experiment at the Castelnau housing estate in the supply of electricity for cooking and heating is that generally the tenants are well satisfied.

Notts Education Committee has authorised an electric light installation at Southwell Minster Grammar School, where candles have been used hitherto for "lighting" the top dormitories, and gas in the remainder.

Brighton Corporation has accepted tenders amounting to £5 055 10s., and £19 989 respectively for the supply and erection of structural steelwork and for building work in connection with extensions at North Road sub-station.

The Electricity Supply Rifle League, of which Mr. R. S. Downe is president, is holding its annual dinner, prize distribution and concert at the Talbot Restaurant, London Wall, London, E.C., on December 1st at 6.30 p.m.

A lecture, entitled "The Development and Uses of Electricity in the Home," was delivered by Mr. A. J. Bridge, of the Western Electricity Supply Co., Ltd., before a large audience in the Public Hall, Marlow, on November 6th.

Leeds Electricity Committee interviewed contractors in regard to the assisted wiring scheme and has decided that from January 1st contracts under the scheme shall only be entered into with firms whose names appear on the National Register of Electrical Installation Contractors.

A lecture, organised by the Western Electricity Supply Co., Ltd., on "The Illumination of Factories and Workshops," was given by Mr. W. J. Jones to a large audience of factory managers and others at the Trowbridge Textile School on November 9th. Mr. M. F. V. Clark was in the chair.

The annual dinner of the Birmingham Electric Club will be held at the Grand Hotel, on March 8th, and not on March 22nd as stated in the Club's programme. The date March 22nd, will be occupied by a meeting which will take the form of a discussion, details of which will be announced later.

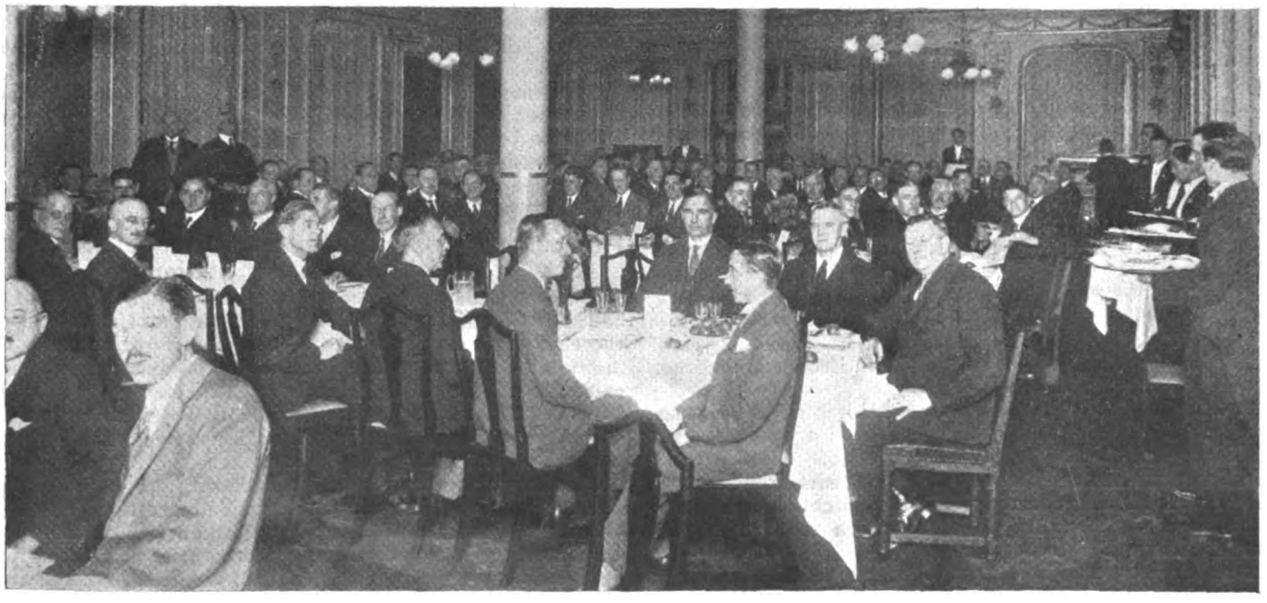
The exhibition of the British Institute of Radiology, incorporated with the Röntgen Society, was opened at the Central Hall, Westminster, last week. It is stated that the new equipment shown is 100% safer for the operator than that which was used two years ago. The exhibition was not open to the public.

The British Engineering Standards Committee has submitted to the Privy Council a petition for a Royal Charter. Under the Charter, the Association will be divided into ten or 12 distinct industrial sections, and these will nominate representatives for election to the governing committee, which will in future be called the council.

The fact that there is an increase of over 300 per cent. in the number of overseas buyers who have promised to attend the next British Industries Fair was revealed on Monday by Mr. Douglas Hacking, M.P., Minister of the Department of Overseas Trade, as a result of the comparison made with the replies received up to the corresponding date last year.

The Chesterfield sub-branch of the E.C.A and its allied associations will hold its first annual dinner on December 6th. The toast of the sub-branch is being left in the hands of Mr. Harry Moss, of Bradford, member of E.C.A. Council, who, it is anticipated, will make some interesting remarks about Compulsory Registration, a matter that has had a great deal of attention given to it by the Chesterfield members.

The A.D.S. Players (Advertising Dramatic Society) are producing on November 26th and 27th, at the New Scala Theatre, "The Eternal Spring," by Peter Garland, in aid of the National Advertising Benevolent Society, under the patronage of the President, Sir Ernest Benn. Last year this youthful but vigorous band of players raised £300 for the great Advertising Charity and they hope this year to be able to hand over at least £500. Tickets are obtainable from the theatre box office, or from Miss L. A. Shaw, 63, Lincoln's Inn Fields, London, W.C.2.



*MEMBERS of the Batti-Wallahs' Society and their guests at the luncheon at the Hotel Cecil, London, on Wednesday. The principal guest was Sir Hamar Greenwood, M.P., a report of whose speech is given on the previous page.*

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# PERSONAL.

DR. J. A. Fleming, F.R.S., has accepted the position of president of the Television Society.

Mr. H. E. Harris has been appointed buyer and stores controller of Graham-Amplion, Ltd., Slough.

The Council of the Royal Society recommends that Sir Ernest Rutherford, F.R., S.be president for the ensuing year.

Mr. B. Forman, of the Boston Electric Supply Co., has been appointed superintendent of the power station at Nuneaton,

Tonbridge Urban Council has appointed Mr. F. Young, of Rainham, as installation engineer. There were 70 applicants for the post.

Mr. E. A. Newman has been appointed chairman of Birkenhead Electricity Committee, and Ald. S. Vaughan chairman of the Tramways Committee.

Mr. J. H. Shepher, who for the last two years has been assistant electrical engineer to Cheadle and Gatley U.D.C., has been appointed borough electrical engineer at Harwich.

Mr. W. B. Sly, inspector of the Reading Post Office engineering department, was presented with a cheque for the purchase of an armchair, on the occasion of his retirement.

Mr. Howard Foulds, secretary of Callender's Cable and Construction Co., Ltd., and its associated companies, has been again re-elected a member of the Council of the Chartered Institute of Secretaries.

Barrow Tramways Committee has accepted the resignation of Mr. J. R. Groves, the manager of the undertaking, and recommended to the Council that he receive a pension. Mr. Groves has been in failing health for some time.

Sir Edmund Wyldbore-Smith has been elected to fill the seat on the board of the Anglo-American Tramways Co., Ltd., vacated by Major-General Sir Fredk. Hugh Sykes, prior to taking up his duties as Governor of Bombay.

In sending a special message to readers of THE ELECTRICIAN, Councillor H. J. Galliers, Mayor of Brighton, says: "I would like to see more electricians giving their services to their town, and helping in the government of the country."

Mr. F. O'Flynn, who has been for several years assistant electrical engineer under the Limerick Corporation, has been transferred by the Electricity Supply Board from the Limerick power station to Enniscorthy, County Wexford, and has been placed in charge of that station and district.

Fulham Electricity Committee has congratulated Mr. M. C. M. Morley, laboratory assistant at the electricity works, upon securing the Kilburn Scott prize for "Fuels and Combustion" awarded by the Northampton Polytechnic Institute to the most successful student during a two years' course in fuel and technology.

Mr. B. C. Holding (the editor of THE ELECTRICIAN) had a narrow escape from a serious accident during the gale of Friday, November 16th, when a slate from a neighbouring building was blown through his office window. Fortunately, Mr. Holding had vacated the room some moments before, for had he been sitting in his usual place the slate would have surely knocked him unconscious, if nothing more serious. See page 591.

Hackney (London) B.C. Establishment Committee recommends: (1) that the salary of the borough electrical engineer, Mr. L. L. Robinson, be based on the "Walker" scale adopted at Ilkley on June 24th, 1920, plus an additional annual amount of 10 % of the salary payable under that scale; and (2) that the Council interviews Mr. A. Watson (Pooley Hall Colliery Co.), Mr. H. J. Harper (Yorkshire Electric Power Co.), and Mr. A. C. Burton (Newcastle-upon-Tyne Electric Supply Co.), with a view to the election of one of them to the position of district engineer (mains).

## Obituary.

MR. R. W. MATTHEW, on November 8th, aged 49 years. He was Director of the Trades, Empire and Economic Division of the Department of Overseas Trade.

MR. GEORGE GIBSON, on November 9th, as the result of a motor accident at Colchester. He had been a traveller with S. G. Leach and Co., Ltd., for twenty years.

MR. SAMUEL ALBERT KERSHAW, aged 44 years, from injuries received whilst motor cycling. He was switchboard engineer at the Hereford Electricity Works and a member of the Palladian Lodge of Freemasons.

HERR W. WINKLER-FORAZEST, aged 71 years. He was a pioneer in electrical engineering work in Austria, having been associated with the construction of the first Edison and Gramme machines in that country. He was for many years city electrical engineer of Klagenfurt.

# LEGAL INTELLIGENCE.

## The Institution of Electrical Engineers and Protection of its Members.

IN the Chancery Division, on November 16th, counsel on behalf of plaintiffs in the action brought by the Institution of Electrical Engineers against T. R. Shaw moved for an injunction to restrain the defendant from making use of the initials A.M.I.E.E. so as to imply that he was a member of the plaintiff institution.

Defendant appeared in person, and did not oppose the motion. Counsel asked for a perpetual injunction as claimed and delivery up of all documents on which defendant had used the initials A.M.I.E.E. Defendant, he added, had had an ample warning extending over two years. For a time he was a student member, but was struck off because he did not pay his subscription.

His lordship granted an injunction as claimed, and ordered defendant to pay the costs up to date.

## The Barton Power Station.

At the conclusion of the hearing, in the Court of Appeal, on November 16th, of the appeal from the judgment of Mr. Justice Talbot, given at the Assizes, dismissing the action which Mr. Arthur Farnworth brought against the Manchester Corporation, the details of which were given in our last issue, their Lordships reserved judgment.

## Sequel to General Strike.

The Court of Appeal on Tuesday allowed the appeal of the defendants, Messrs. Clement Richard Attlee, M.P., M. Aylward, E. J. Rigden, George Groves, H. Lazarus, J. Lewis, and W. P. Parsons, members of the Stepney Electricity Committee, against the judgment given against them in the King's Bench Division before Mr. Justice Avory and a special jury. The plaintiffs, Messrs. G. Scammell and Nephew, engineers, of Fashion Street, Stepney, claimed from the defendants damages for an alleged conspiracy whereby, in breach of a contract, the electricity supply was unlawfully cut off from their premises during the general strike in May 1926. In delivering judgment, Lord Justice Scrutton said the defendants invoked the protection of the Public Authorities' Protection Act. The Act was only needed if the acts complained of were legal. If the acts were done with a desire to injure a person or assist some person or cause without the honest belief that they were covered by statutory authority, the Public Authorities' Protection Act was no defence. The burden of proof of dishonest motive was on the plaintiffs. He (the Lord Justice) thought the Electricity Committee made a mistake in acting without ascertaining what the Government would do in the emergency, but he could see no evidence of any personal feeling against the plaintiffs, or even that defendants knew of their existence. He thought that the finding of the jury that the defendants were not acting in good faith was so destitute of foundation as to be perverse. There was no evidence on which the jury could find that the acts were not in *bona fide* execution of a statutory duty, and in his view the action failed, and must be dismissed with costs. If he were wrong in that view he would have held that there must be a new trial, on the ground of misdirection by the Judge.

Lords Justices Greer and Sankey concurred. Defendants were awarded costs.

# PLANT REQUIRED FOR VICTORIA.

## Particulars of Generating Plant to be Installed at Yallourn Power Station.

THE Australian Parliament has approved a report of the State Electricity Commission of Victoria on the extension of the electricity supply system. The report recommends that approval be given to the increase of the existing generating capacity of the State Electricity Scheme by 75 000 kW installed capacity or 50 000 kW available capacity, the first unit of 25 000 kW to be available for service early in 1931; the whole installation to be completed in 1933; that the generating plant be located at Yallourn, and be based upon the combustion of brown coal from Yallourn open cut; that the main transmission line from Yallourn to Melbourne be duplicated with two additional circuits, the first to be ready for service by 1930; that a terminal station be erected at the Richmond site; and that immediate authority be given for the preparation of detailed designs and specifications and calling of tenders for the whole of the works embraced in the scheme.

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# HARRISON-WOOD PATENT.

## New Invention to be Demonstrated—Brief Details of the Device.

FOLLOWING upon the announcement in our last issue that Mr. W. Harrison and Coun. T. Wood had lodged a patent for a device which, it is claimed, will amplify any voltage applied across its input, we learn from Mr. Robert Lee, borough electrical engineer and manager, St. Helens, that he has received intimation that on a date not yet arranged, the patentee will submit his apparatus to the Electrical Department for testing, the test to be carried out in private.

In this connection it is interesting to note that Coun. Wood is reported to have said, in an interview, "that there is no question as to its passing any tests, as it has been actually working for many months this year," and though we have endeavoured to obtain details of the machine the informationhas not yet been secured. Coun. Wood is also reported as having said "it converts static power into current," and yet again, "we do not claim that we can produce something from nothing. What we do say is that given the original supply we can magnify it five times, and produce five times the power at the original cost of the supply."

The "Liverpool Post" was present at a test of the device, and according to that paper, "the machine is contained in a small wooden box and in a cylinder linked alongside. A plug was placed in the ordinary electric light holder, and the flex attached to the box. A switch was turned on, lighting two ordinary electric lamps (from the main supply) and showing, on an amp-meter attached, that 1½ amperes were being used from the main. Another switch was turned on, and five lamps ranged along the wall were simultaneously lit, while the amp-meter still registered the original 1½ amps."

A picture of the apparatus, together with Mr. Harrison is given on page 591.

# CABLE MERGER BILL.

## Sale Provisions in New Bill—Transfer of Lease to Post Office.

IT will be remembered that details of the report of the Imperial and Wireless Conference, 1928, which was appointed to examine the situation which has arisen as a result of the competition of the Beam wireless and cable services, were published in THE ELECTRICIAN of August 3rd last.

In the Imperial Telegraphs Bill, which was published on November 16th, and came up for second reading in the House of Commons on Wednesday, provision is made for the sale of all the Government's cable undertakings. These are to be transferred to a Communications Company, which will acquire also all the communication assets of the Cable and Marconi Companies. The Communications Company will hold the lease of the Post Office beam stations, and will have a capital at its inception not exceeding £30 000 000. Under the Bill, authority is given for the sale to this company, as from April 1st, 1928, of the following Government undertakings: the Pacific Cable Board's cables; the West Indian cable and wireless system, and the Imperial Atlantic cables.

Provision is made for the dissolution, on a date to be fixed by Order in Council, of the Pacific Cable Board. The terms of transfer of the Government's cables were set out in the report of the conference of representatives, referred to in the first paragraph.

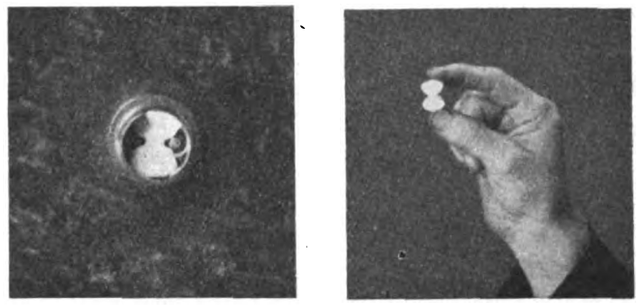
There is to be an undertaking by the Communications Company to meet the annual service of the outstanding debt on the Pacific Cable Board as on April 1st, 1928, and to pay in addition a capital sum of £517 000 for the Pacific cables, together with interest at 5%, as from April 1st, 1928. The company is also to pay £300 000 for the West Indian cable and £450 000 for the Imperial cables.

No reference is made in the Bill to the Post Office Beam services, but it may be recalled that it is proposed to lease them for twenty-five years at a rental of: (*a*) a basic sum of £250 000 per annum; (*b*) as from April 1st, 1931, an addition equivalent to 12%, on any increase in the company's profits (from communications services) above the standard revenue; and (*c*) a payment of £60 000 to be paid in such manner as may be agreed.

The Transatlantic telephone service was extended on November 1st to the town of Puebla, in addition to other towns in Mexico to which the service is already extended.

# A NOVEL LAMP LOCK.

WE have received from Mr. H. Rhodes, of 14, Wall Street, Barnsley, particulars of a novel lamp lock which is the subject of a patent application. The device was exhibited at the International Exhibition of Patents in October last, and was awarded the 1st prize and bronze medal of the Electrical and Wireless Section. As its name implies, it is a device for fitting to existing lampholders for the prevention of the unauthorised removing of lamps. The lock is shown in the accompanying illustrations, and the only tool necessary for fitting is a round $\frac{1}{16}$ in. file to make the bayonet socket a little deeper than is usually the case. The device is made of rubber and rests between the two plungers in such a way as not to interfere with their contact with the lamp. In order to place one of these locks in position it is necessary first to unscrew the top ring so as to release the top and bottom valves of the holder; the rubber locking device should then be placed between the two plunger contacts and the complete holder reassembled. Before tightening the top ring, however, the lamp should be inserted, whereupon the ring may be screwed up as tightly as possible, when, it is claimed, the lamp will be securely locked. The ring may be tightened by means of a small pair of gas pliers, while, should the lamp require to be changed at any time, a few turns of the top ring will be sufficient to ensure the easy removal of the unwanted component. We are given to understand that locks of this type have been in use at various works, collieries and places of amusement in positions where lamps were known to have been stolen, and they have served their purpose.



Illustrating the lamp locking device described below. On the left the lock is shown in position, while on the right it is seen ready for insertion in a holder.

# SOCIAL SIDE.

AT the conclusion of the recent exhibition promoted by the Weald Electricity Supply Co., Ltd., the demonstrators and staff were entertained to supper and a dance. In the unavoidable absence of Major Grace, engineer and manager, Mr. P. G. Hobbs, district manager, presided, and expressed the thanks of the company to all those who had worked to make the exhibition the success it proved to be.

The results of matches shot during October under the Electricity Supply Rifle League are as given in the following table:—

DIVISION 1.

| | | | |
|---|---|---|---|
| City A (Jackson, McNeil, Smith 98) | 581 | Central A (Wright 99) .. .. | 579 |
| Central A (Pearce 99) .. .. | 580 | B. and K. (Jocelyn 99) .. .. | 577 |

| | Shot | Won | Lost | Scores For | Scores Against | Points |
|---|---|---|---|---|---|---|
| Central A .. .. | 6 | 4 | 2 | 3461 | 3448 | 6 |
| B. and K. .. .. .. | 5 | 3 | 2 | 2891 | 2862 | 6 |
| City A .. .. .. | 5 | 3 | 2 | 2885 | 2866 | 4 |
| Shoreditch A .. .. | 4 | 2 | 2 | 2310 | 2282 | 8 |
| County A .. .. .. | 4 | 0 | 4 | 2240 | 2329 | 0 |

DIVISION 2.

| | | | |
|---|---|---|---|
| City B (Hadden 99) .. .. | 574 | K. and K. (Jennings 96) .. .. | 550 |
| City B (Colin 97) .. .. | 570 | County B (Hurst, Reggler 97) .. | 566 |
| St. James' (Andrews 98) .. | 579 | Central B (Lee 98) .. .. | 571 |
| Central B (Watkins, Owen 95) .. | 558 | County B (Coveney, Reggler 94) .. | 555 |
| County B (Coveney 96) .. .. | 550 | Hackney (Wilkinson 92) .. .. | 496 |

| | Shot | Won | Lost | Drawn | Scores For | Scores Against | Points |
|---|---|---|---|---|---|---|---|
| City B .. .. | 8 | 7 | 1 | 0 | 4569 | 4376 | 14 |
| St. James' .. .. | 7 | 5 | 2 | 0 | 3903 | 3829 | 10 |
| Central B .. .. | 8 | 4 | 3 | 1 | 4481 | 4411 | 9 |
| County B .. .. | 7 | 3 | 3 | 1 | 3914 | 3844 | 7 |
| Shoreditch B .. | 6 | 3 | 3 | 0 | 3285 | 3270 | 6 |
| K. and K. .. .. | 6 | 1 | 5 | 0 | 3199 | 3270 | 2 |
| Hackney .. .. | 6 | 0 | 6 | 0 | 2941 | 3292 | 0 |

It is unfortunate that some of the clubs are suffering from lack of range accommodation, and so experiencing difficulty in meeting their engagements. It is a healthy sign that all the available space is being commandeered for plant extensions in connection with the various supply undertakings, and riflemen, if keen, will eventually, we hope, find some place to rest their elbows whilst scoring "possibles" or lesser scores.

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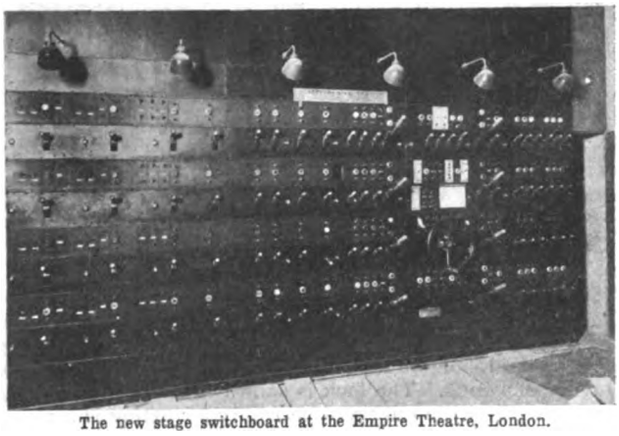
# THE EMPIRE THEATRE.

## Brief Details of the Latest Electrical Installation in London's Theatreland.

THE opening of the new Empire Theatre, in London, on November 8th, brought into use one of the most up-to-date electrical installations in theatreland. The supply is taken



The new stage switchboard at the Empire Theatre, London.

from the Charing Cross Electricity Supply Co., Ltd., who have installed mains capable of giving 3 000 A for the stage, and 2 000 A for supply to the front of the house. There is installed in the theatre no less than 500 H.P. of motive power for ventilating, curtain control, and operating orchestra and passenger lifts, and the lighting load on the stage will be 1 500 A, and elsewhere 1 000 A. For stage lighting, six battens have been installed, each giving four-colour lighting effect, with a total of over 113 000 W, while a footlight with four-colour lighting with 13 000 W also forms part of the equipment. There are two proscenium lengths, each fitted with 16 500 W lamps, while provision is also made for additional lighting on each side of the stage by means of plugs designed for four-colour effect. The auditorium is illuminated by means of special dome lighting in addition to the ordinary pendant and bracket fittings. The main ceiling dome is fitted with a total of 1 328 lamps arranged in four colours, and in addition there are six small ellipses, each fitted with art glass panels and illuminated by 40 lamps each, also in four colours. The balcony ceiling has a dome lighting scheme of eleven art glass panels, and the total number of lamps fitted is 664. All this four-colour lighting is controlled from the stage switchboard, and it is possible to blend the colours by means of dimmers, to give various intensities. The general lighting of the theatre is divided into two sections, maintained and general lighting, the maintained lighting always being "on." On the front of the balcony is installed a flood lighting enclosure containing 24 1 000 and three 1 500 W floodlights, arranged for four-colour lighting, for flooding the orchestra and solo players as required.

The front of the building is flooded with light by means of 18 1 000 W projectors controlled by means of a special device for blending colours to give a colour-mixing effect on the front elevation. Outside signs are provided for by a special switchboard capable of dealing with 500 A. This switchboard controls all the signs on the front elevation, marquise side, and front signs, etc. The ventilating of the theatre is controlled electrically, and in the event of fire, it is possible to close the dampers in the main ceiling from five different positions in the auditorium. The de-humidifying plant is driven by a 250 H.P. motor, and various other motors are used for ventilating purposes.

One of the special features of the theatre on the electrical side is the stage switchboard which is of new design, and is called a "pre-set" switchboard. It is possible to pre-set the lighting for one scene of a "set" while another scene is being played. It is also possible to control any individual light or bank of lights during a set without interfering with the remainder of the lighting. The switchboard is designed for four-colour control, and is made up in three sections. The pilot unit comprises all the control switches, colour master controls, grand masters and black-out switches, together with all dimmer controls and plates. The magazine sections contain all the branch and main fuses, and the contactor section contains all the contactor switches controlled from the pilot section. These three sections are interconnected by means of multiple cables. Pilot lamps are fitted to each control switch to indicate when the switch is "on" or "off," and these also show the state of the dimmer. The projection arcs are supplied by a motor generator set, each capable of an output of 250 A at 100 V. Cables have been installed in the biograph room, for Vitaphone effects.

In the event of a breakdown or interruption of supply, it is possible to change over the motor generator sets to the other supply. This also applies to the lighting. In the sub-basement a water cooling system which supplies the whole of the building with drinking water at 40 deg. F. is installed. This equipment was supplied by Frigidaire, Ltd. The theatre is equipped with vacuum cleaning plant, arranged with fixed suction piping for 25 hose connecting points. This was supplied by the Sturtevant Engineering Co., Ltd. The electric lighting fittings, one of which was illustrated in our last issue, while another is given this week on page 595, were executed to the architect's designs by Metro-Vick Supplies, Ltd.

The whole of the electrical installation work has been carried out by Blackburn Starling and Co., Ltd., of 9, Victoria Street, Westminster, under the direction of Messrs. E. Wingfield-Bowles and Clay, consulting engineers.

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# FACTORY LIGHTING.

## An Interesting and Instructive Method of Display at Birmingham.

AN enterprising method of bringing home more closely to manufacturers the benefits of modern electric lighting has been adopted by the Birmingham Electric Supply Dept. in conjunction with the local Circle of the E.D.A. Industrial Lighting Campaign. At that department's premises in Dale End, model offices and a workshop have been arranged, where two systems of lighting, the modern, and the older system in current use, are installed, so that a ready comparison between each can be made. These are open daily, and are to remain open until the end of the month, invitations having been extended to a large number of manufacturers and others in the district.

There are two offices, a general office and a drawing office. In the first, eight large diffusers give a bright uniform light with complete absence of glare and dark shadow, while in the drawing office, which is equipped and furnished, lighting requirements are served by four 250 W diffusers, which demonstrate convincingly the absence of glare and shadow on the working surfaces. Above one desk where blue prints are laid out, a large artificial daylight lamp is suspended, of the type which is being increasingly used in the textile industries for the matching of colours, and which is also likely to be more widely used for blue print and other drawing office work.

The workshop section is laid out on a comprehensive scale, as a machine shop and assembly shop, and there is a large variety of machines in working order—polishing and grinding machines, power presses, drills and lathes, etc. A light density of 12 foot-candles is obtained here from 21 200 W diffusers, and the absence of glare and sharp divisions of light and shadow as compared with the old system of lighting, which can readily be switched on, is strikingly evident. In the drawing office a light density on working surfaces of 17 ft.-candles is obtained. A large number of campaign posters adorn the walls.

On each Thursday evening during the month, lecture-demonstrations are being given by Mr. J. L. H. Cooper, of the E.D.A., and these are being well attended. After speaking of the proved relationship between good lighting and workshop efficiency, increase of output and minimising of accidents, etc., Mr. Cooper in his lecture last week went on to say that although a considerable number of excellent papers had been published on the subject, engineers generally were proving rather slow to adopt the recommendations put forward. In installing modern lighting, he added, attention must be given to the type of equipment to be used, the spacing, and so on, in order to ensure adequate illumination for working surfaces. It had been definitely shown that in many cases where previously work was done by local lighting, better results could now be obtained by overhead lighting, provided the right intensity were supplied.

The Bradford Circle (E.D.A.), through the efforts of the local hon. secretary, Mr. Harry Moss, has organised a lantern lecture, to be given in the Lecture Hall of the Technical College, Great Horton Road, Bradford, to-day (Friday), at 7.30 p.m., on "Electric Lighting in the Textile Industry," by Mr. R. C. Hawkins.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

WATFORD GUARDIANS.—Electric lighting, etc., of new casual block and mental and infirmary block. Send names, in first instance, to the Clerk, 7, Church Street, Watford.

PERTH COUNTY EDUCATION AUTHORITY, November 24th.—Electric light installation work in connection with erection of new academy at Perth. Contractors desiring to tender should apply to Mr. A. W. Allison, Education Offices, Perth. Schedules will be issued later; deposit, £2 2s.

EASTBOURNE CORPORATION, November 26th.—Provision of electric light bathrooms, massage rooms, etc., at Devonshire Baths. Specifications, etc., from the Borough Engineer; deposit £1 1s.

GLASGOW CORPORATION, November 26th.—Supply and fitting up of two electric lifts at business premises in course of erection at Glasgow Cross. Specification, etc., from the Town Clerk.

GLASGOW CORPORATION, November 26th.—Ground lighting, in connection with erection of Mearnskirk Sanatorium, Mearns, Renfrewshire. Specifications, etc., from the Office of Public Works, 64, Cochrane Street, Glasgow; deposit £5 5s.

BELFAST IMPROVEMENT COMMITTEE, November 27th.—Supply and erection of four motor-driven centrifugal pumps, with automatic switchgear, overhead travelling crane, etc. Specifications from the City Surveyor.

BOLTON GUARDIANS, November 27th.—Conversion of hydraulic lift at Townley's Hospital into an electric lift. Specifications from Mr. J. Ward, 24, Mawdsley Street, Bolton.

KIRKCALDY DISTRICT COMMITTEE, November 27th.—Electric light installation in 16 houses at Kennoway, 14 at Lumphinnans, and 16 at Lochore. Plans can be seen and schedules obtained at the office of Mr. Geo. B. Deas, Central Chambers, Kirkcaldy.

METROPOLITAN ASYLUMS BOARD, November 28th.—Electric light installation at St. Anne's Home, Herne Bay. Particulars from Mr. T. Cooper, engineer-in-chief, Victoria Embankment, London, E.C.

ST. CHAD'S CHURCH, ROMILEY, November 28th.—Concealed flood lighting. Specification, etc., from the Secretary, Parochial Church Council, 2, Leyburn Grove, Romiley.

KINGSTON GUARDIANS, November 29th.—Electric light installation at Central Children's Homes, New Malden. Further particulars from Mr. W. Taylor, clerk, Union Offices, Kingston-on-Thames.

CENTRAL ELECTRICITY BOARD, November 30th.—Supply and erection of 33 000 V transformers, in connection with South East England Electricity Scheme, 1927. Specification (No. S.E.E.-S.T.1) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, November 30th.—Extra high tension link kiosk and transformer switch and distribution kiosk (contract 42). Specifications from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

MANCHESTER CORPORATION, November 30th.—Supply and erection of a grit arrester for No. 51 boiler chimney at Stuart Street power station. Specification (No. 227) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

ELY RURAL DISTRICT COUNCIL, December 1st.—Supply and installation of 550 W, 110 V dynamo 80 V, 50 Ah battery, switchboard and cables, for lighting pumping station and engineer's house, at Mildenhall, Suffolk. Further particulars from the Surveyor, Council Offices, 11, Lynn Road, Ely, Cambs.

SALFORD CORPORATION, December 1st.—Electrical rewiring of Nos. 10 and 12, Encombe Place, Salford. Specifications from Medical Officer of Health, 143, Regent Road, Salford.

SWINDON CORPORATION, December 10th.—(*a*) Installation of new street fire alarm call bell system (19 pillar type fire alarm call boxes), switchboard and wiring; (*b*) supply and fixing of the equipment, but exclusive of wiring. Street plan may be inspected at the office of the Borough Surveyor, 34, Regent Circus, Swindon.

STRETFORD URBAN DISTRICT COUNCIL, December 18th.—Supply and erection of three 3-phase transformers of 10 000 kVA capacity each, with equipment for voltage regulation. Specification, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc., from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

*A GENERAL view of the outside of the new offices and showrooms of Salford Electricity Department. The building has a frontage of 70 ft., and is situated in the main street of the city, adjoining the Town Hall.*

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

CHRISTCHURCH (N.Z.) CITY COUNCIL, November 24th.—Supply of pump and electric motor, valves and automatic flow recorder. (Reference A.X. 7 006.)

EGYPTIAN MINISTRY OF THE INTERIOR, November 24th.—Electric light installation, for Sohag. (Reference B.X. 4 777.)

DUBLIN BOROUGH COMMISSIONERS, November 26th.—Supply and erection of six automatically controlled electrically-driven pumps. Particulars and forms of tender from Mr. J. S. Alford, 11, Victoria Street, Westminster, S.W.1; deposit £2 2s.

INDIA STORE DEPARTMENT, November 26th.—(1) Supply of steam engine generator sets; and (2) insulated cable, insulators, etc. Specifications (5s. each) from the Director-General, Belvedere Road, London, S.E.1.

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EGYPTIAN STATE RAILWAYS, November 27th.—Supply of two transformers, 1 050 metres of armoured cable, five switch pillars, two l.t. switchboard panels and 30 metres l.t. cable. Particulars from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference E.S.R. 7 826.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 27th.—Generators and water turbines, in connection with Waitaki power scheme. (Reference B.X. 4 677.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of indicators (schedule C. 371). Reference B.X. 4 751.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 27th.—Supply of condensers (schedule C. 370). (Reference B.X. 4 753.)

NEW ZEALAND POSTS AND TELEGRAPHS, November 28th.—Supply of dry cells.

TURKISH RAILWAYS AND PORTS DEPARTMENT, November 28th.—Supply at Haidar Pacha of a steam driven, a.c., 600 kW generator. (Reference B.X. 4 842.)

VICTORIAN RAILWAY COMMISSION, November 28th.—Supply of 10-ton overhead electric crane. (Contract No. 42 090.) (Reference A.X. 6 951.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 29th.—Telephone apparatus. (Reference B.X. 4 757.)

SALISBURY (RHODESIA) MUNICIPALITY, November 29th.—Supply of electrically-driven pumping plant. (Reference A.X. 7 089.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, November 29th.—Telephone apparatus for Pretoria. (Reference B.X. 4 757.)

SOUTH INDIAN RAILWAY CO., LTD., November 30th.—Supply of l.t. transmission line materials. Specifications, etc. (10s.) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

COPENHAGEN LIGHTING DEPARTMENT, December 4th.—Supply of 10 000 kVA transformer, for Faelledvej sub-station. (Reference 4862.)

EGYPTIAN STATE RAILWAYS, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500. Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264, 3/34.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 4th.—Supply of submarine telephone and telegraph cable, or supply and installation of the cable. (Schedule C. 379). (Reference B.X. 4 818.)

STELLENBOSCH (SOUTH AFRICA) MUNICIPALITY, December 4th.—Supply of transformers, motors, fans, switchgear and meters. (Reference B.X. 4 864.)

EGYPTIAN STATE RAILWAYS, December 5th.—Supply of 30 tons of h.d. copper live wire. Particulars from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference E.S.R. 7 830.)

MELBOURNE CITY COUNCIL, December 5th.—Supply of insulated, fire-resisting cable (Specification No. 962) (Reference B.X. 4 822.)

RATHMINES AND PEMBROKE JOINT HOSPITAL BOARD, December 8th.—Installation of electric bells at the Isolation Hospital, Clonskeagh. Specification from the Matron.

DUBLIN CORPORATION, December 10th.—Supply, erection, etc., of e.h.t. switchgear and accessories. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

VICTORIAN RAILWAY COMMISSION, December 12th.—Supply of d.c. polarised relays (Contract 42 137). (Reference B.X. 4 886.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of seven-ton electrical overhead travelling crane (tender No. 1 347). (Reference A.X. 6 989.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of one electrically-driven, geared, maximum service, double housing planing machine (tender No. 1 356). (Reference A.X. 7 064.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/69.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically-operated deep dredger, for Yallourn Brown Coal Works (specification 28/94.) Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, December 18th.—Supply of 50 000 metres of rubber covered field telephone wire. (Reference A.X. 4 849.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of two hydraulic pumps and electric motors. (Reference A.X. 7 150.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of switching equipment and relays, for use in automatic telephone exchanges (schedule C. 381). (Reference B.X. 4 880.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of protective apparatus for telephone equipment, including fuses, heat coils and arresters (schedule C. 380). (Reference B.X. 4 881.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 15th.—Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.—Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Reference B.X. 4 873.)

## Tenders Accepted.

ALVA CORPORATION.—J. A. Campbell, electrical fittings for Cochrane Park Hall.

YORK CORPORATION.—A. Reyrolle and Co., switchgear, for Poppleton Road sub-station, £1 155 5s.

ADMIRALTY.—Edison Swan Electric Co., Ltd., central control drums, springs and switch sockets.

CARLISLE CORPORATION.—Brush Electrical Engineering Co., Ltd., supply of three transformers, £375.

GLASGOW CORPORATION.—Callender's Cable and Construction Co., Ltd., supply of 20 000 V cable, £273 5s.

DEWSBURY GUARDIANS.—C. Roberts, electrical work in new casual wards at Staincliffe Institution.

HOLBORN (LONDON) GUARDIANS.—Omega Lamp works, Ltd., six months' supply of Omega lamps.

NEW SOUTH WALES RAILWAYS.—Babcock and Wilcox, Ltd., supply of power house boilers, £261 000.

LOWESTOFT CORPORATION.—Elliott Bros. (London), Ltd., supply of two recorder voltmeters £22 11s. 2d. each, and one ammeter, £22 4s.

LEWISHAM (LONDON) BOROUGH COUNCIL.—A. J. Hewens and Sons, electric lighting installation at the central library, £338 18s. (Recommended.)

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., electrical installation at new weights and measures offices, Euston Road, London, £429.

METROPOLITAN ASYLUMS BOARD.—Alpha Manufacturing and Electrical Co., Ltd., installation of automatic telephone system at High Wood Hospital, £899 (recommended).

SHEFFIELD CORPORATION.—Municipal Electric Supply Department, electric wiring and fittings, £2 896; G. E. Taylor and Co., wiring of power circuits, motors, etc., £1 929 10s., at the abattoir.

LONDON COUNTY COUNCIL EDUCATION COMMITTEE.—H. J. Cash and Co., Ltd., electrical work at the Hammersmith School of Arts and Crafts, on basis of addition of 15 per cent. of net cost of labour and 10 per cent. of net cost of materials.

ILFORD CORPORATION.—Richard Johnson and Nephew, Ltd., copper trolley wire, 10 1/16d. per lb.; Bolckow, Vaughan and Co., Ltd., 245 tons of tram rails, £10 15s. 3d. per ton, and 280 pairs of fishplates (about 7 tons), £14 10s. 3d. per ton; Hadfields, Ltd., supply of one pair of track points, £86 10s., and two crossings, £31 each; Crompton Parkinson, Ltd., supply of two transformer kiosks, £840.

INDIAN STORES DEPARTMENT.—Metropolitan-Vickers Electrical Co., Ltd., pump, Rs. 9 780; General Electric Trading Co., steel poles, Rs. 3 094; W. T. Henley's Telegraph Works Co., Ltd., cable, Rs. 3 047; Mather and Platt, Ltd., booster set, Rs. 3 854; Indian Cable Co., Ltd., cables and cords, Rs. 2 502, cables, Rs. 1 396; Greaves, Cotton and Co., electrical stores, Rs. 1 754; Turner, Hoare and Co., Ltd., spare parts for Vickers-Petters crude oil engines, Rs. 4 279.

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# ELECTRICAL WOMEN.

## Successful Meetings of the Electrical Association of Women.

A MEETING of the Manchester and District branch of the Electrical Association for Women in connection with the electric outlet campaign was held on October 23rd at the Lighting Service Bureau, when there was a large number present. Miss Haslett presided and explained the reasons for the campaign, and reference was also made to the Women's National Specification. Mr. H. C. Lamb, city electrical engineer, also spoke on the campaign and said there is no subject more worthy of attention. Other speakers expressed warm interest in the subject, and in order to further the campaign, it is hoped to arrange visits to many of the new housing estates in the district.

A meeting organised by the Ashford branch of the Association, in connection with the outlet campaign, was held in the Masonic Hall on November 6th. Mrs. F. Hayward (president of the branch) was in the chair, and the speaker was Ald. Mrs. Hammer. Mr. Robinson also spoke. A resolution, proposed by the chairman and seconded by Mrs. Sawyer, that local housing authorities, architects and builders should be asked to make provision for labour-saving devices in the homes of the future by adequate electric service, was carried. Mr. H. Wilson, electrical engineer, Ashford, was also among the speakers.

On November 7th, Mr. E. E. Hoadley (Maidstone) gave a lecture on the Electricity (Supply) Act, 1926, before a large audience of members, with Mrs. Wilfrid Ashley in the chair, at the E.L.M.A. Lighting Service Bureau, Strand, W.C.2. In a very interesting way Mr. Hoadley explained the reason which led up to the introduction of the Electricity Bill, the provisions of the Act, and the setting up of the Central Electricity Board, concluding by outlining the possible developments. An interesting discussion followed, and votes of thanks were proposed and seconded by Mrs. Seward, Mrs. Matters-Porter, and Ald. Vorley.

### Electric Radio-Gramophones.

On November 12th Mr. W. H. Gambrell (B.T.-H.) lectured on "A Complete Electric Radio-Gramophone Equipment," at the E.L.M.A. Lighting Service Bureau. Mr. Gambrell brought with him apparatus and lantern slides. The chair was taken by Miss Reading, of the City of London Electric Lighting Co., and votes of thanks were proposed and seconded by Miss G. Sharp and Mrs. Swire.

About one hundred members of the Women's Electrical Association visited the Metropolitan-Vickers Works on November 7th. The members were mainly of the Manchester District branch, by which the visit was arranged, but included also a number of officials and leading members of the newly-formed North Wales branch, of which Mrs. S. Z. de Ferranti is president. The programme included a brief tour of some of the main departments, though domestic applications were the principal interest in the visit, including an inspection of various kinds of domestic appliances in course of manufacture and demonstrations of their use. The equipment seen and demonstrated included Cosmos cookers and hotplates, incorporating the Metro-Vick totally enclosed heating unit. Considerable interest was shown also in the Cosmos kettle with its safety device. Many other kinds of equipment were also shown in course of manufacture and a general display and demonstration of finished Cosmos products was made in one of the staff dining rooms, where the visitors were entertained to tea after their tour.

At a meeting of the Leeds and West Riding branch of the E.A.W., held at the Electricity Works, Leeds, on November 15th, Mr. Bernard C, Holding (editor of THE ELECTRICIAN) lectured on "Electricity in the Home: the Labour Saver and Comfort Bringer." Mr. Holding contended that if women would only attempt to estimate the value of the time unnecessarily spent in doing domestic tasks by manual methods they would be appalled at the amount of time they actually wasted. He also showed how electricity properly used in the home is not only efficient but conducive to comfort, and explained that the secret of success in electric house keeping was to be found in intelligent human direction of the appropriate machine.

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Birmingham Electricity Committee has placed contracts for the erection of automatic sub-stations at Golden Hillock Road, Sparbrook, and in Freeth Street.

# EDINBURGH'S HOUSE.

## Opening of Third All-Electric House—Co-operation of all Sections of the Trade.

THE various branches of the electrical industry in Edinburgh are, following upon the successful efforts of the last two years, again co-operating in the exhibition of an all-electric house. The previous exhibition houses each attracted about 20 000 visitors, and it is felt in Edinburgh that such houses form one of the best lines of propaganda to extend the use of electricity in domestic directions. The first house chosen two years ago was on the Portobello Road, which is in the eastern district of the city. The second house chosen last year was in Osborne Terrace, which is on one of the main thoroughfares in the western portion of the city. This year the house selected is at 49, Lygon Road, Craigmillar Park, which is in one of the southern suburbs of the city. The house was opened to the public on November 14th by Brig.-Gen. Sir Robert Gordon Gilmour, who in a humorous opening speech described the many uses to which electricity was now put. The house is a thoroughly modern villa consisting of three public rooms, three bedrooms, nursery, kitchen, bathroom, etc., and has been fully equipped with all the most up-to-date artistic and labour-saving electrical appliances. The Corporation Supply Department, the local wholesalers and contractors are all co-operating in the effort. In Edinburgh each section of the industry keeps to its own particular sphere, and the cordial co-operation which exists, the progressive extension of the use of electricity and the comparatively low rate at which supply is given prove that such co-operation can be worked without friction. All visitors to the house are supplied with a catalogue and a prepared post-card in order that they may advise their contractor of the points on which they desire further information. A charge of one penny admission is made, which charge goes to the Royal Infirmary of Edinburgh, and from which the Infirmary hopes to derive as substantial a contribution as last year. The house will remain open until December 1st, and is already attracting a large number of the public. Inquiries and demonstrations arranged so far indicate that the business resulting from the exhibition will be none the less considerable than in previous years.

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# TEXTILE EXHIBITION.

## Brief Particulars of Machines of Electrical Interest at the Manchester Show.

THE eighth Textile Machinery and Accessories Exhibition, now open in Manchester, is larger and, from a textile point of view, more successful than any of its predecessors. Whereas at previous shows, there have always been exhibits of a number of the large electrical firms, these are not present on this occasion. The Manchester City Hall has been greatly enlarged, and the organisers, in the absence of a Corporation supply of electricity, are utilising a portable set for supplying power to the exhibitors. In walking round the stands the increased use of electric drive is very prominent. A good example of the domestic use of the electric motor, was again illustrated on the stand of the Singer Sewing Machine Co. Lang Bridge, Ltd., Accrington, demonstrate a new type of drying cylinder, which is chiefly noteworthy from the fact that it is electrically heated. This is comprised of a stationary inner cylinder round which a thin outer shell rotates on ball bearings. The heaters are situated near to the surface of the inner cylinder and heats the small annular space between the two cylinders. The inner cylinder is insulated, and the degree of heat is regulated by switches. On the stand of Brookhirst Switchgear, Ltd. are exhibited several types of textile controls. These include a compensating regulator for a stentering range, an inching-straight-on starter for controlling motors for driving slubbing frames, and roving frames. An actual roving frame with motor and starter are exhibited. The starter is operated by a push rod running the whole length of the frame. Carver Textile Patents, Ltd., who on several previous occasions have featured electrical devices on their machines, are showing an electrical warp stop motion on one of their looms. When a thread is broken a circuit is formed which stops the loom, and a spring wire indicates the position of the broken thread. Hindle and Son, of Haslingden, are showing their electric baling press and T. Broadbent and Sons, a clutchless electrically driven hydro-extractor. Other exhibitors include Dobson and Barlows, Ltd., with a centrifugal artificial silk spinning cam, Laminated Gears, Ltd., Sheffield, and P.I.V. Chain Gears, Ltd., London, etc.

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# ELECTRICITY SUPPLY.

## Sheffield, Glasgow, Plymouth, Croydon, and Colchester to Extend their Mains—L.C.C. to Renew Clerkenwell Installation—The South Wales Electricity Scheme—Nelson and Supply for Earby—Johnson and Phillips and Nairn T.C.

SHEFFIELD Electricity Committee is to extend mains at a cost of £12 363.

Glasgow Electricity Committee has authorised mains extensions at a cost of £2 000.

Plymouth Electricity Committee has authorised cable extensions at a cost of £7 000.

Croydon Electricity Department is to carry out mains extensions in various roads, at a cost of £613.

Colchester Electricity Committee has received sanction to borrow £7 686 for work in connection with electricity mains, etc., for Lexden.

In connection with the bulk supply to Cranleigh, Guildford Electricity Committee has received sanction to a loan of £6 520 for mains.

Axholme R.D.C. has decided to support the scheme of the Yorkshire Electric Power Co. for supplying electricity in the Council's area.

Buglawton U.D.C. has decided to approach Congleton Corporation as to terms upon which it will supply electricity, when available, in Congleton.

Birkenhead T.C. has received the approval of the Commissioners to an agreement with Wallasey for an increased supply of electricity in bulk.

Gravesend Electricity Committee has decided to lay a new feeder between the generating station and the Rosherville sub-station at a cost of £3 250.

Wolverhampton Electricity Committee proposes to give supplies of electricity to Codsall Wood and Albrighton, the initial cost being estimated at £9 390.

Coppenhall P.C. has arranged with Crewe Corporation for a supply of electricity by means of an overhead main. The charge for lighting will be 6d. per kWh.

Chertsey R.D.C. has decided to raise no objection to the use of overhead lines by the Ascot and District Electricity Co. for a supply of electricity to West Cobham.

London County Council is to renew the electrical installation at the Clerkenwell depot at an estimated cost of £1 050, and selected firms are to be asked to tender for the work.

Portsmouth Electricity Committee recommends extensions to supply Rowlands Castle at a cost of £8 000.—A supply of electricity is now being given to Bognor, through Chichester.

Guildford Electricity Committee has asked the consulting engineer and the borough electrical engineer to submit recommendations with regard to a cheap rate for shop window lighting.

The Commissioners have approved an agreement for a supply of electricity to Earby by Nelson Corporation. The Corporation will apply for sanction to borrow £12 500, estimated cost of cables and equipment.

As a step in the development of Tomintoul as a mountain resort, the General Interests Committee has appointed a committee to open negotiations with electrical firms with a view to introducing electric light. There is water-power available in the district.

Eastbourne Electricity Department is to give a supply for lighting and electric motors at the Southern Railway locomotive sheds at a cost of £430.—The Department is also to provide a supply for the highways depot at Bedfordwell, at a cost of £450.

Cannock R.D.C. has given its consent to the application of the U.D.C. for an Order extending the area of supply, and the West Midlands Joint Electricity Authority has approved of the Council's proposal, subject to the parish of Lapley being included in the added area.

The Electricity Commissioners have informed Tow Law (Co. Durham) U.D.C. that they have decided to grant a Provisional Order to the Cleveland and Durham Electric Power Co. for the supply of electricity in the Council's area. The Commissioners are not disposed to refuse to grant the Order on the ground that the Council supplies gas.

Provost Fletcher, on behalf of Nairn T.C., has signed an agreement providing for the installation of electricity in the burgh by Johnson and Phillips, Ltd., at 8d. per kWh for lighting and 3d. for power, the company undertaking to lay the cable and instal the plant at its own risk. The agreement retains for the town the right of purchase at the end of 7, 14, or 21 years.

Hull Electricity Committee has agreed to a schedule of prices for the assisted wiring scheme, and to pay 90% of each account for such wiring certified by the engineer.—The Works Committee is to be asked to expedite the works necessary in connection with the electric lighting of Anlaby Road and the alteration of the position of electric lamps on the Hessle Road to improve the lighting.

In connection with the application by York Corporation for a Special Order to extend the area of supply, the Electricity Commissioners recommend the inclusion of the villages of Sutton, Stillington and Huby as places in which compulsory mains are to be laid, and that the Corporation should agree to the maximum price in the Order being reduced from 1s. to 10d. per kWh.

Ealing T.C. has agreed to an extension of mains and the erection of a sub-station on the Greystoke Estate, Hanger Hill, for Ardsley Estates, Ltd., at an estimated cost of £1 600. It has also been agreed to extend mains and erect a sub-station at the works of the Dominion Engineering Co. for the supply of current for power and lighting up to 10 H.P. in Craven Mews and the adjoining garage of Richards and Co., at a cost of £700.

On behalf of Rhyl U.D.C., it was stated at the Ministry of Transport inquiry at Rhyl, last week, that the erection by Electricity Distribution of North Wales and District, Ltd., of overhead lines, would tend to depreciate property. They, therefore, opposed the granting of an Order authorising the company to supply current to the new part of the town. It was contended by the company that the purpose of the Council was to get hold of the supply.

Torquay Electricity Committee has agreed to the scheme of the electrical engineer for supplying the villages of Marldon and Campton to be put in operation as and when the demands so warrant, and has decided to seek consent for the erection of overhead wires in the village of Marldon and Compton and a further extension to the village of Ipplepen. The Committee has obtained consent to the erection of overhead lines from Ipplepen to Dartington.

On Friday last Sir John F. C. Snell, chairman of the Electricity Commission, inspected the sites at Swansea and Llanelly which have been suggested by the local authorities concerned as suitable for the proposed West Wales super-power station which will form part of the government's national electricity scheme. Sir John said his investigations were of a preliminary character, the scheme for South Wales being in an embryonic stage. It was hoped to tackle the problem next spring.

The Electric Supply Corporation has informed Chelmsford T.C. that it is unable to meet a suggestion to reduce the charges for electricity for all purposes. Negotiations for a supply of electricity in bulk have fallen through, and the company is now preparing plans for additional generating plant. There is also the question as to how far it is advisable to extend the system at a frequency 100 cycles when there is every likelihood of its being changed before long to 50 cycles.

The Commissioners have decided to issue an Order, with the concurrence of the Minister of Health, constituting a Joint Electricity Board consisting of representatives of the Wilmslow and Alderley Edge Urban District Councils, which have decided to purchase the undertaking of the local Electric Supply Co., and to supply electricity to outside areas as well as for the two towns. Alderley Edge Urban Council has applied for a loan of £113 000 in connection with the electricity scheme.

The Town Clerk of Carlisle has reported to the Electricity Committee the result of an interview between Corporation representatives, the Electricity Commissioners, and the Central Electricity Board, at which it was ascertained that it was intended to grant a Special Order to the Old Silkstone Colliery Co. to generate and supply electricity to a company not yet formed for the purpose of supplying electricity in the area covered by the Order in West Cumberland. The Committee has decided that, having regard to the Central Electricity Board's decision to erect a secondary transmission line capable of supplying the area covered by the Order, the Town Clerk be requested to urge the Commissioners to withhold the granting of this Order until an opportunity is given to the local authorities concerned to reconsider the matter.

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# ELECTRICAL PICTURES.

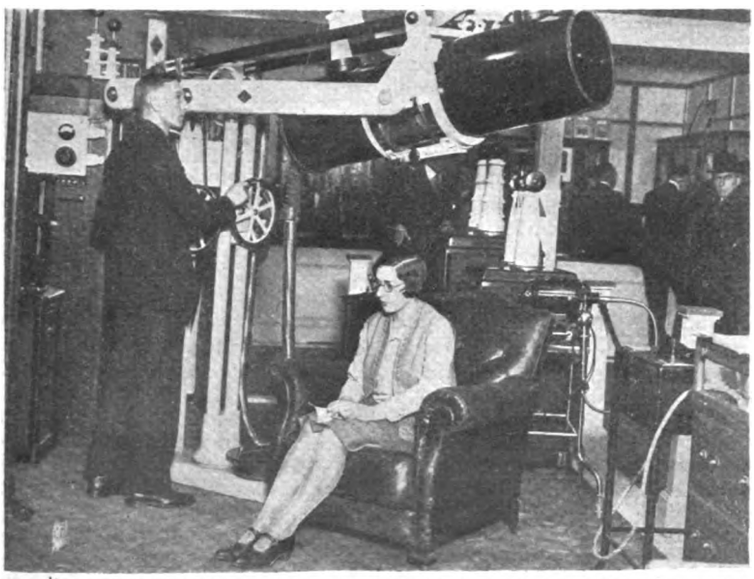
Mr. E. Jordan, formerly borough electrical engineer, Harwich, who joined the West Wilts Electricity Supply Co., Ltd., on Saturday, November 17th, as resident electrical engineer for Devizes, Trowbridge, etc.

One of the new electric vans which the Post Office is installing, experimentally, for use in London and Leeds for parcel delivery work in congested traffic areas.

Part of the slate which was blown through the window of the editor's room during last week's gale. Fortunately, Mr. Holding was out at the time, otherwise our story might have been a different one. See p. 584.

Mr. W. Harrison, of St. Helens, with the machine which he claims will amplify any voltage applied across its input. The device is to be tested by St. Helens Electricity Dept. (P. 585.)

Some of the members of the committee of the Electrical Association for Women (Ireland) on the occasion of the "At Home," in Dublin, on November 9th. The photograph includes Mrs. T. A. McLaughlin (President), Mrs. E. J. Black (Vice-President), Mrs. M. Cosgrave, Mrs. Hatte, Mrs. Mary Kettle, Mrs. J. T. O'Farrell (Hon. Treasurer), Miss M. Cole (Secretary), Miss H. Carr, Miss M. O'Donnell, and Miss K. O'Sullivan.



The latest designs of X-ray apparatus were a feature of an exhibition arranged by the British Institute of Radiology and the Röntgen Society, which opened last week in London. Most of the apparatus was of British manufacture. The new apparatus embodies features for the safeguarding of the operator which minimise the ill-effects of the rays. In the photograph is seen the latest X-ray equipment for deep treatment.

A "Factory Lighting" window display fitted up by the British Thomson-Houston Co., Ltd., at the Manchester showrooms. The machines are made to run, and bad and good lighting systems are wired up to a flasher system.

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# SELLING LINES.

AFTER considerable experimenting with automobile headlamps constructed of natural blue or blue coloured glass, the General Electric Co., Ltd., is now marketing certain types of Osram automobile headlamps in natural blue glass. These are available in 24 or 36 W, suitable for 6/7 or 12/14 V lighting systems.

One of the new lighting fittings by Siemens Electric Lamps and Supplies, Ltd.

Siemens Electric Lamps and Supplies, Ltd. have recently introduced a number of new lighting fittings, details of which have been sent to us. The first series bears the name Heliolux, and these comprise a new range of moulded glass lighting units suitable for installations where something of a more decorative nature than the plain Silvaray fittings, is required. They are eminently suitable for the lighting of banks, large stores, and the better class business premises. The second series is called the Ultralite, and these consist of a range of enclosed lighting units making use of a glass canopy in place of the usual metal device. The glass is 3-ply quality as used in the Silvaray fitting, and it is claimed that the use of a glass canopy results in greatly increased efficiency. Special care has been given to the details of the fitting. The bowl mounts are self-centering, and felt washers are used in preference to leather. The Sanaray ceiling fittings should prove another popular line. The glass is opal-cased and a substantial gallery is provided. Various types of Silvaray fittings have been reduced in price, while in addition the range has been added to by the placing on the market of Silvaray bowls, decorated with a blue coloured pattern.

We have received from the Carborundum Co., Ltd., of Manchester, a sample of the carborundum stabilising unit for the rectification of radio signals. The inherent stability of carborundum as a rectifying crystal is already well known, but the necessary potential applied across it has in the past possibly been responsible for its not attaining the full measure of popularity it deserves. Recognising the inconvenience of the external batteries and potentiometer used with carborundum crystals, the Carborundum Co. has designed a special unit comprising crystal, potentiometer and battery, already mounted on a small base, with knurled knob for potential adjustment, which may be applied to any set either as a separate unit or a part of the whole. The unit sent to us has been tried in a number of circuits such as a crystal receiver, and in reflex circuits, and in all cases remained stable, sensitive and silent as to extraneous noises.

Philips Lamps, Ltd., have introduced a novel current and polarity indicator which provides a convenient means of telling which wires are alive. The indicator consists of a neon tube with lead-in wires at each end, protected by a bakelite cover. A small cable, 2 ft. in length, is connected to one end and enables mains some distance apart to be tested. A high resistance is provided in the tube which limits the current so that the indicator cannot cause a short circuit. Upon application of the pointed end of the instrument and the metal contact at the end of the cable to two mains in tension, a bright glow appears in the small window in the centre of the indicator. The instrument may be used across potentials up to 750 V, while, should there be a high resistance in the circuit, the indicator will still work so long as the voltage has not dropped lower than 110 V in the case of a.c. or 150 V in the case of d.c. With mains of the latter type the indicator can be used as a pole indicator. A plate-shaped electrode bears a positive sign, and is connected to a contact similarly marked. When this plate-shaped electrode glows the contact referred to above is connected to the positive pole of the direct current supply.

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Metro-Vick Supplies, Ltd., have published a new wireless catalogue arranged in sectionalised form. The various sections can be supplied overprinted on request. Another feature is that supplies of individual pages can be obtained which will enable specific inquiries to be dealt with without interfering with the contents of the complete section.

# BUSINESS ITEMS.

MR. Douglas Moore, electrical engineer, has opened new premises at 179, Higher Union Street, Torquay.

Mr. C. Clayton, on November 17th, commenced business as a wireless engineer at 37, High Street, Boston.

J. Philipson and Son, wireless dealers, Kendal, on November 16th, opened larger premises at 26, Highgate.

Mr. A. S. Sayer, electrical engineer, of Reading, has removed his business from Merchants Place, to 157, Oxford Road.

Gray-Hodge, Ltd., electrical goods dealers, have opened a branch business at 282, Romford Road, Forest Gate, London.

The B.E.N. Patents, Ltd., announce that they have received an order to supply B.E.N.-Myers car washers to the Maharajah of Patiala.

The Mullard Wireless Service Co., Ltd., has opened a new depot at 9, Brunswick Street, Belfast. Mr. L. H. Brown has been appointed manager.

H. S. Phillips and Co., electrical engineers, of 30, the Boulevard, Weston-super-Mare, have opened a factory for the manufacture of portable wireless sets.

The Walsall Hardware Manufacturing Co., Ltd., has opened a new branch at 11, Young Street Lane South, Edinburgh, under the management of Mr. C. H. Walker.

A local firm at Bahia desires to get in touch with British suppliers of small electric pumps for household water supply. Particulars from the Department of Overseas Trade, reference A.X. 7130.

It is interesting to note that Hart " R.M.E. 9 " type low tension accumulators have been used exclusively for the experimental work in this country, connected with the production of Fultograph wireless picture apparatus.

Siemens-Schuckert (Great Britain), Ltd., are showing a complete range of their domestic appliances and Lucette fittings at the Food and Cookery Exhibition, which opens at Olympia to-day (Friday). The stand number is 84.

Recent substantial orders received by the Hart Accumulator Co., Ltd., include one for a battery of 245, 13-plate " STE " type cells having a capacity of 600 Ah (when discharged in one hour) to be installed at Port Soudan power station.

With reference to the article on page 552 of our last issue concerning the extensions at Nottingham, the consulting engineers were given as Messrs. Reece, Cardew and Rider. This should of course, have read Messrs. Preece, Cardew and Rider.

The wireless section of the Derngate Motor Co., Ltd., 31, Sheep Street, Northampton, has been taken over by Cowell, Wyatt and Co., Ltd., wireless apparatus manufacturers, of 47, Abingdon Street, Northampton. Mr. Moody has been appointed manager.

Sadia, Ltd., are exhibiting at the Cookery and Food Exhibition, at Olympia, a complete range of their electric apparatus for hotels, hospitals, etc. The equipment includes electric ranges with loadings up to 42 500 W, electric roasting and baking ovens, grills, tipping boilers, etc.

The Drayton Regulator and Instrument Co., Ltd., points out that the withdrawal of the V. P. Welldeck steam trap appears to have created the impression that the Standard Welldeck steam trap was thereby affected. This is not so, and no alterations have been made in distributing arrangements.

The Underfeed Stoker Co., Ltd., has entered into arrangements with the Combustion Engineering Corporation of New York and the Société Anonyme des Foyers Automatiques of France whereby they are licensed to sell throughout their respective territories the new " L " type travelling grate stoker, designed and patented by the first named company.

An electrical exhibition, organised by the Western Electricity Supply Co., Ltd., was held at Market Lavington from November 8th to 10th. Mr. A. J. Bridge (publicity and development manager) at the opening said that although electricity had only been available in the village a few weeks over 100 residents were making use of it, many for cooking and domestic purposes. Each evening demonstrations of cooking, cleaning, wiring, etc., were given.

Yarrow and Co., Ltd., announce that their licensees in Holland, Messrs. " De Schelde " of Flushing, have recently secured orders for Yarrow boilers for the Nijmegen power station, two boilers each of 100 000 lb./hr. evaporation; the Philips Lamp Factories, Eindhoven, three boilers, 35 000 lb./hr.; the Geertruidenberg power station (repeat order), four boilers, 150 000 lb./hr.; Rotterdam (repeat order), one boiler, 120 000 lb./hr.; and the Van Gelder Zonens Paper Works, Velsen, two boilers, 70 000 lb./hr.

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Mr. J. W. Russell announces that he has sold the business carried on by him at the Electrical House, Queen's Road, Watford, to J. W. Russell, Ltd., who will continue this business at the same address. He will be managing director of the company.

An electrically-equipped house at West Hagley was opened for public exhibition on Monday by the Shropshire, Worcestershire and Staffordshire Electric Power Co. The wiring for lighting, heating, and cooking was carried out by A. Pritchard and Co., of High Street, Lye.

Messrs. G. R. Cooper, electrical engineers, of Castle Street, Oxford, Messrs. Eagleston and Son, electricians, of St. Clement's, Oxford, Mr. Shirley, wireless engineer, of Oxford, and Messrs. Hill, Upton and Co., electrical engineers, of George Street, Oxford, had stands at the Oxford Trades Exhibition, held last week.

The General Electric Co., Ltd., has just installed a number of electric cooking appliances in the West Ham Union Central Home at Leytonstone. Provision is made in the kitchen to cater for about 2 000 persons per day. The equipment includes a large cabinet type roasting oven, a fish fryer, and a hot cupboard with carving table.

The Harland Engineering Co., Ltd. has advised us of the receipt of an important order for electrical machinery which has been placed on behalf of the Canadian Government. This is for all the electric motors required to operate the sluice valves and taintor valves of the lock gates on the Welland Ship Canal, Ontario, the construction of which will rank as one of the most famous civil engineering undertakings of the day. It will open up over two thousand miles of inland waterways for navigation and will permit ocean liners to use the Great Lakes of Canada.

Following the successful operation of Worthington two-cycle double-acting marine Diesel engines in the United States Shipping Board vessels, the Société d'Electricité et de Mécanique, Procédés Thomson-Houston et Carels, of Belgium, arranged with the Worthington Pump and Machinery Corporation of the United States for the manufacture of these engines at the Carels works at Ghent. The building of a Carels-Worthington four-cylinder engine of 4 000 B.H.P. for central station service was started and a complete line of large two-cycle, double-acting engines of this type will be available, supplementing the Carels two-cycle single-acting engines. The first engine has been sold to the General Electric (S.A.) and it will be direct-coupled to a General Electric (U.S.A.) alternator, installed in the Cordeba power plant, one of the central stations of the Herlitzka Group in the Argentine. The extensions of this station will include two of these engines.

We referred briefly in our issue of November 9th to the placing by the Central Electricity Board of contracts for a number of outdoor transforming and switching stations required in connection with the main transmission lines in South East England. The supply and erection of twelve stations in Kent, Sussex and Surrey has been entrusted to the English Electric Co., Ltd. The total value of this contract is about £300 000, and the work will extend over a period of three years in accordance with the Board's programme for the erection of certain stations each year up to 1931. As already indicated, the switchgear itself will be of the outdoor type, with the control equipment for the electrically-operated circuit-breakers installed in a small switch house. There will be five types of station, and all but one type will be equipped with oil circuit-breakers, suitable for 132 kV system, and with a rupturing capacity of 1½ million kVA. At some of the stations, the usual steel structures for carrying the isolating switches and connection will be dispensed with, and the isolating switches will be mounted on concrete columns of adequate height. We understand that the English Electric Co. has completed or has in hand a considerable number of contracts for large e.h.t. outdoor switching stations for India, Hungary, New Zealand and Greece, as well as many smaller stations in this country, and that demand for this class of apparatus, as well as for their armour-clad power station switchgear, has necessitated extensions to their switchgear works.

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The new stock list of the T.B.T. Electric Co., Ltd., has been received.

The conveying of goods by mechanical means is the subject of a further publication by Herbert Morris, Ltd.

List R.C. describing electric apparatus for hotels, restaurants, hospitals, etc., has been published by Sadia, Ltd. Electric ranges with loadings up to 42 500 W are dealt with, in addition to other similar equipment.

# ELECTRIC TRACTION.

## London's Experiment at Speeding-up the Tramway Service.

METROPOLITAN Electric Tramways, Ltd., are experimenting with a car fitted with a trolley boom at each end of the vehicle instead of the usual one arm in the centre only. It is expected that the employment of two booms will speed up

**One of the new single-deck high-speed cars belonging to Blackpool Corporation.**

the changing over of cars at the termini and eliminate the necessity for cutting off the lighting of the car, which occurs when the single arm is swung round from one cable to another.

Doncaster T.C. has decided to apply for an Order authorising the running of trackless trolley vehicles on certain of the existing tram routes.

Sunderland T.C. is applying for a Provisional Order to allow it to extend the Durham Road tram route to Humbledon, a distance of over 5 furlongs.

The Italian Government is to electrify the Trieste-Campo Marzio-Opecina, the Trieste-Centrale Monfalcone and the Trieste Aurisina-Opecina railways.

In connection with sea front improvements, Brighton Corporation is recommended to give notice to Magnus Volt, Ltd., to determine the lease of the electric railway on the sea front on March 25th next.

Four engineers of the United States National Electric Light Association who are studying the practice of steam railroad electrification in Europe, visited the Tyneside electrified area of the London and North Eastern Railway on November 9th.

The Scottish Tramways and Transport Association, which represents the municipal tramways undertakings, has written to all the members for Scottish Parliamentary constituencies urging them to support the agitation to relieve the tramway authorities from the expenditure incurred on the maintenance of the permanent way.

The Czecho-Slovakian Minister of Railways states that the electrification of the Wilson Station, Prague, and sections of line in connection therewith to the extent of some 60 km. is practically complete. As soon as all the electric locomotives are delivered trains will be operated on the entire length of line which is being electrified.

The special committee on traffic of the London County Council reports that it has requested the Minister of Transport to call a conference of local authorities owning tramways in the London traffic area to discuss the proposed unified operation of London local passenger transport undertakings on the basis of common management and a common fund.

Glasgow Corporation recently approved, by 45 votes to 42, the minutes of the Tramways Committee which included a decision to accept the tender of Felten and Guilleaume for trolley wire of German manufacture, amounting to £1 106.—A proposal, passed by the Tramways Committee, to the effect that a special sub-committee be appointed to consider the substitution of 'buses for tramcars on unremunerative tramway routes was defeated on submission to the Corporation.

Trackless trolley vehicles are to take the place of the Bradford Corporation tramway to Saltaire. Coun. Irvine Smith, Chairman of the Tramways Committee, states that the cost of equipping the route for railless trolley traction will be £43 752, a saving of £100 000 compared with the cost of reconstructing the tramway. He has also informed the City Council that in actual experience it is found that petrol vehicles have to be taken off the road after an average of 910 miles and trams after 2 100 miles, while an average of 3 700 miles is run by trackless trolley 'buses before being taken off.

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# COMPANY NEWS.

## Revival of Electrical Share Market—American Cable and Radio Merger Scheme—Electric Supply Co. of Victoria pay 10% on Ordinary—German Company's Bonds Offered in England—India Rubber Co.'s Report—New Companies Registered.

CHANGES in market quotations of electrical share prices are more numerous this week. In the transportation group, Metropolitan Electric Tramways 4½ per cent. debenture stock is 3 points higher at 72, and London United 1st debenture stock 1½ at 62. District and Metropolitan Railway ordinary stocks are both higher, and Underground shares have improved 6d. In the electricity supply section Newcastle-upon-Tyne and Yorkshire ordinary shares are each 2s. 6d. down, and smaller falls are shown by County of London and Metropolitan. Ever Readies have fallen 2s. 6d.

| Last Annl. Divd. % | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 92½ | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord... | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 44/- | 43/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 42/6 | 44/4½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | N'castle-upon-Tyne Elec. Sup. Ord. | 25/- | 27/6 | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P... .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops,Worcs.&Staffs Power B.Ord. | 36/3 | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 35/6 | 37/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk... | 126 | 126 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 129 | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb... .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 77½ | 77½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk... | 72½ | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb... | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 62 | 60½ | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 72 | 69 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 66 | 65 | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 79½ | 79 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 81½ | 80½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/6 | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P... | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb | 103 | 103 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P... .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf | 19/- | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 27/6 | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/- | 29/6 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord... .. .. | 42/- | 42/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 117/6 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 40/- | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 28/9† | 30/-† | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 53/9 | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 28/1½ | 28/1½ | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25/- | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 254½ | 255½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 78½ | 78½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 26 | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 29 | 28½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 77/6 | 78/9 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 54/- | 55/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7⅛d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
† Ex rights. ‡ Including 1s. bonus.

EVER READY TRUST AND FINANCE CO., LTD.—Subscriptions were invited last week for 500 000 £1 ord. shs. at par.

SIEMENS BROS. AND CO., LTD.—Intm. div. of 2½ % actual, less tax, on ord. shs. (same rate as last year) will be payable Dec. 7.

ELECTRIC CONSTRUCTION CO., LTD.—Intm. divs. at the rate of 7% on pref. shs. and at the rate of 6% p.a. on ord. shs., both less tax, will be payable on Nov. 30.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—The transfer books of the 5% deb. stk. are closed until Nov. 30, inclusive, preparatory to paymt. of int. due Dec. 1.

PROPOSED AMERICAN CABLE AND WIRELESS MERGER.—Conversations are proceeding with regard to a workg. arrangemt. between the Western Union Telegraph Co. and the Radio Corporation.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Fin. div. on ord. shs. of 6 % actual, will be payable on Dec. 1, makg. 12 % (same as last year) free of British tax in the case of certain shs. on London register.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Fin. div. on con. ord. stk. of 3 % actual, makg 10 % for year ended Aug. 31, 1928 (same rate as previous year) is announced, free of British tax in the case of stk. on London register.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—In order to provide capital to cope with the Co.'s expanding business, the directors, last week, offered to the pref. and ord. shhldrs. 100 010 ord. shs. at 30s. p. sh., in proportn. to present hldgs.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—It has bn. decided to issue a further 205 000 B. £1 ord. shs. at 24s. p. sh., and 200 000 of these shs. are offered to hldrs. of A. and B. ord., the remaining 5 000 shs. being reserved for subscriptn. by members of the staff.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—In order to meet expenditure in connection with expansion of business, an issue of 925 000 £1 ord. shs. at 23s. 6d. p. sh. to pref. and ord. shhldrs was announced last week. The shs. are to be allotted in the proportn. of one new sh. for every five shs. held.

ATLAS LIGHT AND POWER CO.—Shhldrs. have been offered, during the present week, 250 000 7% cum. pref., and 250 000 ord. shs. in units consistg. of one pref. and one ord. sh. Shhldrs. are entitled to an allotment of one unit for every 11 ord. shs. held, at £2 per unit, to carry int. at 5% p.a. from date of paymt. to March 31, 1929, after wh. the shs. are to rank for div.

ELECTRIC SUPPLY CO. OF VICTORIA, LTD.—Gross pft. for year ended March 31, 1928, £66 120, agst. £58 402, blce. to credit of pft. and loss acct., after providg. for taxes and sundry writg. off, £54 443, plus amt. brt. in, makg. £91 805. Int. on 6% 5-year notes absorbed £8 607; to special res., £35 000 leavg. £48,198. Pref. div. for year required £10 500. Fin. div. on 5% ord. shs. makes 10% for year (agst. nil). Fwd. £25 198.

WESTERN ELECTRICITY SUPPLY CO., LTD.—Pft. for year ended June 30, 1928, after provisn. for income tax, directors' fees, and other exes., £17 037, plus £518 brt. in. Intm. divs. on pref. and ord. shs. at rate of 3%, less tax, have been paid. Div. of 3%, less tax, on pref. shs., makg. 6% for year, was also paid on Aug. 10. It is proposed to pay a div. of 7% on ord. shs., makg. 10% for the year, to write off blce. of debit of prelim. exes. and exes. of increase of cap., £839, to transfer £1 734 to res. and to carry fwd. £972. Res. stands at £40 000.

PRUSSIAN ELECTRIC CO. (PREUSSISCHE ELEKTRIZITATS-AKTIENGESELLSCHAFT).—During this week Higginson and Co., Brown, Shipley and Co., and Harris, Forbes and Co., Ltd. (London) have offered for sale at £93 10s. % £1 000 000 6% 25-year Sterling bds. of this co., which is described as one of the most important power producers and public utility hldg. cos. in Germany. Its entire cap. is owned by the State of Prussia. The properties operated by it include nine generatg. statns. with an aggregate capacity of 101 400 kW, and a comprehensive h.t. transmissn. system with over 1 220 miles of inter-connected circuits. Upon completn. of present constructn. the combined generatg. capacity of the co.'s plants will total 149 570 kW.

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BUENOS AIRES TOWN AND DOCKS TRAMWAYS, LTD.—Gross receipts for year ended June 30, 1928, £169 219, increase £15 450. Working exes., £132 371, increase £4 969, leavg. net receipts £36 847, increase £10 481, and, with int., deposits and sundry receipts, total available is £43 740. Int. on 7 % deb. stk. takes £5 392, and sinkg. fd. for deb. stk. redemptn £904, leavg. £37 443, plus £2 128 brt. in. To renewals res., £20 000 (agst. £15 000). Div. 3 % (compared with 2 %), subject to tax. Fwd. £4 719.

INTERNATIONAL POWER SECURITIES CORPORATION.—Gross earngs. for year ended Sept. 30, 1928, $3 171 668, against $2 545 667 ; net earngs. $555 301, against $288 242. Divs. of $6 p. sh. amounting to $450 000, were paid on 75 000 shs. of pfd. stk., leavg. $317 551 in surplus acct. Co. recently declared an initial div. of $1 p. sh. on common stk., payable on Dec. 15. As during preced. year, a comparison of present market and cost prices on securities held by the corporatn. discloses considerable increase in values. The corporatn. continued its policy during the year of investg. in equities of French and Italian utility companies.

AMERICAN CITIES POWER AND LIGHT CORPORATION.—Messrs. Dillon Read and Co. offered for sale in New York last Friday 400 000 shs. class " A " stk. of par value $50 p. sh. and 400 000 shs. of " B " stock of no par value of the American Cities Power and Light Corporation, which has been formed by the Central States Electric Corporation to take over important hldgs. in well known public utility cos. The new co., which has an authorised cap. of $75 000 000 " A " stk. and 5 000 000 shs. " B " stk., has acquired securities of an aggregate value of $16 500 000 from the Central States Electric Corporation in exchange for 1 600 000 shs. " B " stk.

STOCK EXCHANGE NOTICES.—The Stock Exchange Committee has ordered the following securities to be quoted in the Official List : 270 000 20s., fully paid, ord. shs. and 270 000 20s., fully paid, 7% cum-pref. shs. of the East African Power and Lighting Co. ; £4 000 000 5% deb. stk. of the London Power Co., Ltd. ; 446 890 £1, fully paid ord. shs. of the Northampton Electric Light and Power Co., Ltd. ; 49 484 £1, fully paid, ord. shs. of the Underground Electric Railways Co. of London, Ltd. Dealings in the following have been specially allowed : 1 136 950 £1, partly paid and fully paid new ord. shs. of the Metropolitan-Vickers Electrical Co., Ltd. ; 2 000 000 1s., fully paid, ord. shs. of Everlite, Ltd.

JERUSALEM ELECTRIC AND PUBLIC SERVICE CORPORATION, LTD.—A statement issued to comply with the Stock Exchange Regulatns. contains the following information : Co. has been formed in Palestine to acquire and operate a concessn. granted by the High Commissioner for Palestine for supplying electricity for power and lightg. purposes in Jerusalem and district. The concessn. confers on the co. the sole right for public supply and distributn. of electrical energy to consumers in Jerusalem and within a surroundg. area of 480 sq. miles for 44 years from Jan. 1, 1928, and for an extensn. of that period by 16 years, provided the High Commissioner has power to grant such extensn. Contracts have been made with Power Securities Corporation, Ltd., whereby the co. agreed to purchase the electricity concessn. and certn. other rights, for £60 000 in cash, and between the co. and Balfour, Beatty and Co., Ltd., for the provisn. of a generatg. statn. and the laying of cables. Issued cap. is 10 000, fully paid, and 170 000, 5s. paid, 7% £P1 pref. shs. ; 30 000, fully paid, and 90 000, 2s. paid, £P1 ord. shs. Authorised cap. includes the above-mentioned shs. and 200 000 £P1 shs. not yet issued.

A. REYROLLE AND CO., LTD.—This co. has issued a statemt. calling attentn. to the fact that the recent order placed with it by the Central Electricity Board is one of the largest contracts for switchgear ever made, possibly in the whole world. Several transmissns. at 66 000 V are in use in this country, but only one of them has switchgear directly connected to the 66 000 V line, and A. Reyrolle and Co. supplied this switchgear. The co. points out that it is entirely free from any outside financial or other control. Its cap. is £500 000, of which £460 000 is in £1 ord. shs., now standing at about 50s. p. sh., and there are no debs. It is further stated that the firm started in Hebburn-on-Tyne, with entirely British cap., in 1901, that shortly afterwards it began to mfre. " metal clad and earthed " switchgear, and that for many years it worked alone on this design. It is also claimed that during the last few years the company has probably supplied one-third of the switchgear installed in this country. Switchgear is now being mfd. in collaboratn. with the firm, and to their designs, in other countries, including the U.S.A., Germany, Holland and Denmark.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—Blce. sheet as at Aug. 31, 1928, shows blce. to credit of pft. and loss acct., £42 655, made up of £14 202 brt. in from previous year, less div. on pref. shs. paid in Jan. and July, £12 500, pft. for year, £237, and £265 000 transferred from res., less total exchange deficit written off Persan assets, £224 284, the amt. carried fwd. being £42 655. Practically the whole of the reserve fund hs. bn. applied to mt. the losses caused by the depreciatn. of the French currency, and now ascertainable owing to the stabilisation of the franc in June last. The directors regret that they cannot recommend the paymt. of a div. to the ord. shhldrs. Pref. div. due on Jan. 1, 1929, will be paid as usual. The directors much regret that the tradg. results of the past year are still disappointg., but there is considerable improvemt. in comparison with the previous year, although the actual turnover is slightly lower. Much of this improvemt. is the result of further economies. All the co.'s factories are in a highly efficient conditn., and since the reorganisatn. at Persan the prospects there are distinctly good. The pfts. derived from the foreign branches show a substantial increase on the previous year.

*ONE of the lighting fittings in the Empire Theatre, London, which was made to the architects' design by Metro - Vick Supplies, Ltd. The fitting shown is one of many installed in the tea room. Other details of the theatre are given on page 586.*

## New Companies.

STAR WELDING CO., LTD.—Cap., £2 500. Welders, electricians, etc. Reg. office : 38c, Peterborough Road, London, S.W.6.

R.P. ADJUSTABLE THERMOSTAT CO., LTD.—Cap., £7 000. Electrical engineers, etc. Reg. office : 195, Strand, London, W.C.2.

MORECAMBE ELECTRICAL EQUIPMENT CO., LTD.—Cap., £3 000. Manufacturing electrical engineers, electricians, etc. Reg. office : Fahy's Garage, Euston Road, Morecambe and Heysham.

JAMES MARSTON, LTD.—Cap., £100. Dealers in wireless receiving and transmitting sets, dynamos, electric lamps and fittings, electrical supplies, etc. Reg. office : 161, High Street, Southend, Essex.

COMMERCIAL RADIO CO., LTD.—Cap., £1 000. To carry on the business of electrical, wireless and radio engineers as formerly carried on by E. Davidson at 47, Rathbone Place, Oxford Street, London, W.

AUTOMA APPLIANCES, LTD.—Cap., £100. Electrical and mechanical engineers, manufacturers and hirers of and dealers in automatic coin and slot machines, etc. Reg. office : 74A, Regent Street, London, W.1.

ELECTRO UNIVERSAL MOTOR EQUIPMENT CO., LTD.—Cap., £3 000. Electrical, wireless, mechanical and general engineers, etc. Man. director : B. J. Hughes, 25, Fendale Avenue, East Boldon, Co. Durham.

ATOMLITE (PARENT CO.), LTD.—Cap., £10 000. Electricians, electrical and mechanical engineers, manufacturers of, agents for and dealers in electrical, magnetic, galvanic, electro-therapeutic and other apparatus, etc. Reg. office : 322, Regent Street, London, W.

HASLAM AND NEWTON, LTD.—Cap., £450 000. To adopt agreements (*a*) with the Haslam Foundry and Engineering Co. (1927), Ltd., and (*b*) with Newton Brothers (Derby), Ltd., and to carry on the business of manufacturers of and dealers in machinery, electrical and general engineers, electric light contractors, manufacturers of and dealers in electric light and power plants, wireless stations, dynamos, etc. Solicitors : J. D. Langton and Passmore, 111, Old Broad Street, London, E.C. (Public co.)

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ORCHORSOL GRAMOPHONES, LTD.—Cap., £120 000. Manufacturers and factors of, agents for and dealers in gramophones, phonographs, telephones and other machines and apparatus for recording, reproducing or transmitting music, speech or sound, electrical, wireless on television apparatus, appliances and accessories, mechanism and apparatus for synchronising sound with cinematograph films, etc. Reg. office: 639-643, Salisbury House, London Wall, London, E.C.2. (Public co.)

## LEAD MARKET REPORT.

Regarding the lead market last week, James Foster and Co. state that the market opened easier on Monday, but the tone became steadier, and on Wednesday there was a rally of 5s. per ton to £21 3s. 9d. for November. The price of American lead was lowered to 6·35 cents, and it is now reported that conditions on that side are easier.

Closing prices on November 16th, were £20 18s. 9d. for November, £21 1s. 3d. for December, £21 2s. 6d. for January and £21 3s. 9d. for February, 2s. 6d. per ton lower on the week

# Coming Events.

### Friday, November 23rd.

ASSOCIATION OF ENGINEERING AND SHIPBUILDING DRAUGHTSMEN.—Chamber of Commerce, New Street, Birmingham. Lecture by Mr. F. H. Boden on "Bearings." 7.30 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN (MANCHESTER DISTRICT BRANCH).—Corporation Electricity Showrooms, 28, St. Ann Street. Lecture by Mrs. Flack on "Electric Appliances and Their Uses in the Home." 2.30 *p.m.*

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Papers by Mr. G. Temple on "The Physical Interpretation of Wave Mechanics"; Mr. A. Monkhouse on "The Effect of Superimposed Magnetic Fields on Dielectric Losses and Electric Breakdown Strength"; Mr. A. Campbell on "A New Potentiometer of Larson Type"; Prof. E. F. Herroun and Prof. E. Wilson on "Ferromagnetic Ferric Oxide." 5 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row, Birmingham. Lecture by Mr. P. E. Erikson on "Some Aspects of Long Distance Cable Telephony." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Lt.-Col. C. H. Sylvester Evans on "Searchlights and Their Applications." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—Engineers' Club, 17, Albert Square, Manchester. Paper by Mr. R. Brooks on "Electric Traction on Railways." (Joint meeting at invitation of the Manchester Association of Engineers.) 7.15 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Paper by Mr. C. F. Moore on "A Survey of Cadmium." 7.30 *p.m.*

### Saturday, November 24th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—Visit to Cardiff Engineering Exhibition.

### Monday, November 26th.

ELECTRICAL ASSOCIATION FOR WOMEN.—E.L.M.A. Lighting Service Bureau, 15 Savoy Street, Strand, London. Lecture by Miss N. Miller, on "Advertising Electric Lamps." 7 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (EALING SUB-BRANCH).—Ordinary meeting.

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion, "Picture Telegraphy." (Opened by Mr. E. S. Ritter.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE).—Sopwith's Lounge, Northumberland Street, Newcastle-on-Tyne. Informal discussion on "Automatic Network Voltage-Regulating Equipments." 7 *p.m.*

ROYAL SOCIETY OF ARTS.—John Street, Adelphi, London. Cantor Lecture (III) by Dr. F. Kidd on "Refrigeration." 8 *p.m.*

### Tuesday, November 27th.

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN STUDENTS' SECTION).—Annual Dinner.

ELECTRICAL CONTRACTORS' ASSOCIATION (BIRMINGHAM BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (CHESTERFIELD SUB-BRANCH).—Falcon Café. Ordinary meeting.

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH CENTRE).—Grosvenor Restaurant, Gordon Street, Glasgow. Annual dinner. 6 for 6.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE).—Station Hotel, Newcastle-on-Tyne. Annual dinner. 7 for 7.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE).—Hotel Metropole, King Street, Leeds. Informal discussion.

ELECTRICAL POWER ENGINEERS' ASSOCIATION.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Dr. A. T. de Mouilpied on "Low Temperature Carbonisation of Coal." 7.15 *p.m.*

INSTITUTION OF ENGINEERING INSPECTION.—Hyde Park Hotel, London. Annual Reception and Dance. 8.30 *p.m.*

### Wednesday, November 28th.

ELECTRICAL CONTRACTORS' ASSOCIATION (CROYDON SUB-BRANCH).—Ordinary meeting.

ELECTRICAL ASSOCIATION FOR WOMEN.—46, Kensington Court, London. Lecture-demonstration on "The Commonsense Handling of Domestic Electrical Equipment." By Mr. R. W. Kennedy. 3 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (BELFAST BRANCH).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (MERSEY AND NORTH WALES—LIVERPOOL CENTRE).—University Club. Annual dinner. 7 *p.m.*

### Thursday, November 29th.

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—20, Trongate, Glasgow. Eighteenth Illumination Design Course. Lecture on "General Lighting Problems." 7.30 *p.m.*

### Friday, November 30th.

INSTITUTION OF MECHANICAL ENGINEERS.—Storey's Gate, St. James's Park, London. Thomas Lowe Gray Lecture by Prof. W. E. Dalby, F.R.S., on "The Possible Vibration of a Ship's Hull Under the Action of an Unbalanced Engine." 6 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—Royal Technical College, Glasgow. Lecture before the Royal Technical College Civil Engineering Society on "Factory Lighting." 7.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE).—Grand Hotel, Birmingham. Annual dinner. 7 *p.m.*

# Electrical Trade Marks.

***This list has been specially compiled for us from official sources by GEE AND CO., Patents and Trade Mark Agents, 51 and 54, Chancery Lane, London, W.C. 2, from whom further information may be obtained.***

*Opposition to the registration of the following trade marks can be lodged up to November 24th, 1928.*

B461 914. Class 6. Dynamos, electric motors, electric starters and parts thereof, all being machines or parts of machines. September 2nd, 1925. B461 920. Class 13. Electric switches and electric fuses, all being goods of ordinary metal. Siemens-Schuckertwerke Gesellschaft mit beschrankter Haftung, 101 to 110, Nonnendamm-Allee, Berlin-Siemensstadt, Germany; manufacturers. September 2nd, 1925. The applicants undertake that this Mark, when registered, and the Mark No. 461 914 shall be assigned or transmitted only as a whole and not separately. User claimed from February 1st, 1921.

DREM. 494 534. Class 6. Machinery of all kinds, and parts of machinery, except agricultural and horticultural machines and their parts included in Class 7. August 28th. (To be associated September 24th.) 494 535. Class 8. Philosophical instruments, scientific instruments and apparatus for useful purposes. Drem Products Corp., 152, West 42nd Street, New York; manufacturers. August 28th, 1928. (To be associated. Sect. 24.)

494 026 Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Vereinigte Stahlwerke Aktien-Gesellschaft, Breitestrasse 67 to 69, Dusseldorf; manufacturers. August 11th, 1928. (To be associated. Sect. 24.) Registration of this trade mark shall give no right to the exclusive use of the letter "U."

CINOPHOT. 494 539. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Drem Products Corp., 152, West 42nd Street, New York; manufacturers. August 28th, 1928.

UNILOY. 493 763. Class 6. Electrical machines. Chicago Pneumatic Tool Co., 6, East 44th Street, New York; manufacturers. August 1st, 1928.

RISHAR. 494 621. Class 8. Wireless telephone apparatus and parts thereof. I. Harris and Sons, Ltd., 64, Hanover Street, Liverpool; merchants. August 31st, 1928.

492 064. Class 13. Electric switches (ordinary) and electric fuses, being metal goods not included in other classes. Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Barford Street, Birmingham; manufacturers. June 5th, 1928. (To be associated. Sect. 24.) Registration of this trade mark shall give no right to the exclusive use of the numeral "8."

WEE-APEX. 493 393. Class 13. Electric switch and fuse gear. Foster Engineering Co., Ltd., Morden Works, Morden Road, Wimbledon, London, S.W.19; electrical and mechanical engineers. July 18th, 1928. (To be associated. Sect. 24.

*Opposition to the registration of the following trade marks can be lodged up to November 30th, 1928.*

IGRANIKIT.—494 923. Class 8. Instruments and apparatus for use in wireless telephony and telegraphy. Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.4; electrical engineers. September 11th, 1928. (To be associated. Sect. 24.)

GILARMONIC.—495 427. Class 8. Philosophical instruments, scientific instruments, and apparatus for useful purposes; instruments and apparatus for teaching. Matthew Gill, Brunswick House, City Road, Manchester; manufacturer. September 27th, 1928.

CANDELUX.—492 783. Class 8. Electric lamps (ordinary). British Electric Lamps, Ltd., Spencer Lamp Works, Spencer Hill Road, Wimbledon, London, S.W.19, manufacturers. June 27th, 1928.

FOSALSIL.—494 261. Class 50. Electric insulating substances and materials. Moler Products, Ltd., 8, Old Jewry, London, E.C.2; manufacturers. August 20th, 1928. (To be associated. Sect. 24.)

*Opposition to the registration of the following trade marks can be lodged up to December 7th.*

VITAKLOR.—494 429. Class 1. Chemical substances for use in the maintenance and repair of electrical storage batteries. The Vitaklor Co., 1A, Rigly Street, Nelson, Lancashire; manufacturers and dealers. August 24th, 1928.

WALTER JENKS.—493 547. Class 6. Air purifying machines worked by electricity and compressed air. Walter Jenks, Fitzalan House, Arundel Street, London, W.C.2; company director. July 24th, 1928.

SILEX.—493 847. Class 8. Electric drills, hammers and grinding machines. Henri Cuinier, 15, Passage de la Folie Regnault, Paris, France; constructional engineer. August 3rd, 1928.

TRIOLA.—495 080. Class 8. Gramophones and wireless telephonic and telegraphic apparatus. Triotone, Ltd., 41, Wigmore Street, London, W.1; manufacturers. September 15th, 1928. (To be Associated. Sect. 24.)

ELCRON.—495 567. Class 10. Electric clocks and parts of electric clocks. L. S. Mayer (London), Ltd., 12, New Union Street, Moorfields, London, E.C.2; merchants. October 2nd, 1928.

INVENTUM.—494 401. Class 18. Electric fires and radiators. Inventum Electrical Appliances, Ltd., 3, Chase Estate, Willesden Lane, North Acton, London, W.3.; manufacturers. August 23rd, 1928.

# METAL AND CHEMICAL PRICES.

TUESDAY, November 20th.

| | Price. | Inc. | Dec. |
|---|---|---|---|
| *Copper*— | | | |
| Best Selected .. .. .. per ton | £72 10 0 | — | — |
| Electro Wirebars .. .. „ | £75 5 0 | — | — |
| H.C. Wires, basis .. .. per lb. | 10⅛d. | — | — |
| Sheet .. .. .. .. „ | 10¼d. | — | — |
| *Phosphor Bronze*— | | | |
| Wire (Telephone) basis .. per lb. | 1s. 1⅛d. | — | — |
| *Brass* 60/40— | | | |
| Rod, basis .. .. .. per lb. | 8¼d. | — | — |
| Sheet „ .. .. .. „ | 10¼d. | — | — |
| Wire „ .. .. .. „ | 10¼d. | — | — |
| *Pig Iron*— | | | |
| Cleveland Warrants .. .. per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „ | £14 15 0 | — | — |
| *Lead Pig*— | | | |
| English .. .. .. per ton | £22 10 0 | — | — |
| Foreign or Colonial .. .. „ | £21 2 6 | 5s. 0d. | — |
| *Tin*— | | | |
| Ingot .. .. .. .. per ton | £230 10 0 | — | 5s. 0d. |
| Wire, basis .. .. .. per lb. | 3 0 | — | — |
| *Aluminium Ingots* .. .. per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. .. „ | £24 15 0 | 7s. 6d. | — |
| *Mercury* .. .. .. per bottle | £22 15 0 | — | 7s. 6d. |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 15 0 *Boric Acid* (Crystals) £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2¾d.
*Sodium Bichromate*—Per lb. 3¼d.

*Rubber*—Para fine, 10¾d.; plantation, 1st latex, 8¾d.

*** The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

AUTO RADIO SUNDRIES, London Road, Manchester, radio and auto engineers. £15 9s. 6d. October 2nd.

BROWN, R., and TUXFORD, H. (trading as MORRISON AND BROWN), Acre Lane, Brixton, electrical engineers. £18 11s. 6d. October 10th.

CORNALL AND METCALFE, Ribblesdale Garage, Gisburn, electricians. £25 10s. 11d. October 16th.

CRESSY, Mr. J. W., Waterloo Street, Market Rasen, wireless dealer. £10 8s. 10d. October 10th.

DOUDNEY, Mr. E., 93, East Street, Chichester, wireless dealer. £22 12s. 3d. October 5th.

LEIGH, Mr. E., 25, Beach Road, Heaton Mersey, Manchester, wireless dealer. £22 10s. 10d. October 2nd.

OWEN, Mr. H., 72, High Street, Shoeburyness, radio dealer. £23 15s. 4d. October 5th.

RUNBAKEN, Mr. J. H. Maryvale, Hill Top, Wilmslow, magneto manufacturer. £32 18s. 5d. October 16th.

SMITH, Leonard J., 3, Lower King's Road, Berkhamsted, wireless factor. £15 18s. 2d. October 9th.

WESTNUTT, John Victor, High Street North, Dunstable electrical engineer. £78 2s. 9d. August 9th.

## Bill of Sale.

RADFORD, Henry Joseph, 167, Gloucester Road, Bishopston, wireless engineer. Dated November 9th, filed November 14th. £50.

## Receivership.

BRITISH RADIO VALVE SERVICE, LTD.—S. Cole, of Sardinia House, Sardinia Street, Kingsway, W.C.2, was appointed receiver and manager on November 7th, 1928, under powers contained in debenture dated March 30th, 1925.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

DAKOL ELECTRIC, LTD., Newcastle-on-Tyne.—Registered October 29th, series of debentures for £12 000, present issue £6 000; general charge.

ENGLISH ELECTRIC CO., LTD., London, W.C.—Registered October 24th, mortgage (supplemental to Trust Deed dated August 14th, 1923, securing £1 600 000 6% convertible debenture stock), also registered October 24th, mortgage (supplemental to charge dated September 15th, 1924, securing £500 000 (not exceeding) to Lloyds Bank, Ltd.; charged on properties at Hough and Castle Church and Coventry, &c. *£2 545 714. May 14th, 1928.

HARRIS, WILLIAMS (MANUFACTURERS), LTD., London, E.C., electricians.—Registered October 23rd, £5 000 debenture to H. S. Sutherland, Chislehurst, Carmel Road, Darlington, and another; general charge.

RICHMORE VALVE CO., LTD., Birmingham, manufacturers of wireless valves.—Registered October 30th, £700 debentures; general charge.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON, LTD., London, S.W.—Registered October 19th, trust deed dated October 15th, 1928, securing £4 000 000 debenture stock; charged on certain stocks and shares. *£9 435 450. March 21st, 1928.

## Satisfactions.

GILWERN MANUFACTURING CO., LTD., wireless manufacturers.—Satisfaction registered October 29th, £1 950, registered December 29th, 1927, and March 28th, 1928.

STEYNING ELECTRIC LIGHT CO., LTD.—Satisfaction registered October 2nd, all moneys etc., registered February 26th, 1921.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

PORTABLE UTILITIES CO., LTD., 8, Fisher Street, Southampton Row, W.C.2, wireless and electrical factors. At the statutory meeting of creditors in this voluntary winding up, the liquidator submitted an approximate statement of affairs which disclosed liabilities of £11 500, of which £5 810 was due to the trade, and the Electrical Appliance Co. were creditors for £5 900. Including a contingent claim of £1 150 there was a deficiency of £7 885. For the six months to September, 1926, the sales were £9 143, but for the half-year to September, 1927, they dropped to £4 736, while for the period from March, 1928, down to the date of liquidation the turnover was £7 961. After discussing the position at considerable length, it was decided to confirm the appointment of the present liquidator, Mr. F. S. Salaman, C.A., Bucklersbury, E.C.

## London Gazette, etc.

### Winding-up Petition.

HELIKON WIRELESS CO., LTD.—A creditor's petition for winding-up has been presented, and is to be heard at the Court House, Half Acre, Brentford, Middlesex, on November 30th, at 10.30 a.m.

### Company Winding-up Voluntarily.

J. AND C. MANUFACTURING CO., LTD.—By special resolution, October 12th, confirmed November 7th. C. Hastings, Diamond Works, Brighton, appointed as liquidator.

### Bankruptcy Information.

LANE, Edward, 50, Angerstein Road, North End, Portsmouth, electrician. Receiving order, November 14th, Debtor's petition.

NORMAN, George Arthur, 11, Freeman's Yard, Barnsley, electrical engineer. Receiving order, November 12th. Debtor's petition. First meeting, November 27th, 11 a.m., and public examination, December 20th, 10.30 a.m., County Court Hall, Regent Street, Barnsley.

### Notice of Dividend.

COOPER, Arthur Coath, 1A, Sherwood Street, Scarborough, electrical engineer. First and final dividend, 3s. 11½d. per £, payable November 29th, Official Receiver's Office, 48, Westborough, Scarborough.

WEEKES, Amos Lawrence, 13, Crescent Road, Luton, Bedford, electrical engineer. First and final dividend, 6s. 4d. per £, payable November 26th, Official Receiver's Office, The Parade, Northampton.

### Notice of Intended Dividend.

WOOD, Harry, Market Place, Meltham, Yorks, electrical and radio engineer. Last day for receiving proofs, November 30th. Trustee, J. O. Morris, 12, Duke Street, Bradford, Official Receiver.

## Bankruptcy Proceedings.

LESLIE, John Morice, trading as J. M. LESLIE AND CO., 66, Victoria Street, Westminster, insulating engineer and contractor. This debtor's public examination was held in the London Bankruptcy Court recently before Mr. Registrar Francke, the liabilities, according to his statement of affairs, being £1 482, expected to rank, against assets £169. The debtor, after his demobilisation in January, 1919, was employed by a firm of engineers and contractors until September, 1926. In that month, in partnership with another person, he began business as insulating engineers and contractors at the above address under the style of Harvey, Leslie and Co. But their business was adversely affected by the lack of enough working capital, and in May of last year the partnership was dissolved. He paid his partner £100 for his interest in the firm, and afterwards traded alone under the style of J. M. Leslie and Co. But in consequence of keen competition the debtor was compelled to execute contracts at prices which proved insufficient to meet overhead charges, and last March, realising his hopeless financial position, he discontinued the business and filed his petition. The debtor attributed his insolvency to lack of capital, to keen competition and to the gross profits having been insufficient to meet the overhead charges of the business. The examination was concluded.

WOOD, Harry, Market Place, Meltham, near Huddersfield, Yorkshire, electrical and radio engineer. The public examination of this debtor was held recently at the County Court House, Queen Street, Huddersfield, when a deficiency of £705 was disclosed in his statement of affairs. The present position was attributed to illness due to a motor accident, lack of cash capital, and a contributory cause was the unnecessary expense in shop front alterations. It appeared that he had previously been in partnership and had paid his partner out for £300. The debtor later became involved in a motor accident, in which he sustained a broken leg, and was ill for several months, during which time losses were incurred on contracts. The examination was closed.

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Modern Building Construction, Series No. 1, "Standard Practice for the Manufacture of Concrete Blocks," as its title denotes is a text book dealing with this subject. The particulars given are based on technical and practical experience. The notes are a compilation of the processes and methods by the Portland Cement Selling and Distributing Co., Ltd., followed in various block factories, briefly described, so that, if desirable, they may be adapted to the needs of any block-making plant.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

283 128 Westinghouse Brake and Saxby Signal Co., Ltd. Apparatus for rectifying alternating-currents. (4/1/27.)
299 408 J. L. A. Hilbrenner. Porcelain-like electric insulating substances. (26/7/27.)
276 641 Dr. A. Scherbius and E. R. Ritter (trading as Scherbius and Ritter, (Firm of)). Electric switches. (26/8/26.)
299 500 A. West and Co., Ltd., and V. Breeze. Electrical resistances. (27/7/27.)
299 505 H. J. Round. Thermionic valves. (27/7/27.)
299 507 R. T. Smith and C. H. Smith. Wireless direction-finding systems. (28/7/27.)
299 513 Sign Construction Co., Ltd., and S. H. Instone. Electrically operated advertising signs. (28/7/27.)
299 518 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Modulated carrier-wave signalling systems. (29/7/27.)
299 523 W. E. Beatty (Bell Telephone Laboratories, Inc.). Wire-drawing apparatus. (29/7/27.)
299 524 Handstock, Ltd., and F. Avery. Electric welding-apparatus. (29/7/27.)
299 537 M. Trouton and Wireless Music, Ltd. Electromechanical vibration-translating devices, such for example as loud-speakers. (5/8/27.)
299 540 F. Berg. Suspension of the live wire of electric railways. (6/8/27.)
275 675 British Thomson-Houston Co., Ltd. Transmission of pictures by radio or other telegraphy. (9/8/26.)
299 543 Dr. M. Hahn and Dr. K. B. Eisenberg. Material for damping sound and other waves. (9/8/27.)
299 545 J. Collier. Electrical transmission lines. (10/8/27.)
299 555 T. Ferguson, J. R. Johnstone and Metropolitan-Vickers Electrical Co., Ltd. Electric lighting and like systems having a constant voltage load and a variable voltage source of supply current. (20/8/27.)
276 675 British Thomson-Houston Co., Ltd. Carburisation of ferrous metals. (26/8/26.)
299 561 W. Guy-Pell and W. West. Electrical bonding junction-boxes and the like for use with metallic-sheathed wires and cables. (29/8/27.)
299 564 Standard Telephones and Cables, Ltd., and A. M. Searle. Fire-alarm systems. (2/9/27.)
299 569 R. W. Neale. Electric lamps. (9/9/27.)
299 572 British Thomson-Houston Co., Ltd., A. P. Young and E. G. Parrott. Electrical contact making and breaking devices. (12/9/27.)
299 574 Sterling Telephone and Electric Co., Ltd., N. Blades and L. V. Marks. Telephone transmitters. (14/9/27.)
299 575 Quasi-Arc Co., Ltd., and A. P. Strohmenger. Fusible electrodes for use in electric arc welding. (15/9/27.)
299 577 English Electric Co., Ltd., and F. Morris. Trucks for electrically-driven vehicles. (16/9/27.)
279 053 G. Claude and J. M. E. De Beaufort. Process of and apparatus for modifying the colour of light in electric discharge tubes. (18/10/26.)
299 580 D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. Electrical switchgear. (21/9/27.)
278 368 British Thomson-Houston Co., Ltd. Electric switches. (1/10/26.)
278 381 Siemens and Halske Akt.-Ges. Automatic telephone systems. (1/10/26.)
299 594 British Thomson-Houston Co., Ltd. (General Electric Co.). Loom-pickers. (6/10/27.)
299 593 Muirhead and Co., Ltd., F. H. Muirhead, E. S. Heurtley and J. V. Foll. Electrical or other contact-making devices. (5/10/27.)
299 603 F. W. Fawdry. Suspension of overhead conductor wires for electric railways and tramways. (19/10/27.)
299 604 B. Turner and Ferro-Arc Welding Co., Ltd. Electrodes, feed rods, or the like for use in the fusion deposition of alloys. (19/10/27.)
281 332 Siemens-Schuckertwerke Akt.-Ges. Regulation of asynchronous dynamo-electric machines. (29/11/26.)
282 079 Siemens-Schuckertwerke Akt.-Ges. Bright-annealing furnaces. (9/12/26.)
299 642 H. J. Fisher. Means of connecting electric conductors. (30/12/27.)
283 156 Telefonaktiebolaget L. M. Ericsson. Group selectors for automatic telephone systems. (5/1/27.)
299 649 J. Katunsky. Electric soldering-iron. (24/1/28.)
299 660 W. J. Charles and A. Watson. Electrical tumbler switches. (21/2/28.)
286 691 British Thomson-Houston Co., Ltd. Electric signalling systems. (9/3/27.)
287 459 Westinghouse Electric and Manufacturing Co. Radio transmitting systems. (17/3/27.)
299 669 H. Huthmacher. Time-controlled switches for radio receivers and the like. (19/3/28.)
288 613 Quarzlampen-Ges. Means for concentrating light from straight-line sources of light, more particularly quartz burners. (13/4/27.)
288 996 Associated Telephone and Telegraph Co. Telephone systems (19/7/26.)
299 680 Dr. O. T. Blathy. Rotating field magnets for turbo-generators. (23/4/28.)
290 245 Westinghouse Electric and Manufacturing Co. Optical systems for the scanning or recombining devices of picture transmission or television systems. (11/5/27.)
290 208 British Thomson-Houston Co., Ltd. Electromagnets. (9/5/27.)
299 689 H. Wade (Aluminium-Industrie Akt.-Ges.). Electrolytic extraction of aluminium. (25/10/27.)
293 027 British Thomson-Houston Co., Ltd. Means for indicating at a distance electrically. (1/7/27.)
299 735 H. E. Potts (H. Plauson). Process and apparatus for producing rapidly moving electrons and for subjecting matter thereto. (30/5/27.)
299 818 J. Parkinson. Heating vessels by electricity. (30/6/27.)
299 738 W. A. Williams. Method for the electrodeposition of rubber or homologous substances. (30/6/27.)
299 822 M. Trouton. Acoustic devices. (2/7/27.)

## Applications for Patents.

### October 22nd.

30 503 British Thomson-Houston Co., Ltd. Wireless signalling. (21/10/27, U.S.)
30 505 British Thomson-Houston Co., Ltd. Vacuum tubes. (11/11/27, U.S.)
30 504 International General Electric Co., Inc. Electric meters. (27/10/27, Germany.)
30 501 Maschinenfabrik Oerlikon. Electric circuit breaker. (23/11/27, Switzerland.)
30 517 Metropolitan-Vickers Electrical Co., Ltd. Systems for automatically paralleling a.c. circuits. (20/10/27, U.S.)
30 588 H. J. Mitchell. Electric drying cabinet, etc.
30 571 N. V. Philips' Gloeilampenfabrieken. Electric discharge tubes. (29/10/27 Holland.)
30 581 J. Navascues. Electric machines.
30 471 D. S. B. Shannon. Means for energising field magnets of loud speakers.
30 456 A. M. Taylor. Alternating current power transmission.
30 547 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves. (21/10/27, Germany.)
30 580 M. Trouton and Wireless Music, Ltd. Loud speakers.
30 492 F. R. F. Wall. Automatic lighting switch.
30 555 A. E. White (J. A. Williams). Igniters for internal combustion engines.
30 480 A. C. Wynne. Electric switches. (21/1/28.)

### October 23rd.

30 674 Allmanna Svenska Elektriska Aktiebolaget and D. Danielsson. High tension fuses.
30 701 Automatic Telephone Manufacturing Co., Ltd., and H. H. Harrison. Telegraph systems.
30 628 A. E. Berriman and Birmingham Small Arms Co., Ltd. Moving coil loud speakers, etc.
30 684 British Thomson-Houston Co., Ltd. High tension cables. (25/10/27, U.S.)
30 720 W. L. Colassi. Loud speakers.
30 640 Coventry Automatic Telephones, Ltd., and E. P. L. Westell. Devices for generation of audio-frequency electric currents.
30 659 E. Edser. Manufacture of insulated wires, etc.
30 663 Electrical Research Products, Inc. Driving mechanism. (28/12/27, U.S.)
30 666 Electrolux, Ltd. (Inventia Patent-Verwertungs Ges.). Electric switches.
30 677 H. George. Electric furnaces for manufacture of glass. (25/10/27, France.)
30 644 Metropolitan-Vickers Electrical Co., Ltd. Protective apparatus for electric power systems. (21/11/27, U.S.)
30 609 D. M. Ridgeway. Telephone receiver rest.
30 667 Siemens Bros. and Co., Ltd., and J. R. Thorpe. Electrical condensers.
30 709 Siemens-Schuckertwerke A.G. Electric switches. (28/10/27, Germany.)

### October 24th.

30 771 H. Wadey. Radio receiving and transmitting apparatus.
30 833 A. W., S. and W. V. Butterfield and Mycromet Manufacturing Co. Plug and socket connections.
30 834 A. W., S. and W. V. Butterfield and Mycromet Manufacturing Co. Electrical fittings.
30 835 A. W., S. and W. V. Butterfield, W. E. Evers and Mycromet Manufacturing Co. Cord grips for lampholders, etc.
30 815 W. L. Colassi. Electrical sound reproducing apparatus.
30 862 Anode Rubber Co., Ltd. Insulating products, etc. (28/10/27, U.S.)
30 866 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electrical amplifying arrangements.
30 776 A. L. M. Douglas and G. E. Ward. Intervalve devices for speech amplifying apparatus.
30 868 Maschinenfabrik Oerlikon. Cascade connections for asynchronous machines, etc. (35/11/27, Switzerland.)
30 869 Maschinenfabrik Oerlikon. Electric switch installations.
30 840 Metropolitan-Vickers Electrical Co., Ltd. Ship propulsion systems, etc.
30 865 A. P. Mill. Electric switch for controlling signalling apparatus.
30 738 T. W. Ord. Alternating current rectifier circuits.
30 789 W. G. Poetzsch. Electrodeposition of chromium. (25/10/27, Germany.)
30 809 F. Rother. Method of releasing electrons from conductors. (14/11/27, Germany.)
30 734 L. B. Smith. Wireless receiving apparatus.
30 759 Soc. Electro-Metallurgique de Montricker. Mounting furnace electrodes. (26/10/27, France.)
30 756 L. P. Todd. Apparatus for telegraphic transmission of visual representations.

### October 25th.

30 883 J. R. Blaikie. Electric candle lamps.
30 954 J. P. Bowen and General Electric Co., Ltd. Incandescent lamps.
30 957 British Thomson-Houston Co., Ltd. Electrical distribution system. (27/10/27, U.S.)
31 014 Eastern Telegraph Co., Ltd., and H. V. Higgitt. Means for picking up submarine cables.
30 955 C. G. Eden and General Electric Co., Ltd. Electric switches.
30 939 G. Fischer. Current collectors for electric vehicles. (31/10/27, Hungary.)
30 951 W. Germershausen. Incandescent cathode for discharge tubes. (26/10/27, Germany.)
30 910 S. Loewe. Multiple valves.
30 937 Metropolitan-Vickers Electrical Co., Ltd. Power systems.
30 988 Mullard Radio Valve Co., Ltd., and P. W. S. Valentine. Electric circuits, etc.
30 966 J. Pintsch Akt.-Ges. Electrical sound emitting apparatus. (26/10/27, Germany.)
30 889 D. M. Shannon and D. D. Walker. Illuminated signs.
30 920 Standard Telephones and Cables, Ltd. (K. M. Sano). Switching mechanisms for automatic telephone systems.
30 969 F. Szalay. Device for preventing tilting movement of bows of current collectors. (31/10/27, Hungary.)
30 911 G. W. Walton. Television apparatus.

### October 26th.

31 126 J. L. Baird and Television, Ltd. Television systems, etc.
31 085 British Thomson-Houston Co., Ltd. Electric switches. (26/10/27, U.S.)
31 125 Columbia Graphophone, Ltd., and F. A. Mitchell. Electromagnetic sound reproducing devices. (17/8/27.)
31 141 L. H. Crook. Transmission lines.
31 135 C. N. Dudley. Electric display devices.
31 018 W. R. Hall, and Platt Bros. and Co., Ltd. Mechanism for transmission of motion from electromotors to ring spinning frames, etc.
31 103 Loewe Audion Ges. Interrupting connections in evacuated vessels. (27/10/27, Germany.)
31 152 Marconi's Wireless Telegraph Co., Ltd. Aerial systems. (28/10/27, U.S.)
31 142 Maschinenfabrik Oerlikon. Pressure gauge for high vacua. (30/11/27, Switzerland.)
31 092 C. Berrage Moulton. Electromagnetic pickups.
31 134 Pilot Ray Corporation. Dirigible headlights. (7/11/27, U.S.)
31 147 J. E. Pollak (Associated Telephone and Telegraph Co.) Alternating current bells.
31 059 M. Schmidt Elektrotechnische and Metalwaarenfabrik and M. Schmidt. Anode battery.
31 093 Siemens-Schuckertwerke A.G. Electric motors. (9/11/27, Germany.)
31 150 Standard Telephones and Cables, Ltd. (Western Electric Co.). Electric transmission systems.
31 052 Westinghouse Lamp Co. Incandescent lamps. (31/10/27, U.S.)
31 155 A. W. Whistlecraft and G. M. Wright. Ignition systems.

### October 27th.

31 255 A. D. Barton. Metal cabinets for wireless apparatus, etc.
31 196 British Insulated Cables, Ltd., and L. B. Wilson Apparatus for electrically heating rivets, etc.
31 206 British Thomson-Houston Co., Ltd. Methods of coating glass articles. (28/10/27, U.S.)
31 240 L. A. Catlin and Electro-Mechanical Brake Co., Ltd. Tramway brakes, etc.
31 175 B. L. Cutting. System of control for railway trains.
31 181 Electroacustic Ges. Electrical compensator. (27/10/27, Germany.)
31 235 G. de Gasenko. Incandescent lamps. (31/3/28, France.)
31 182 A. E. Heath. Wireless receiving instruments.
31 211 Holophane, Ltd. Spot light projectors.
31 239 J. Lucas, Ltd., and O. Lucas. Vehicle electric lamps.
31 171 J. Roberts. Electrical distribution systems.
31 234 C. Russ. Construction of electrical heating elements.
31 219 A. E. White (Pioneer Instrument Co.). Electric generators.

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# THE ELECTRICIAN

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# Current Topics.

## Raw Materials.

OUR policy of publishing periodical Special Issues dealing with various specialist sections of the electrical industry or of electrical work has been so well received by readers that it has been decided materially to enlarge the scope and variety of these monographs, and to reach out into other fields of electrical endeavour. The present issue, for instance, is mainly concerned with what we rather arbitrarily call the raw materials of the electrical industry, and the equipment which is necessary to transform these raw materials into the finished electrical product. There can be few industries in existence which need and regularly employ such a vast range of material as the electrical industry, and the number of additional applications of hitherto untried products is constantly being added to. Of the better known materials, the electrical industry absorbs something like one-half of the world's total production of copper. In 1927 the British electrical industry alone used some 70 000 tons of copper (out of the total home consumption of 144 000 tons), and, large as this figure appears, it is interesting to note that the industry's requirements of lead are still greater, the tonnage used for cable sheathing in this country having been estimated at approximately 80 000 tons per annum. In variety, as well as quantity, the electrical industry makes remarkable demands on the world's material resources, and the number of known insulation materials alone runs into several hundreds. Obviously it is impossible, in one issue, to deal completely with all the products, natural or manufactured, which form the raw materials of the electrical industry, but in view of the wide interest of a subject which has not to our knowledge received adequate treatment in the past, arrangements have been made to publish in THE ELECTRICIAN a series of special articles at monthly intervals over a period of three years, dealing with every kind of electrical raw material. The start that is made in the present issue will give some idea of the thorough way in which the field is being explored, and it is confidently expected that these special contributions will lead to a greater interest being shown throughout the industry in the materials which go to the making of the finished electrical product, and will stimulate thought in the direction of finding new uses for existing materials, and new materials to replace some that are now in use.

In this, the first of our Raw Materials issues, a considerable amount of space has been devoted to insulation materials in general, and insulating varnishes in particular. As one of our contributors to this section points out, the branch of insulation development that has advanced most in recent times is that concerned with moulded compounds, and some idea of the extent to which British electrical manufacturers are now employing synthetic moulding powders can be gained from the author's statement that one firm manufactures, for its own use alone, two tons per day. It is also interesting to note that though most electrical manufacturers start making or using synthetic mouldings for electrical purposes they eventually find that they are using an increasing quantity for purely mechanical applications, the new moulding art having virtually provided the designers with a new creative medium.

Of the various developments on the metallurgical side there is probably none so interesting to our readers, particularly those on the electricity supply side of the industry, as the new aluminium alloys, which are claimed to have sufficient mechanical strength to eliminate the steel cores commonly used in pure aluminium conductors for overhead lines. Consideration of the properties of these alloys suggests that interesting developments are to be looked for in this direction.

## Factory Lighting Campaign.

ACCORDING to the latest E.D.A. report on the progress of the Factory and Workshop Lighting Campaign, the number of inquiries received up to the end of last week in response to campaign propaganda was well over two thousand. As the campaign has only been active during three months this figure is highly satisfactory, representing, as it does, an average of over thirty inquiries per working day. Detailed arrangements for lecture demonstrations have been made so far up to the middle of January next, and if the present progress is maintained there is no reason why the E.D.A.-E.L.M.A. combination should not have made contact with a very large percentage of factory and workshop owners. Each inquiry received is, we understand, followed up, and, whenever necessary, further demonstrations are arranged; the evidence of business already done is, however, very considerable. During the next month the London district will form the special area of attack, and invitations have been sent to owners of factories and work-

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shops, and to shop stewards in fifteen boroughs and areas. A very considerable measure of the success of the campaign is due to the personal efforts of Mr. W. J. JONES, whose lectures on the subject of factory lighting might almost be said to be the heart of the campaign; so much so in fact that the Council of the National Union of Manufacturers "have been considering the effect of lighting in factories upon industrial fatigue, accident and production, and are convinced that by good lighting the manufacturer and his employees have much to gain." This conviction, we may say, is largely due to Mr. JONES.

## M.E.T.A. and the I.E.E.

IT is now generally known that the Meter Engineers' Technical Association is to terminate its separate existence at the end of the present year, and its members, or such of them as secure admittance, will in future form the Meter and Instrument Section of the Institution of Electrical Engineers. Although no official reference was made to the matter at the final social gathering of the M.E.T.A. last Saturday, we gathered, in conversation with members, that, although the I.E.E. favoured the absorption of the Association, it stipulated that each member of the latter should make separate application and possess the necessary qualifications for membership. Many of the members can pass the test easily enough, but there are a number of young members who are likely to be deterred by the requirements of a record of the applicant's previous career, and qualifications which may be somewhat beyond their present capabilities. The more influential members of the Association are averse to the casting adrift of any of these younger members, and are of opinion that the Institution should take over the Association as a whole. As these junior members are all doing actual meter work, have been considered fit for membership of the Association, and will probably be, in the future, those who will carry on the essential work of improving the science of metering, it seems at first glance to be a case in which the Institution might reasonably waive its examination and forego strict insistence upon the usual conditions of membership. Further consideration, however, shows that a standard of knowledge for qualifying purposes which can ever be waived once it is established is not a standard, and is definitely contrary to the idea of qualifying membership. If the standard is lowered, status is lowered also, and one exception, however worthy, forms the logical precedent for further deflections. The various grades of the I.E.E. cater for every class of electrical engineer, and those members of the M.E.T.A. who are not at present eligible for corporate membership can find temporary accommodation in the non-corporate grades.

## Lord Birkenhead and "Individualism."

LORD BIRKENHEAD'S statement of the individualist case at the Individualists' luncheon in London last week was the more impressive because it opened in a critical and judicial mood, and frankly recognised the natural limitations both of socialism and of individualism. The movement, as he understood it, was founded on the conviction that the nation will prosper most whose policy encourages individual effort and enterprise, and which, neglecting the swaddling clothes of Government control, trusts to the character and fibre of the people. Frankly admitting that except as a critical and corrective force, the individualist movement could not greatly influence the future of the world, Lord Birkenhead demonstrated within those qualifications the vital part that individual effort has played in British history, and the vital need to leave ample scope for individual initiative in the future. As he rightly pointed out, we are drifting to-day more and more rapidly towards the mistaken view that great new areas ought to be taken over by the new State octopus by which we are menaced. His general conclusion was that although individualism cannot be pressed to its extreme limits, the retention and development of individualist initiative is essential to progress in this and every other country, and up to this point he allied himself whole-heartedly with the movement represented by Sir ERNEST BENN and others who are striving to keep the wholesome and stimulating individualist spirit alive.

## The National Register and the Public.

CRITICISM of the National Register of Electrical Installation Contractors has mainly centred round the suggestion that this public-spirited body is not sufficiently alive to the power of publicity, and that its objects are not sufficiently known to the general public. Evidence that these criticisms no longer apply has already been furnished by the advertising campaign upon which the National Register has recently embarked, and further signs of activity are showing themselves in the news columns of the lay Press. Most notable among recent efforts in this direction was the article occupying 7 column inches which appeared in the "Daily Mail" of November 16th. This article, based upon information supplied by the National Register, was the logical sequel to the reference of a contributor to a recurrence of the epidemic of country house fires due to defective electrical installations, and very clearly explained that the only sure way to secure a reliable electrical installation is to employ a registered electrical installation contractor. Following the publication of this article, the National Register, we learn, has been inundated with inquiries from all parts of the country, including the Highlands and Wales. Such widespread interest can hardly fail to benefit registered contractors, both generally and individually, while it will probably bring in many applications for registration from the rapidly decreasing number of reputable contractors who have not in the past appreciated the benefits which registration brings.

## British Broadcasting Progress.

THOSE who are given to proclaiming the advantages of the listener to American broadcasting programmes, over those emanating from our own stations—and there are still many such people—will have received something of a surprise to learn that the B.B.C. have decided to establish headquarters at a new building in the west-end of London. The new premises will accommodate ten studios, four of them double the size of the largest at Savoy Hill, and one large enough to accommodate an audience of 1 000 people, as well as a large orchestra. The technique of British broadcasting cannot be rivalled, even with our present broadcasting conditions; when the new building is put into service, however, the "balance" of the London transmission, at any rate, will leave the rest of the broadcasting world even farther behind. The progress of broadcasting in this country is not only of interest to electrical contractors and others concerned with the selling and making of receiving sets, for when it is remembered that such people as Prof. HUGHES, Sir OLIVER LODGE, Dr. FLEMING and others are associated with the pioneer work which led to the development of the present art, the electrical world may be regarded as the elder brother of radio. The modern radio engineer is essentially an engineer with knowledge of all electrical principles; further, the majority of the large electrical manufacturers are also makers of radio equipment.

## Japanese Manufacturing Developments.

IT is evident from recent reports that Japan is becoming increasingly independent of foreign suppliers of electrical goods. The latest news from Tokyo is that the Tokyo Electric Light Co. has decided to make electric lamps for its own requirements, and as this company alone is said to have an annual consumption of 8½ million lamps the new departure is likely to have some effect on the distribution of non-Japanese lamps. Initially the company aims at an output of 5 million lamps, but it is hoped in due course materially to reduce the balance obtained through existing sources of supply. Another sign of growing independence is seen in the announcement that high grade silicon sheet steel for electrical machinery is now being successfully made at the Government foundry at Yahata.

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# INSULATION MATERIALS.

## A Brief General Survey of "Natural" and Vitrified Insulations, Moulded Composites, Sheet Materials, Varnishes, Treated Materials and Wire Coverings—Great Increase in Use of Synthetic Moulding Compounds.

By H. WARREN.

THE study of insulation materials is an interesting one, not only on account of the great advances that have been made in recent times, but because some of the natural and manufactured materials that have been appropriated by electrical engineers are linked with antiquity, and are attributes of the customs, or expressions of the industry, of primitive peoples.

Important materials such as resins, gums, bitumens, sulphur, waxes, oils, marble, slate and mica were, of course, available for use, even before there was a human race to fashion or apply them, and it is sometimes forgotten that it was the electrical characteristic of a fossil resin (amber) that marked the birth of electricity as a terrestrial manifestation, and accounted for the name itself. Amber is certainly the original electrical insulator, and, as electrical insulating processes have progressed, the use of natural and artificial amber-like resins has become greater and greater.

As electrical science advanced, designers cast around for materials with which to insulate their conductors, and pressed into their service mica, bitumens, porcelain, glass, etc., and with the onward march of research they extended their range of materials with such additions as insulating varnishes, enamels, synthetic compounds, etc., developed specifically to meet their requirements.

In briefly reviewing the subject of insulation materials it is natural, perhaps, even though it may not lend itself to perfect classification, to consider first "natural" insulations, after that to deal with vitrified insulations, and finally with moulded composites, sheet materials, varnishes, treated fabrics, etc., and wire coverings.

### "Natural" Insulations.

MICA AND MICA PRODUCTS.—Mica is unquestionably the most important "natural" insulation. It is a mineral of a perfectly unique nature, and is of interest for insulation purposes because of its perfect basal cleavage into thin, strong and flexible splittings, with unrivalled electrical and heat-resisting qualities, and possessed of great chemical inertness. It is one of the most widely distributed of all crystalline substances, and its glittering aspect in the surface of all granite is a familiar sight. Mica is found in association with two other materials important in insulation manufacture, viz., Felspar and Quartz, in various parts of the world, but the localities in which the mica pieces are of sufficient size to be of commercial importance are by no means numerous.

The mineralogy of mica involves many complicated varieties, but to the electrical engineer there are really only two kinds of mica that are of great interest, namely Muscovite and Phlogopite. The first of these includes the ruby and green micas which are hard, strong, and excellent electrically, and the second covers amber mica, which is not quite so good electrically, is softer, but more resistant to high temperatures. We hear quite frequently of Biotite or black amber mica, but this is an electrically weak mica which is not generally considered for high voltage purposes.

All micas are silicates of aluminium with varying proportion of potassium, magnesium, iron, etc., Muscovite being characteristically potassium mica; Phlogopite, magnesium mica; and Biotite, magnesium-iron mica.

The principal mica-bearing areas of the world are India, Canada, United States, Tanganyika and Madagascar. India, of course, produces by far the most, mainly Muscovite, and amber mica comes principally from Canada and Madagascar. Virgin mica is used for such purposes as condenser plates, certain heating devices, small commutator segments, washers and sparking plug insulation, but the greatest amount of mica is, of course, used in connection with built-up mica products.

Hard micanite for commutator segments, barriers, etc., bonded with, say 3 per cent. of shellac, must be regarded as an indispensable insulating material. It is made from Muscovite splittings for use in undercut commutators, and from Phlogopite (amber splittings) for flush commutator segments, and the new synthetic (Glyptal) bonded Glyptanite represents the latest development in connection with this material. Moulded micanite for cones, troughs, sleeves, etc. generally made from Phlogopite splittings and 10 per cent. or 15 per cent. of shellac, is an important product also to be obtained Glyptal bonded.

Flexible wrappings and tapes made from thin splittings and non-drying adhesives find wide application for slot liners and the taping of coils, and composite mica wrappings such as Micafolium—composed of thin splittings with paper backing—produce excellent insulation for high voltage jobs, where the presence of the resultant proportion of organic backing is permissible.

One of the latest additions to the mica products available is Micalex, which is essentially mica dust bonded with borosilicate glass, and this material possesses the excellent electrical characteristics of mica, has attractive mechanical and physical properties, and can be moulded or machined into simple shapes.

### Uses of Asbestos.

ASBESTOS.—Asbestos enters into electrical insulation as a filler for moulded compounds which have to resist heat, or as a paper or fabric for laminated materials. Its very name means "indestructible" or "fire resisting," and it is because of its resistance to high temperatures, and despite its poor electrical qualities, that it is used for insulation purposes. Strictly it ought not to be dealt with under the heading of Natural Insulations, because it is never used in its natural state alone; it constitutes, however, so large a proportion in the make-up of materials having the asbestos characteristic that it is pardonable to include it in this classification.

Most asbestoses are silicates of magnesia and lime, and the mineral is particularly liable to the presence of iron. It is a blue or white fibrous substance found in Italy, Canada, Russia and South Africa, the blue being generally weaker, less heat resisting, and containing more iron than the white, but this latter is softer and more susceptible to the action of acids.

Asbestos paper is used for insulating wires, shafts, etc., and for building up boards for barriers, and troughs for slot liners. Synthetic varnishes are frequently used for bonding the material, which often contains cotton fibres to add to its strength. Asbestos fabric in the form of cloth or tapes, and asbestos cords and yarns are adopted for a variety of purposes, the fabric being particularly used for the building up of laminated products for mechanical spacers, wedges, etc. Asbestos tapes are used for giving a mechanical and flame resisting finish to the stator coils of large machines, and very recently a cellulose-doped asbestos tape has become available, which is relatively non-absorbent and still much less inflammable than the usual organic fabrics.

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There is a considerable variety of moulded asbestos products useful for arc chutes, barriers, burning plates, etc., and sheet asbestos materials such as Sindanyo, Asbestone, Bravilite, Everite, Siluminite, Uacolite and Uralite, are useful for various purposes where moderate insulation and high heat or flame resistance are required.

SLATE AND MARBLE.—Slate is still an important insulator in the electrical industry, because it is relatively cheap in large pieces, and if carefully selected is reliable, does not warp or soften, and is non-inflammable. It is a rock composed principally of silica and alumina with iron oxides, lime, magnesia, potash and soda, with well developed cleavage, and can thus be split into thin regular sheets for the production of panels, terminal boards, cross bars, etc. It was customary to obtain the bulk of slate supplies from Welsh quarries, but with modern methods of test, and the adoption of suitable precautions in design, other sources have become available. In recent years electrical slates have also been imported from Portugal, Spain and Norway, and these, whilst not generally so reliable as the home produced, are, nevertheless, being used successfully in selected services.

In mentioning slate it is useful to note that substances such as Ebony Sindanyo, Siluminite and Kalanite are finding a widening vogue. These materials, although, generally speaking, more expensive for the same thickness, are uniform, better electrically, and stronger in crushing and impact strength, although they are not generally so good as regards tensile strength. It has been found economical to use slate substitutes in thicknesses 75 per cent. of those of the corresponding slates.

Marble is a crystalline material, and the name is commonly applied to a mixture of calacite and dolomite, which is capable of taking a good polish. It is often contaminated with quartz, haematite, mica, etc., and is commercially graded as fine, medium or coarse. White Italian marble, though hard to work, is good electrically and relatively free from conducting veins. The use of marble is certainly not widening at the present time, largely on account of the alternative supplies of slate and satisfactory substitutes.

WOOD.—Very little can be said about wood in the very limited space available. It is, however, an important non-conducting medium used for structural and insulating purposes for electrical gear, and generally graded under the generic terms soft or hard. The soft woods include Pine, Spruce and Larch, and the hardwoods commonly used are Ash, Beech, Hickory, Maple, Oak, Teak and Mahogany. These woods, used for tension rods, guides, barriers, etc., are usually impregnated, after careful drying and under pressure, with paraffin wax or oxidising oils, and are varnished before use.

The seasoning and drying of timber are very important features, and most large electrical works now have their own kiln dryers for taking care of this work. In addition to its application to electrical plant, wood is extensively used for conduits, troughs, etc., and for these purposes is impregnated with preservatives from rot and destruction by insects. Creosote, Anthracene, Naphthalene, Cresol, Copper Sulphate, etc., are typical preservatives adopted for the purposes mentioned.

RESINS, BITUMENS, ETC.—It is impossible in the space available to give any kind of list of the resins, bitumens, etc., used in electrical work, but we may mention rubber, shellac, copals and such bitumens as Gilsonite, all of which enter to a large extent into the composition of insulating compounds, varnishes, etc., to be dealt with later.

## Vitrified Materials.

PORCELAIN.—Porcelain is one of the materials which existed before electrical science, as the product of the ancient potter, and the engineer has availed himself of its electrical characteristics. It consists essentially of a fusible and an infusible earth mixture which is fired at a sufficiently high temperature to fuse the former, which acts as a bond consolidating the whole into an impervious mass. The infusible and plastic constituent is commonly ball clay or China Clay (Kaolin), which are found in nature as decomposition products of felspar. Felspar, rich in potash, is used as a flux, and an inert filler is quartz. The constituents are thoroughly ground up with excess of water to form a "slip." They are recovered from the water by filtration; the cakes are aged and then "pugged" and insulating pieces are made by three principal processes, known respectively as dry, wet (plastic) or wet (cast).

In the dry process the cakes from the filter press are disintegrated into a damp, coarse, powder. This material is charged into automatic steel dies, moulded under fly presses, and the process is used for such small parts as switch bases, fuse bases, cleats, etc., for low voltage work.

The wet (plastic) process utilises the porcelain mixture in a putty like condition. It is formed approximately to the desired shape by hand on a potter's wheel or in a lathe, and finished with special tools. This process is applied to pieces of symmetrical shape too large to be dry pressed. It does not require any moulds, but the degree of dimensional accuracy obtainable is naturally not so great as in the case of dry process parts.

The wet (cast) process porcelain is made by pouring the fluid "slip" in the form of a thick milky liquid into plaster moulds, and after the plaster has absorbed the water from the liquid, and the mouldings have dried sufficiently, they are taken from the moulds ready for further drying.

After the pieces have been formed, they are very carefully dried and then glazed by dipping or spraying. They are next packed in fireclay "saggers" and fired in special kilns, and in the course of the firing the glaze melts, the felspar fluxes, dissolving the clay and bonding the quartz, thus producing a vitrified product.

The application of porcelain to the electrical industry is exceedingly wide; it ranges from small wiring cleats to high voltage bushing insulators up to several feet in length. The material has exceedingly good electrical properties, it suffers from a characteristic lack of dimensional accuracy and from brittleness, but it is reliable, and so far practically unrivalled in a general sense as an outdoor insulator—at any rate, in this country.

STONEWARE.—The plastic clays of porcelain are Kaolin, whereas in stoneware ordinary clay is utilised. These materials appear to be of much the same composition when compared, but as used they differ in physical properties. Clay is more plastic than Kaolin, and is stronger when dry. It shrinks only 10 or 12 per cent. in manufacture, instead of 16 to 25 per cent. as in the case of porcelain, and it is these differences which really constitute the distinction between porcelain and stoneware manipulation, and reduce the difficulty of handling and manufacturing. This is particularly so in the case of large pieces, which are very much cheaper in stoneware than in porcelain.

From the very earliest times it has been customary to make large articles from stoneware, and with the modern improved density of body and perfection of glaze, there seems to be a possibility of certain designs of large insulators being satisfactorily made in stoneware. It is fired at a lower temperature than porcelain, but it is glazed with salt glaze instead of the enamel glaze with which we are familiar. This glaze is very thin, and not so durable as the porcelain glaze. There is, however, no line of demarcation or differential expansion between the body and the glaze, as is the case with porcelain and, therefore, no possibility of the hair-like cracks arising in the way that they sometimes do in porcelain subjected to varying temperatures. The application of stoneware to the insulation of high voltage bushings has developed somewhat considerably in Germany, and it may be that the practice will spread to this country.

STEATITE.—For many years steatite has been well known as an insulator for small parts such as sparking plugs, heating devices, etc., where great mechanical strength, resistance to temperature change, and maintenance of electrical properties at high temperatures are essential, and the art has in recent years advanced very considerably, particularly in Germany where the finest deposits of natural steatite (Speckstein) abound.

Moulded steatite articles contract only to a very small extent during manufacture. They are, therefore, produced to a high degree of accuracy, and pieces are now made on the Continent for relatively large jobs, such as relay and meter bases. Steatite and a combination of steatite and porcelain (Melalith) make excellent tension insulators, and the "motor" type of insulator represents a modern design. Steatite has a high co-efficient of expansion, and should not, therefore, be used for insulators particularly liable to flashover.

BASALT.—Basalt has had some application to the production of outdoor and heat resisting insulators. The name signifies a group of volcanic rocks similar to silica in basic composition, and commonly having a well-marked columnar structure. In the production of insulators the basalt is moulded and cast in sand moulds much in the same way as iron castings are made.

GLASS.—Glass was one of the first electrical insulations, but to a large extent it went out of use as the more reliable materials

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became available. A typical analysis would show 70 per cent. of silica, 12 per cent. of soda, 12 per cent. of lime, and 6 per cent. of alumina, and common sand is the foundation of all glasses. The principal use of glass as an insulation nowadays is for telegraph and telephone line insulators on the Continent, and, of course, for lamps and other gasfilled or vacuum devices. It has high electric strength; is particularly impervious to moisture, but its brittleness and the fact that its electric strength rapidly diminishes with increase of thickness make it unreliable for most applications.

QUARTZ.—Quartz is fused silica, the main characteristic being, of course, its very low co-efficient of expansion and resistance to the highest temperatures, thus making it useful for high temperature applications as in furnaces, electric fires, and for certain vacuum apparatus. Quartz is in some respects an ideal insulator for sparking plugs, and it may be that some day the production of the material will be simplified to such an extent that sparking plug insulators will become economical.

## Moulded Composites.

Undoubtedly the branch of insulation development that has advanced most in recent times is that concerned with moulded compounds. To take one class only (i.e., the synthetic materials) the electrical concern with which the writer is associated made its first synthetic moulding powder only a few years ago, whereas, at the present moment it manufactures, for its own use alone, two tons per day.

MISCELLANEOUS COMPOUNDS.—Thermo-plastic compounds bonded with shellac, copals or bitumens, vulcanising compounds bonded with rubber, gutta-percha or bitumen, high temperature compounds richly filled with asbestos, and arc resisting materials made from lime silica and asbestos, have all to be catered for in the electrical moulding plant. Each calls for different mixing, moulding and curing conditions, and represents a problem in itself. Any large electrical factory requires millions of mouldings every year, and the writer knows of one specific piece of radio apparatus which requires more than a ton of mouldings per day in the course of its bulk production.

SYNTHETIC MOULDED PRODUCTS.—Phenol-formaldehyde moulding powders are made by synthesising the resin from phenol or cresol and formaldehyde with a basic catalyst. The resin is mixed with dyed filler (wood flour for most purposes, and asbestos for high temperatures) and the mass is dehydrated and pulverised. The mouldings are made from powder or cold pressed tablets in heated, polished steel moulds, and a successful powder needs no cooling, and keeps the moulds like burnished silver without any cleaning whatsoever. The moulding time is anything from 45 seconds to five minutes, according to the grade of the powder and the design of the piece, and the moulded parts come from the mould in a finished condition.

Most electrical manufacturers start making or using synthetic mouldings for electrical purposes, but they find eventually that they use a growing percentage for purely mechanical applications, the new moulding art having virtually provided the designers with a new creative medium.

The important thing to bear in mind in using phenol-formaldehyde compounds is their tendency to carbonise, and no design should be accepted where any kind of surface corona, sparking, or arcing may occur. The latest urea-formaldehyde and Glyptal products do not suffer to the same extent from surface breakdown.

SHEETS, RODS AND TUBES.—Many kinds of rigid, semi-rigid and flexible sheet insulations perform important insulating functions. Various grades of paper, pressboard and fibre make wrappings, slot liners and packing; and composite laminated boards, made by sticking together layers of paper, wood, asbestos, cotton or mica, provide material for panels, barriers, etc.

Ebonite, synthetic products, fibre and laminated paper materials are available in the form of rods, tubes and cylinders.

The bonds regularly used in the laminated products are shellac or phenol-formaldehyde synthetic resins, but recently Glyptal (glycerine-phthalic anhydride) resin has been applied to bonding the inorganic materials, and blood albumen to the organic laminations. The former confers a leathery characteristic at high temperatures, and the latter affords maximum resistance to climatic agents.

Untreated tapes and sleevings should also be mentioned; these are used respectively for finishing coils and for insulating connections.

## Varnishes, Paints and Filling Compounds.

These more or less liquid substances are met with in great variety—and principally as insulating or protective media. Insulating film varnishes, either yellow with a linseed or china wood oil base, or black with a bitumen base, have extensive use for all kinds of coil and fabric insulation, etc., and protective enamels with oil, bitumen, cellulose, etc., bases are available in many forms. The finishes are either air drying or baking, according to compositions and circumstances.

Bonding varnishes or adhesives composed of gums or bitumens dissolved in spirits are required for building up laminated products and wrappings. The modern tendency is to utilise synthetic resins for rigid materials for general purposes, and, wherever possible, bitumen preparations for the wrapping and sealing of high voltage generating conductors. Bitumens resist sustained voltage and temperature stresses better than the vegetable oils.

Bitumen, oxidising oil and synthetic filling and sealing compounds are important for consolidating structures, filling cavities and making windings solid and waterproof.

It is unnecesssary to do more than mention the petroleum oil used in vast quantities for insulating h.t. transformers, switchgear, etc.

## Treated Fabrics, etc.

One of the most useful classes of insulating materials is cotton or silk fabric or paper carrying an insulating film. The film may be either yellow oil or black bitumen varnish. The former is the more flexible and oil resisting, but the latter withstands prolonged electrical stress better. The fabric material is used in the form of cloth, 28 in. or 30 in. wide, for insulating straight conductors, shafts, spools, etc., and as straight or bias cut tape. The time when engineers will accept stitched bias tape is rapidly passing, and a feature of the present varnished tape position is the great endeavours that are being made to establish a reliable and adequate home supply of seamless bias material. To this end, the British insulation manufacturers are in close collaboration with the cotton weavers and finishers, and already supplies are available.

Varnished fibre, leatheroid, pressboard, paper, etc., for such purposes as inter-coil separators, slot liners and packing, is prepared in continuous rolls or sheets according to thickness, and waxed paper is still required for certain purposes.

Varnished cotton and silk (natural and artificial) sleevings are used for insulating all kinds of connections, and the radio industry caused a considerable rise in the demand for these products. Where the greatest flexibility is desired, pyroxylin varnish is used for treating, but for ordinary purposes oil varnishes—black or yellow—are satisfactory, and less inflammable.

## Wire Coverings.

Wire coverings occupy a conspicuous position in the insulation engineer's purview. Cotton and silk are still the most important coverings, and artificial silk has made little headway in this field.

Enamelled wire has a coating of very high electric strength, and thus favours the attainment of the best space factors in winding. The film continuity and electric strength of wire enamel have recently been improved by utilising synthetic ingredients, and higher enamelling speeds have been attained.

The present day quality of certain asbestos-covered wires is an improvement over former supplies, and they may be relied upon to give satisfactory service in high-temperature conditions.

Fibrous wire coverings are often coated with impregnating and bonding materials before winding, in order to facilitate cementing and waterproofing the final coils, and to improve thermal conductivity.

## Research on Insulation Materials.

In even briefly surveying the field of insulating materials it is impossible to escape being impressed by the range of products available. Their properties cannot be too carefully investigated, nor can too much effort be directed to their improvement. University, private and industrial laboratories are making important contributions to this objective, and the result is reflected in the improved and more lasting performance of electrical apparatus.

The writer desires particularly to mention the very important and successful work of the British Electrical and Allied Industries Research Association in the advancement of insulations technique and usage. The activities of this excellent body are deserving of the most serious attention and the fullest support.

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# IRON, STEEL AND FERROUS ALLOYS IN THE ELECTRICAL INDUSTRY.

## Wide Use of Cast Iron—Competition of Fabricated Steel—Electrical and Magnetic Considerations—Electric Furnaces and Special Steels—New Heat-Resisting Non-Scaling Steels—Tungsten Steel for Permanent Magnets.

By J. G. PEARCE, M.Sc., M.I.E.E.

IT is convenient still to distinguish broadly between applications of ferrous and non-ferrous metals, although it is becoming increasingly difficult to maintain the distinction. Several conditions are contributing to this. In the first place, alloys of ferrous and non-ferrous metals are becoming of increasing importance, as, for instance, the alloy of nickel and iron (78% nickel and 22% iron) which has such extraordinary permeability; the alloy of cast iron, nickel and copper containing about 16% nickel and 8% copper, which has in certain directions

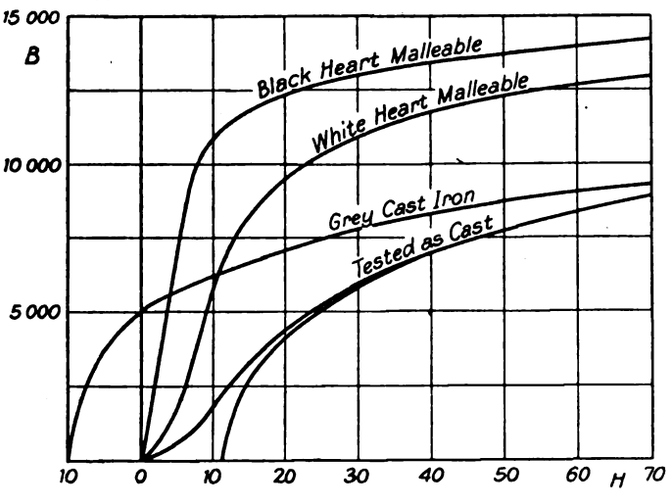


Fig 1.—Magnetic properties of cast iron.

greatly increased resistance to corrosion, compared with ordinary cast iron, or permanent magnet steels containing cobalt. Secondly, ferrous and non-ferrous metals are being used in such close juxtaposition that it becomesdiffi cult to separate them for treatment, such, for example, as the stranded steel conductors, now specified by the Electricity Commissioners, enclosed in stranded aluminium. Thirdly, from the purely metallurgical point of view, marked similarities of behaviour are now recognised between certain ferrous and non-ferrous alloys, and these will doubtless be ultimately explained by a comprehensive metallurgical theory.

### Two Classes.

The iron, steel and ferrous alloys used in the electrical industry comprise two classes: those used for ordinary constructional purposes in prime movers and electrical machines, and which require properties similar to those demanded by other engineers, and those requiring special magnetic and electrical properties demanded exclusively by the electrical industry. In these two fields the electrical industry uses every variety of ferrous products. In no industry is the application of material so governed by its inherent properties, for in no industry is design so refined and so dependent on accurate knowledge of properties, design being nothing more than rational disposition of engineering material; the greater the knowledge the more rational does the design become.

CAST IRON.—The most widely used ferrous material in the industry is still cast iron, for it constitutes approximately one-half of the tonnage output,* and it is in this material that the greatest changes have taken place within the last few years. The change is mainly due to the fact that metallurgical investigation has shown cast iron to be not a single material, but a wide range of materials more complex even than alloy steels, the choice of particular members of which is dependent upon service requirements.

In spite of increased foundry difficulties due to the gradual and inevitable deterioration of the naturally-occurring raw materials which the founder is compelled to use, castings can to-day be made stronger, much more sound and free from internal defects and stresses, than was formerly the case. It is, of course, much more important to make sound castings han to make high-strength test-bars, and under present conditions of test-bar specification, the requirements in the two are not necessarily consonant.

### Revolutionary Changes.

The new B.E.S.A. Specification for grey cast-iron† embodies revolutionary changes in cast-iron testing, all of which are in a metallurgically desirable direction.‡ These include the use of a separately-cast test-bar, round in section, the size of this being dependent upon the section of the casting, and tested both in transverse and tension. Engineers are urged to use this specification, and to abandon, in favour of the round bar, the square and rectangular bars now so widely used. The round bar has been shown to be stronger per unit area than the square bar,‡ for the same metal cast at the same time.

While it has been general knowledge in the past that cast iron in thick sections is weaker than the same iron in thin sections, the extent of the change has not been known; consequently the design of cast iron structures has lacked a proper scientific basis. When the transverse strength of cast iron is expressed as a rupture modulus, a fairly close relationship exists between transverse and tensile, and tensile and compression. The transverse: tensile ratio is usually 1·8 to 2, while the compression: tensile ratio is about 4. The author has shown§ that the change of strength with diameter of a test bar is continuous, and that the testing of a series of bars of different diameters from the same mixture renders possible for the product of a given foundry, relationships between strength and diameter, and from various mixtures, between strength and composition.

There are no satisfactory relationships between ordinary static tests and some service conditions, such as resistance to abrasive wear, or resistance to heat. Neither is there satisfactory connection between any form of hardness test or mechanical test and machinability.

Recent fatigue tests ‖ on cast iron have shown it to have an unexpectedly high endurance ratio, that is, ratio of the endurance limit in fatigue to ultimate tensile strength, and also an unexpected response to understressing, the endurance limit being raised 30% to 40%. It has also been shown that holes and grooves and other "stress raisers" have comparatively little effect on the fatigue strength. The proportional diminution of fatigue strength up to 450 deg. C. is also low.

The improvement in high-quality iron may be judged from the fact that while Grade A in the above-mentioned B.E.S.A. Specification calls for 11 tons per sq. in. tensile on a 1·2 in. bar, this being an ordinary engineering iron, it is possible to get tensile tests with reasonable regularity up to 18 tons per sq. in., and a variety of irons low in carbon content have been produced, giving over 20 tons per sq. in. These, of course, require special consideration in manufacture, and are somewhat dearer. Very approximately, the cost of molten grey iron, special molten grey iron and molten cast steel are as 1:1·5:2. Including the cost of labour and overhead with that of the molten metal the ratios are 1:1·2:1·5. Strength ranges are approximately, intension, 8—11: 1:2—18:21—27 tons per sq. in. Cast iron is approximately one-half the price of light alloys, but about 2 to 2·5 times as dense. In addition to improvements in strength, considerable improvements have taken place in production of irons to resist heat, to resist corrosion and for other special purposes. The development

* For an analysis of proportions of ferrous and non-ferrous metals in various types of prime movers, including steam engines, turbines and internal combustion engines, see Martin, "Non-Ferrous metals in the Shipping Industry"—Institute of Metals, Liverpool meeting, September, 1928.

† B.E.S.A. Specification 321–1928. Grey Iron Castings, Grades A and C.

‡ See Norbury, "Foundry Trade Journal," November 1st, 1928, and Pearce, "Engineering," October 19th, 1928.

§ "Use and Interpretation of the Transverse Test for Cast Iron," presented to the Spanish meeting of the Iron and Steel Institute, September, 1928.

‖ University of Illinois, Bulletin, No. 164.

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of alloy cast irons, such as by the addition of nickel, chromium, copper, etc., is making progress, because it is based on a better understanding of causes of the effects obtained.

FABRICATED STEEL.—At this point the welded structure generally known as fabricated steel may be considered, for it is in active competition with cast iron, and its development is confined almost wholly to the electrical industry. When only one casting is required—part of a large machine—the cost of the pattern and time required to prepare it gives the welded structure an advantage with respect to time of delivery, and there is a saving of weight and volume on account of the increased specific strength of steel over cast iron. Welding, however, has been regarded with suspicion by many engineers for jointing of any importance, and the fabricated steel structure has yet to be proved over longer periods of service.

The main stimulus for its employment comes from U.S.A., where good large castings are less easy to obtain than in this country. The ultimate criterion, of course, is that of cost, and actual comparisons have not yet been published in this country. In Germany it has been found that the cost of a casting is practically identical with that of a corresponding fabricated steel structure, and, of course, when several castings are required from one pattern, the balance in favour of the foundry becomes marked. Welding requires considerable skill and technique to ensure satisfactory results, and in the interests of welded structures, it is hoped that they will not develop more rapidly than the economies of the situation justify. The industry has characteristically helped itself here by the development of electric welding.

MALLEABLE CAST IRON.—The amount of malleable cast iron used in the electrical industry is not large, but here again improvements have been made, and the B.E.S.A. has recently issued two specifications.¶ Whiteheart made by the older European method of partially decarburising and graphitising a hard white casting in an oxidising ore gives a mechanically hard type of malleable, and even very thin sections can be made with marked success. The specification calls for an ultimate tensile strength of 20 tons per sq. in. with an elongation of 5% and a bend value round a 1 in. pin of 45 deg. without cracking. Blackheart made by the process which has gained favour in America consists of graphitising without much decarburisation a white iron casting in a neutral packing medium. This gives a softer type of malleable with greater ductility than whiteheart. The specification calls here for an ultimate tensile strength of 20 tons per sq. in. and an elongation of 7½% with a bend value of 90 deg. Both names, at one time charcteristically descriptive, are now outmoded, although they are retained for convenience in distinguishing the two types.

## Electrical and Magnetic Properties.

One of the difficulties of the electrical industry arises from the fact that improvement in mechanical properties is frequently obtained by alloying, whereas magnetic and electrical properties are made worse by this process, these properties being greatest in the purest materials. This view is now subject to important qualifications illustrated by the nickel-iron alloy, Permalloy. Fig. 1 (p. 604) shows the magnetic properties of an ordinary cast iron tested as cast in the form of a 0·5 in. diameter bar. This curve is due to Mr. H. Field, and is on a British iron, but it follows closely the proposed new German standard for magnetic properties.

Considerable improvement is usually obtained on annealing, but there is often a loss of mechanical strength as the matrix of the iron after annealing more closely approximates to that of the magnetically superior pure iron, instead of the laminated pearlite structure of iron and iron carbide usually found in grey iron. Fig. 1 also shows the magnetic properties of malleable cast iron, due to Partridge, not specifically made for electrical purposes, each curve, one for blackheart and one for whiteheart, being the mean of tests on two samples.

The improvement in the magnetic properties of malleable over ordinary grey iron is due to the annealing, which graphitises the iron carbide present to iron and graphite, the iron being, of course, magnetically better than its compound with carbon. Also the graphite deposited is in the form of fine nodules, since it is formed in the solid, and offers less interruption to the structure than the longer flake usually found in grey iron, and which has formed while the metal was fluid or plastic. Blackheart is magnetically better than whiteheart owing to its softer condition, for it approximates more closely to pure iron than whiteheart, which is frequently of pearlitic structure. Grain size has an important effect on permeability, being markedly increased as grain size increases, and Partridge quotes a whiteheart malleable specimen which had a greater maximum permeability than mild steel, probably due to this.

## Non-Magnetic Iron.

During the past few years an interesting special non-magnetic iron has been produced.** The metal is rendered austenitic and hence non-magnetic by means of alloy additions, notably nickel and manganese. The permeability of this iron at ordinary temperatures is just over unity. Its specific resistance is 50% higher than ordinary cast iron and its resistance temperature coefficient up to 100 deg. C. is 0·00045, about one-fourth that of grey iron.

STEEL.—In the case of wrought iron and cast steel, although constant improvements have been made during the past few years, the changes have been less spectacular than in the case of cast iron, and progress has been mainly directed towards economising in production without sacrificing quality. Wrought iron of the very highest quality is still produced in this country. Steel castings in the main require furnaces of comparatively small output, and the most popular methods are cupola melting with subsequent treatment in some form of converter such as a Troepenas, or the electric furnace. For large castings and for steel ingots a contest is in progress between the various methods of production. In the acid Bessemer process, a high silicon hematite (*i.e.*, phosphorus free) is reduced in the converter after melting in the cupola. This process is practically giving way to the open-hearth process in which pig and scrap are melted in a Siemens-Martin regenerative furnace. The basic process, in which phosphoric ores can be dephosphorised, was of greater use to steel-producers abroad than in this country.

The acid open-hearth process is the standard method for the production of engineering steels of the highest quality, and metallurgical opinion regards it as the most suitable for this purpose. The basic open-hearth process is used mainly for the production of mild steels for constructional purposes. Alloy steels and special steels are, of course, made in the electric furnace and in the crucible furnace, and in America steel is often made by a duplexing process, the molten metal being transferred to the electric furnace after preliminary melting in the open-hearth or Bessemer converter.

Transformer and dynamo steels are essentially alloy steels, the alloying element being silicon. In transformer steels about 4% silicon is found advantageous, not intrinsically, but because it offsets or neutralises the harmful effect of other inevitable impurities. The hysteresis loss in a modern silicon steel at 60 cycles varies from about 0·66 to 10 W. per lb., the total loss being 1·1 to 1·25 W per lb., with a resistivity of 5 to 10$\mu\Omega$ per c.m. cube.

In connection with the improvements in purity in relation to magnetic and electrical properties the industry has placed a valuable instrument in the hands of metallurgists in the form of the induction furnace. Metallurgists have for some time appreciated the influence of small quantities of impurities on the properties of metals, and a great deal of metallurgical progress has been due to the necessity for purity. In the induction furnace the charge reaches a high melting temperature in a comparatively short time, free from contaminating effects of fuel, gases, etc. It is now possible to melt in these furnaces on a commercial scale, and steels are actually being produced in Sheffield in this way.

## Improvements in Alloy Steels.

Vast improvements have taken place during the past few years in alloy steels, of which the most oustanding example is the so-called stainless steel containing 13% chromium. This has found application in many fields, and has helped to maintain Sheffield's great reputation.

A large amount of research has been conducted during the past few years on steel ingots,†† which unavoidably suffer from a certain degree of heterogeneity. The use of nickel and chromium renders it possible to secure large pieces of steel in a hardened and tempered condition of a degree of homegeneity comparable with that obtained in small pieces of ordinary carbon steel. The high chromium stainless steel maintains its properties at higher temperatures than plain carbon steels. Tungsten and molybdenum are also used with chromium.

¶ B.E.S.A. Specification No. 309-1927 White Heart Malleable Iron Castings and 310-1927 Black Heart Malleable Iron Castings.

** Ferranti-Dawson Patent No. 204 598.

†† First and Second Reports on the Heterogeneity of Steel Ingots. "Journal of the Iron and Steel Institute," 1926, I., and 1928, I.

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Ferro-chromium of 1%-2% carbon content is used in making rustless steel; if a carbon-free ferro-chromium is used the product is virtually a rustless iron, which can be worked much more easily than the steel.

The most recent and most important development is that of a series of heat-resisting non-scaling steels, which contain, in addition to chromium, either silicon or nickel or both, or nickel-tungsten. Little is gained by quoting test figures, because any reasonable engineering requirement or combination of requirements can now be satisfied. Permanent magnets, formerly made of carbon steel, but now of tungsten steel, readily give a coercive force of 60 or 65, with a remanence of 10 000 to 11 000, and chromium further raises the coercive force. Cobalt steel with 30% to 35% cobalt, due to Honda, gives a coercive force of 200 with a remanence of 10 000, but cobalt is still too expensive, and hence the use of these steels is limited. Cobalt in smaller proportions is advantageous.

# INSULATED WIRES.

## Demand for Materials to Meet More Exacting Conditions—Cotton and Silk Coverings—Enamelled Wires—Asbestos and Paper Covered Wires.

By E. LAURENCE WILDY, A.M.I.C.E., A.C.G.I.

THE important rôle played by insulated magnet wire in electrical machinery and instruments is too well known to need any lengthy discourse on its function. Nevertheless, the continued progress in the industry throws demands on the manufacturer of insulated wires for materials to meet different and ever more exacting conditions.

There is no ideal insulation that will meet all the conditions of service, from heavy duty machines to light instruments, but there are available products which differ in their properties, so that by careful choice the most suitable form can be selected to meet most usual requirements.

Cotton is the most extensively used material, wound round the conductor in either single, double or more layers. On account of its soft, yielding nature, this covering forms a cushion between the layers which is resilient to the stresses produced in the coils during service, and it is sufficiently strong mechanically to withstand a reasonable amount of forcing into place by hammering and pressing. The space factor on wire of large diameter or of rectangular section is relatively high, but in the case of fine wires the radial thickness of the covering is so great compared with the diameter of the wire that the space factor becomes very low. For this reason it will be found that very few wires are cotton covered below 0·0060 in. dia.

Cotton is an absorbent material, containing under normal conditions of humidity 8% of moisture, and since each cotton hair is in shape similar to a flattened tube, it is necessary thoroughly to dry out the coils and impregnate them with some suitable insulating medium.

The soft cotton insulation absorbs insulating varnishes or compounds more satisfactorily than any of the other types of magnet wire, but it is of the utmost importance to dry the cotton out thoroughly and then impregnate as completely as possible so as to eliminate moisture, and prevent, so far as possible, the absorption of water while the coil is in service.

Fine wires are covered with natural silk, which gives a covering having a good space factor, since the radial thickness of the covering is less for silk than for any other fibrous covering. For wires of large diameter the silk has insufficient mechanical strength, and is susceptible to damage by abrasion. It is for this reason that these wires are rarely used for sizes of over 0·064 in. dia.

Normally silk contains 10% of moisture, but the filament is solid, causing it to be inferior to cotton for cushioning, and for absorbing insulating compounds and varnishes. This lack of cushioning and the usually small size of wire, cause very compact coils which are more difficult to completely impregnate with either varnish or compounds. There is no doubt that silk makes an excellent covering for fine wires, and this is clearly proved by the increasing demand for this type of magnet wire, in spite of the popularity of the low priced, high space factor enamelled wire.

### Use of Artificial Silk.

Artificial silks have not yet been produced sufficiently fine or of the required mechanical properties to be of service for magnet wires, and the only example of the use of artificial silk is the use of "Celanese" in telephone switchboard cables.

Enamel insulated wires have a very thin covering, resulting in a high space factor. The covering is non-hygroscopic, but cannot be considered waterproof since it suffers from occasional pinholes, which are places of minute dimensions uncovered by the enamel. These bare spots are liable to become seats of corrosion, particularly in the Tropics, or where the coil is continuously loaded. In the early stages this corrosion is manifested by the appearance of small green specks which eventually cause fracture of the wire.

Large wires solely insulated with enamel are easily abraded by rubbing against the formers, or where turns cross, so that it is necessary to use the utmost precaution to prevent mechanical damage. The covering is non-resilient, and for this reason it is advisable when winding deep coils to insert between every few layers a sheet of paper to act as a cushion, especially at the corners of rectangular coils where all the stresses are concentrated when in service.

Enamelled wire varies in colour from a light straw colour to black, and it seems to be the general opinion that the black is more brittle than the brown. With the light or bronze coloured enamels the colour usually becomes darker as the thickness of the film is increased. This is why large diameter wires are usually darkest. The high space factor, electric strength and low price have combined to make enamelled wire extremely popular in the last few years.

### Combined Insulation.

Combined insulation of enamel and silk or cotton has the advantages of both forms of insulation. The enamel gives a high dielectric strength, and the fibrous covering adds the necessary absorbent cushion for holding the impregnating material. The higher space factor for enamel and single cotton than for double cotton makes this form of insulation an attractive proposition.

Where coils and windings have to tolerate excessive temperature rises, as obtained in heavy duty machinery, such as blow out coils, rolling mill, traction and crane motors, asbestos covered wires are available. Such wires can be worked up to 150 deg. C. but the space factor is usually not quite so good as double cotton covering, and, further, the asbestos being a more variable product than cotton, the coverings are not so uniform.

Oil immersed transformer windings are now usually made with paper covered conductors. Good quality paper with butt lapped joints and thoroughly impregnated with Grade A transformer oil gives a 5 sec. electric strength value from 300 to 600 V per mil when tested between two conductors bent round a small radius.

# MATERIALS FOR INSULATORS.

## Some Outstanding Advantages of Talc or Steatite Products.

WHEN naturally occurring substances possess the necessary characteristics for the production of insulators, it is reasonable to expect that manufacturers will try to make use of such substances in preference to the highly complex porcelain bodies commonly employed.

Talc or steatite is a case in point. As obtained from certain quarters this mineral bears a formula almost similar to that of a porcelain, being an alumina silicate, but having a magnesia base instead of a complex one composed of potash or soda and lime.

Talc or steatite insulators have been known to possess great dielectric strength. Risk of distortion in a highly vitrified body is reduced to the minimum when talc or steatite is introduced. The toughness and viscosity of the fused steatite imparts toughness to the body, rendering it less liable to lose its shape.

The use of magnesium silicates holds an additional advantage in that it is very resistant to sudden changes of temperature. The following proportions have been found outstandingly successful: 86 parts of talc and 14 parts of gelatinous precipitated magnesium silicate. On account of its elasticity, this mixture may be pressed into the necessary moulds with facility, whilst at the same time avoiding the drawbacks attendant on true plasticity.

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# INSULATING VARNISHES: CLASSIFICATION, SELECTION AND USE.

## Lack of Uniformity in Varnish Specifications—B.E.A.I.R.A. Work on Standardisation—The Vogue of Cellulose Varnishes for Electrical Work—Classification According to Uses.

By A. R. DUNTON, A.M.I.E.E., and A. W. MUIR. D.S.O., M.C., B.Sc.

A STORY is told of a man who wanted the best possible varnish for his motor boat, and thought that the choice was merely a matter of price. He could not find a marine varnish that cost more than 16s. a gallon, so he used piano varnish at a guinea and was surprised that, despite its high cost, it was ruined by salt water in a week.

Without crediting electrical engineers with so little intelligence, it is certain that the range and variety of insulating varnishes obtainable from practically every manufacturer of repute must often create in the mind of the designer or the maintenance engineer a feeling of doubt as to whether he is using the best varnish available for each particular purpose.

### Need for Standardisation.

It may seem strange that no recognised specifications exist which clearly define the necessary properties of the more important varnishes used for insulation purposes. The need for standard specifications is clearly indicated by a review of the various trade names given to almost identical products by various manufacturers. The following list—Table 1, for example, gives some of the trade names of clear baking coil varnish as commonly used for impregnation purposes.

TABLE 1.—SOME NAMES GIVEN TO CLEAR BAKING COIL VARNISH.

| Name. | Supplied by. |
|---|---|
| **British** | |
| Standard Coil Varnish | Pinchin Johnson. |
| Lacwatt No. 49 | Jenson and Nicholson. |
| Clear Insulating Varnish, No. 354 | Robert Ingham and Clark. |
| Brown Baking Varnish (C.V. 345) | Docker Bros. |
| **American.** | |
| Amber Insulator Varnish, No. 311 | Westinghouse Co. |
| Elastic Insulating Varnish, No. 4 | E. Calmon and Co. |
| Dielectric Varnish | Dielectric Mfg. Co. |
| Chinalac Clear A (and also D) | J. C. Dolph and Co. |
| Clear Baking Varnish No. 450 | General Electric Co. |
| Clear Elastic Insulating Varnish | Glidden Varnish Co. |
| Clear Coil Varnish | Impervious Varnish Co. |
| Clear Insulating Varnish | Impervious Varnish Co. |
| Clear Baking Varnish, No. 1220 | Imperial Varnish Co. |
| Shield Brand, No. 1 | Mitchell Rand Mfg. Co. |
| No. 56 Walpole Clear Insulating Varnish | Robertson Chemical Co. |
| P. & B. Clear Baking Varnish | Standard Paint Co. |
| Ajax Clear Baking Varnish, No. 14 | Sherwin Williams Co. |
| Ajax Clear Quick Baking Varnish, No. 17 | Sherwin Williams Co. |
| Standard Clear Insulating Varnish | Standard Varnish Works |
| Sterling Extra Insulating Varnish | Sterling Varnish Co. |
| Sterling Elastic Insulating Varnish | Sterling Varnish Co. |
| Baking No. 10 Insulating Clear Varnish | Watrous Varnish Co. |

It will be noted in some instances two or three varnishes by the same concerns are quoted; these represent refinements of varnish manufactured for special reasons.

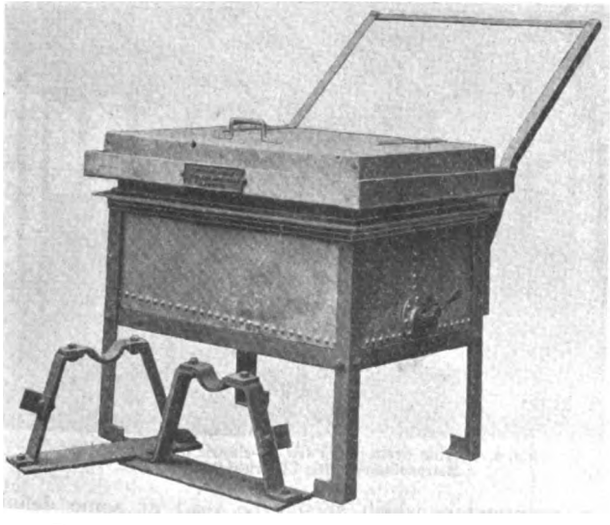

**Fig. 1.—A patented tank specially made for dipping small coils (Sterling Varnish Co.)**

Similar lists can be compiled for the many other varieties, but the above will serve to indicate the difficulty experienced by the ordinary engineer in choosing a varnish by reference to the names allocated by different makers. How much easier it will be when he can specify simply "Clear Baking Coil Varnish B.E.S.A. Spec. No. . . . ."

The reason for the lack of specifications is identical with the reason for their desirability, namely, the great variety of materials and applications to be considered. Almost every manufacturer's list proclaims the merits of a dozen or more

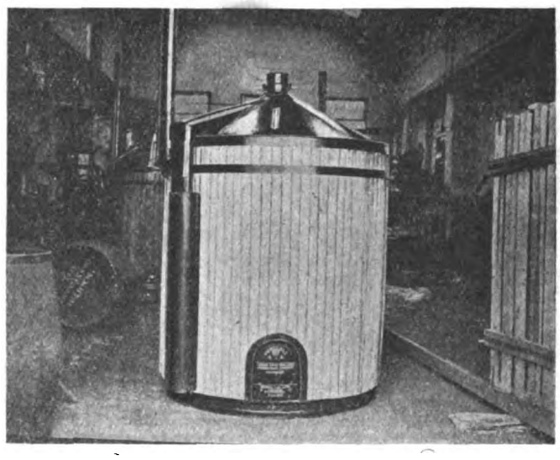

**Fig. 2.—A small quick-baking oven supplied by the Sterling Varnish Co. for baking coils.**

kinds of varnish, each of which has a definite recommended field of application.

It is interesting to note that definite steps are now being taken by the B.E.A.I.R.A., of Kern House, Kingsway, London, to meet this long-felt want, and that suitable specifications will ultimately result from the studies and research investigations now being undertaken. The magnitude of the work can only be realised by those who are familiar with the wide field of application of the materials, but it will be appreciated that the order of preparation of specifications will be governed to some extent by the order of demand of the different grades of varnish. At the present time the order of merit for attention would seem to be somewhat as follows:—

1. Clear baking coil varnish for impregnating purposes.
2. Black finishing varnish for final air-drying coats to finished armature and stator windings.
3. Synthetic resin insulating varnishes for the treatment of papers for boards and tubes.
4. Clear cloth varnishes for cotton or silk fabrics, press-boards, fibre, etc.
5. Black cloth varnish for similar purposes to the clear variety.
6. Brown shellac varnishes for general air dried finishes and repair work.
7. Grey insulating enamel for treatment of coils to improve their heat dissipation.
8. Flexible mica sticking varnish for bonding to mica splittings.
9. Acid resisting varnish for protection of windings against alkali or acid fumes.
10. Cellulose varnishes for moisture-resisting finishes.

Immediate results cannot, of course, be expected, and in the meantime it is with the object of assisting those who have to select varnishes that a general survey of the subject is here attempted and some of the main features of the various varnishes are indicated.

### Classification of Varnishes.

The insulating varnishes commonly used may be divided into the following groups:—

(1) OIL VARNISHES.—Consisting of linseed, china-wood or other oil blended with resins (chiefly copals and succin) and gums, (chiefly dammar, mastic and sandarac), and thinned with benzine or other hydro-carbon solvent.

(2) ASPHALTUM VARNISHES.—Consisting of asphalts, native or pyrogenous, dissolved in benzine or other hydro-carbon solvent.

(3) SPIRIT VARNISHES.—Consisting of lacs, (shellac, etc.), which are the resin-like excretions of insects, and synthetic resins, dissolved in methylated spirit, acetone, etc.



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(4) Cellulose Varnishes.—Consisting of specially prepared cellulose materials, derived from processes used in artificial silk manufacture, dissolved in acetone, etc.

Oil varnishes give a coating which consists largely of oxidation products of the oil. They take a long time (6-8 hours) to dry, even under the best baking conditions, but are employed on account of their penetrative power and the excellent properties of the finished coating with regard to toughness

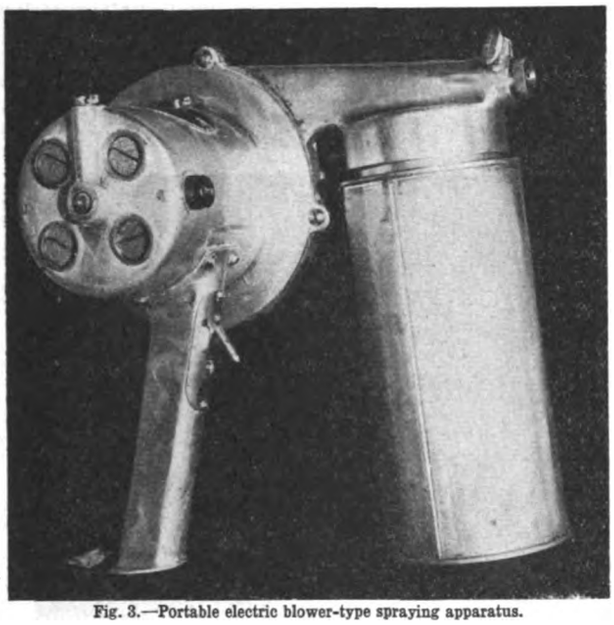

Fig. 3.—Portable electric blower-type spraying apparatus.

hardness, dielectric strength, ageing, and resistance to moisture and to hot mineral oils.

Asphaltum varnishes, which are generally of black colour, take an even longer time to dry (6-15 hours). The finished coating has similar qualities to those of oil varnishes, with an even greater elasticity when made with suitable admixtures of oils and resins.

Spirit varnishes are practically all rapid air-drying varnishes, and are chiefly used where time is of considerable importance, or where the use of baking vanishes is not practicable, as, for example, in repair work. There is a large variety of varnishes in this group, including the synthetic resin varnishes used for laminated work and for improving the rigidity of coils.

Cellulose varnishes have recently come into considerable demand for many purposes outside the electrical industry, and are finding some application to insulation work on account of their rapid drying under normal air conditions, and the hard, tough, elastic finish, which is very resistant to the penetration of moisture. Successful use has been made of these varnishes for the impregnation of stators and rotors, but it is well to note that draining off has usually to be carried out in an atmosphere saturated with its solvent, in order to prevent skinning over and imprisonment of solvent.

It will be seen from the above notes that the character of a varnish depends largely upon the solvent. For this reason, and because in many varnishes mixed materials are dissolved, it is convenient and useful to classify varnishes according to their solvents and according to the applications for which they are to be used.

## Classification According to Solvents.

Classification according to the solvent or the thinner is especially valuable where the choice is governed or influenced by the method of drying which is practicable, or by the time which is available for the operation. It is important also in connection with questions of shipping or insurance for which flash-point is a consideration.

Practically all makers recommend the use of special thinners, often disguised under special names. Their reluctance to publish particulars of the thinners used is due largely to the fact that many users have not facilities for ensuring the correctness of properties, and the unsatisfactory results unjustly but inevitably reflect upon the manufacturer. Where facilities exist which will ensure the necessary standard of material it will usually be found that the technical staff of the varnish manufacturer is quite willing to give full information and advice.

Practically all of the thinners used for insulating varnishes consist of one or more of the materials shown with their characteristics in the Table II. In most cases benzine, methylated spirit or acetone is used alone.

TABLE II.—Solvents Used in Insulating Varnishes.

| | Sp. Gr. | Flash Point. | Boiling Point. |
|---|---|---|---|
| Benzine or Industrial Motor Spirit .. .. | 0·7 | 16° C. | 70° C. |
| Denatured Alcohol or Methylated Spirit .. | 0·8 | 16° C. | 66° C. |
| Bisulphide of Carbon .. .. .. .. | 1·27 | 16° C. | 46° C. |
| Turpentine .. .. .. .. .. .. | 0·86 | 93° F. | 165 |
| Benzine .. .. .. .. .. .. | 0·884 | 16° C. | 80° C. |
| Acetone .. .. .. .. .. .. | 0·796 | 16° C. | 56·3° C. |
| White Spirit (B.E.S.A., Spec. 245) .. .. | — | 25·6° C. | — |

The benzine used is a product of petroleum distillation, and is generally associated with linseed or china wood oil base varnishes. It should not be confused with benzene or benzol, which are coal-tar products.

The methylated spirit used is obtained from the dry distillation of wood. It is chiefly used with resin, shellac, or synthetic resin varnishes.

Acetone is obtained by a number of different processes, including the dry distillation of barium acetate. Amyl acetate has very similar solvent properties to acetone. Both materials are characterised by the peculiar smell of "pear-drops."

With these three solvents there are produced a large variety of varnishes, which may be briefly classified on this basis as shown in Table IV.

## Methods of Drying.

The thinner used can be regarded as a rough indication of the method of drying advisable and time required, since it is obvious that a varnish employing highly volatile spirits, such as methylated spirits or acetone, will dry more much rapidly than the oil base varnishes thinned with benzine. Thus we have the light spirit varnishes of the shellac or cellulose type, which will dry at normal air temperatures in a few minutes, in contrast with the heavier varnishes requiring from six to twelve hours at 90 to 100 deg. C. Recorded tests after three hours' heating at 90 to 100 deg. C. under similar conditions show that it is possible for the loss by evaporation of a varnish to be anything from practically 0 to 70% according to the thinner used.

In view of the fact that the thinners mentioned occupy so important a position it is important to note their required characteristics shown in Table III.

TABLE III.—Required Characteristics of Principal Varnish Solvents.

| Details. | Benzine. | Methylated Spirit. | Acetone. |
|---|---|---|---|
| Specific Gravity at 15° C. .. | 0·725 to 0·750 | 0·810 to 0·820 | 0·796 to 0·801 |
| Distillation Test 1st Drop .. | 70° C. | 70 to 80° C. | — |
| Percentage and Temperature | 90% at 160° C. 100% at 200° C. | 99% below 80° C. | 90% at 60° C. |
| Special Requirements .. | — | 65·5% over proof | No opalescence when 10 ccm. are mixed with 40 cc. of Carbon Disulphide at 15° C. |

The process of thinning a varnish to the desired consistency should be carefully carried out by the use preferably of a

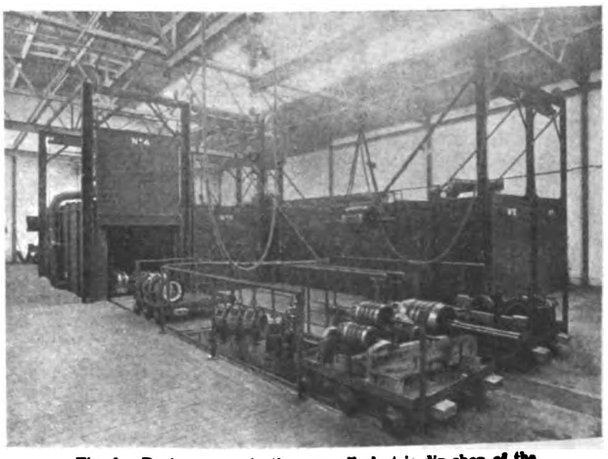

Fig. 4.—Drying ovens in the new all-electric dip-shop of the Metropolitan-Vickers Electrical Company.

glass hygrometer, which should be read at some definite temperature. It is not always possible to do this, however, as variations in temperature are often met with, in which case reference to a table showing the variations in specific gravity at different temperatures should be insisted upon.

The most convenient temperature for measuring the specific gravity of a varnish will depend on the working conditions, but, as a rule, this will be found to be approximately 21 deg. C.

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TABLE IV.—Classification of Varnishes according to Solvents.

| Solvent | Benzine | | | Denatured Alcohol | | Acetone |
|---|---|---|---|---|---|---|
| Variety of Varnishes | Oil Treating Varnishes | | | Finishing Resin Varnishes | Synthetic Resin Varnishes | Cellulose Finishing Varnishes |
| Type of Process | Baking | Baking or Air Drying | Air Drying | Air Drying | Baking | Air Drying |
| Colour | Clear Black | Clear Black | Clear Black | Clear Black | Natural | Various Colours |
| Method of Application | Brushing Dipping Soaking Impregnating | | | Brushing Dipping | Brushing Soaking Impregnating | Spraying Brushing Dipping |
| Applications for which Varnishes are Suitable | Stator Windings Rotor Windings Armature Coils Field Coils Field Coils Transformer Coils Solenoid Coils Pressboard Pieces Fibre Pieces Bakelite Pieces Asbestos Pieces Asbestos Fabrics Cotton Fabrics Silk Fabrics Thin Papers Enamelled Wires | | | Repair Work Finishing Coats Mica Bonds Papers Fibrous Materials | Papers Powder Fillers for Moulded Compositions Fabrics Field Coils Armatures Solenoids | Slate Panels Field Coils Armatures Wires |

in most dip shops. Table V shows the specific gravity correction for each degree difference in temperature.

In the case of a high prevailing temperature a subtraction of values will be necessary; for low temperature the correct reading is obtained by an addition of the necessary correction.

TABLE V.—Specific Gravity Corrections for Temperature.

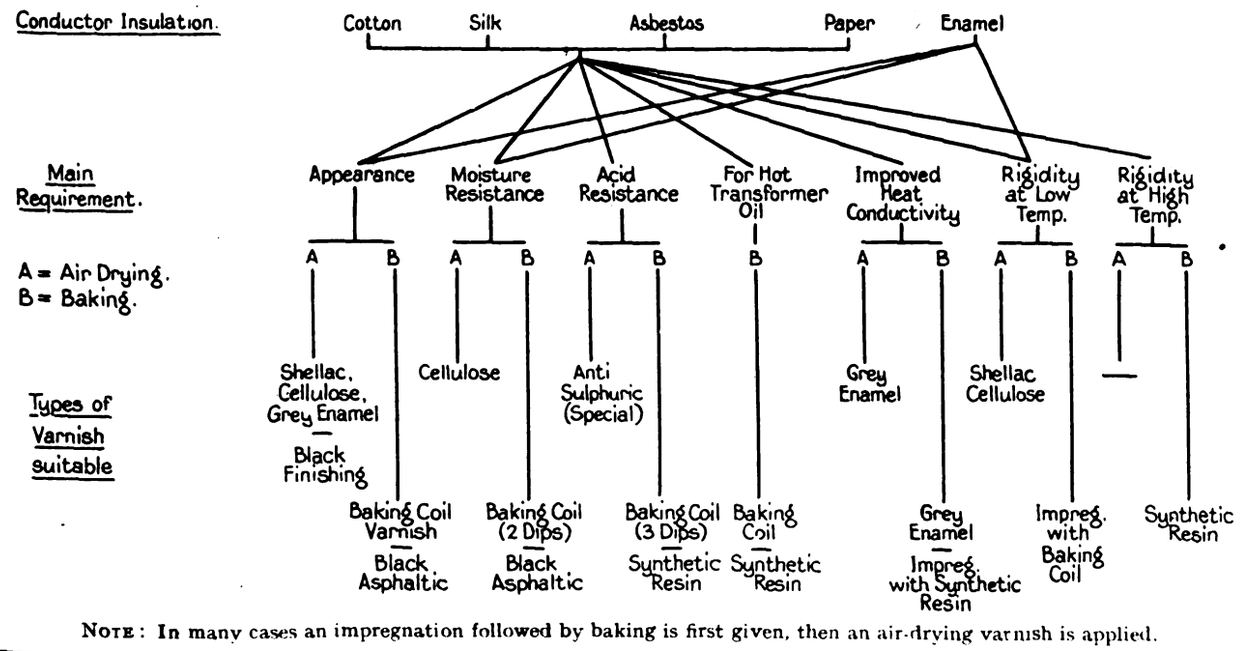
| Centigrade. | | Fahrenheit. | |
|---|---|---|---|
| Temperature Variation Degrees. | Specific Gravity Correction. | Temperature Variation Degrees. | Specific Gravity Correction. |
| 1 | 0·0007 | 1 | 0·0004 |
| 2 | 0·0014 | 2 | 0·0008 |
| 3 | 0·0021 | 3 | 0·0012 |
| 4 | 0·0028 | 4 | 0·0016 |
| 5 | 0·0035 | 5 | 0·0020 |
| 6 | 0·0042 | 6 | 0·0024 |
| 7 | 0·0049 | 7 | 0·0028 |
| 8 | 0·0056 | 8 | 0·0032 |
| 9 | 0·0063 | 9 | 0·0036 |
| 10 | 0·0070 | 10 | 0·0040 |
| 11 | 0·0077 | 11 | 0·0044 |
| 12 | 0·0084 | 12 | 0·0048 |

It should be remembered that in cold weather a varnish may seem to be too thick or heavy, but if warmed to the correct temperature will often be found to be correct. The temperature at which a varnish is used is of importance; too low temperatures result in poor penetration; high temperatures result in excessive loss by evaporation. It may be noted here that storing pigmented varnishes at unduly low temperature has been known to have a permanent detrimental effect on the colour.

During the thinning operation both the varnish and the thinner used should be at approximately the same temperature, otherwise in some instances a chilling may take place which will result in the precipitation of the varnish.

The most helpful classification of varnishes from the point of view of the user is probably on the basis of the applications for which they are required. Of these the most important and the most characteristic are the various processes for the treatment of transformer coils, armature coils, stator coils, field coils, solenoids, etc., and the later processes of treatment of the assembled windings of machines. A classification of varnishes and treatments suitable for these and similar

TABLE VI.—Insulation Varnish Treatments for Coils, etc., grouped according to Requirements of Service.




Note: In many cases an impregnation followed by baking is first given, then an air-drying varnish is applied.

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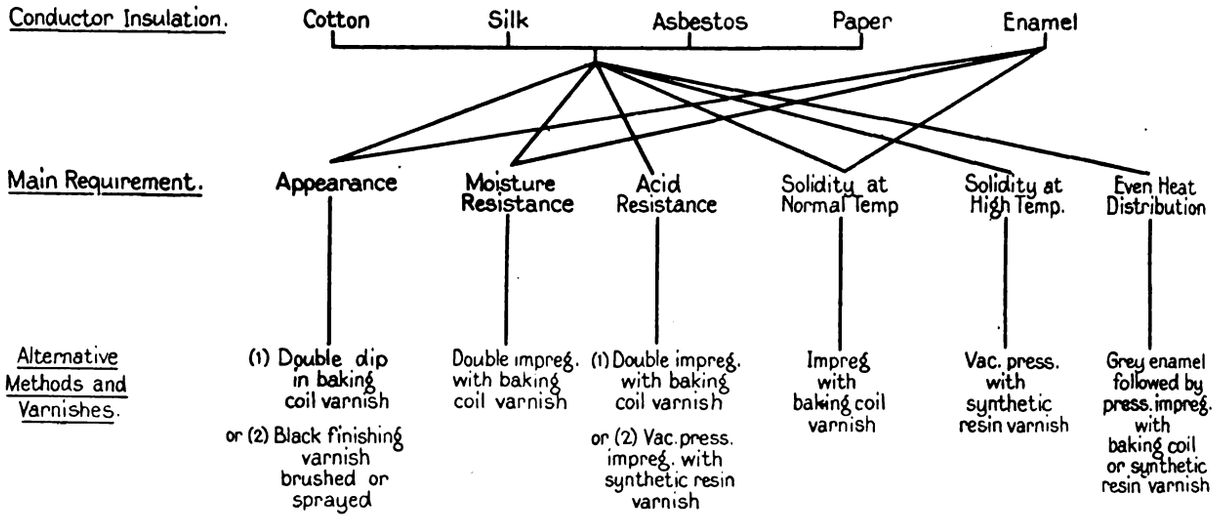
TABLE VII.—Insulating Varnish Treatments for Wound Armatures, Stators, etc., assembled with Coils Previously Treated, as in Table VI.




Note.—Where impregnation is used to ensure thorough treatment a final brushed or sprayed coat of air-drying varnish is usually applied for appearance.

purposes is attempted in Tables VI and VII. Within the space available only the more important considerations and processes can be mentioned, but the principles, which are based on careful study and practical experience will be found capable of wide application.

In selecting a varnish and method of treatment for any application it is useful to arrange in order of their importance the characteristics required with regard to the conditions of service. The selection may, of course, be affected by the facilities of plant available, and the permissible time for the operation.

## Equipment.

The processes of brushing and dipping, followed by air drying or baking, owe a great deal of their popularity to the fact that they require only very simple equipment, while the more elaborate vacuum pressure process involves the use of costly plant, which is only to be found on well-equipped premises. A good deal of controversy has taken place on the relative merits of vacuum pressure impregnation and impregnation by immersion. It is not possible to deal with the question at length here, but it may be said, that if thorough pre-drying is effected, results adequate for the majority of requirements can be obtained by simple immersion of coils in a suitable varnish, provided this is done while they are still hot. In cases where, in order to improve the heat conductivity of a coil, it is essential that all the interstices should be filled, vacuum pressure impregnation is often adopted.

Even with large plants the limits of capacity will often be exceeded by the size of work to be treated, as with the assembled windings of large machines. In such cases the finishing coats have to be applied by brushing or spraying processes.

The photographs reproduced in Figs 1 and 2 show examples of simple small-scale equipment for dipping and baking processes. Fig. 4 shows part of a new large scale dip-shop with all-electric equipment recently put into commission at the Metropolitan-Vickers works. Fig. 3 shows a new portable electric blower-type of spraying apparatus, supplied in this country by the Sterling Varnish Co. This has been developed to simplify the application of spraying processes for which, until recently, a separate compressed air supply was necessary.

Acknowledgments are due to the Metropolitan-Vickers Electrical Co. for permission to publish some of the information here given, and for Fig. 4, and to the Sterling Varnish Co. for Figs 1, 2 and 3.

# ELECTRICAL USES OF PLATINUM.

By "METALLURGIST."

THE enormous growth of the electrical industry in modern times is due, in the main, to three metals: iron, copper and platinum. Indeed, it may be doubted whether, without the latter metal, it could have developed at all. In spite of the constant endeavours of the metallurgist to supply the electrician with platinum substitutes this metal still remains an essential material in the electrical engineering industries.

The annual production of platinum fluctuates considerably, but may be put roughly at an average of 300 000 ounces. Of this approximately 15%, or about 45 000 ounces, is used directly in the electrical industries. The chief use of platinum in the electrical industries is for contact points.

The physical properties of platinum vary, it need hardly be said, with its degree of purity. Amongst these properties is the strictly utilitarian one of durability. Platinum is, of course, exceedingly resistant to ordinary corrosive influences, but it is a soft metal and wastes materially on abrasion. In view of its scarcity, waste of the metal is essentially to be avoided; it has been estimated that in any case something like two-thirds of the platinum used in the electrical industry is wasted, but this uneconomic application can be mitigated by the use of platinum alloys—quite distinct in this connection from platinum substitutes.

There is considerable, and often unexpected, abrasive wear on all contact and sparking points, and for these platinum-iridium alloys are therefore preferable, giving longer service and necessitating less repair work. Moreover, platinum is an exceedingly sensitive metal, when used by itself and in a relatively pure state, in so far as it absorbs many gases, which act as impurities and, to that extent, impair its natural properties. Its congener metals, osmium and iridium, confer hardness on platinum and render it better able to withstand the very real wear and tear of continuous sparking, and exposure to the gaseous products of the passage of the electric spark. As, however, there are attendant disadvantages associated with osmium, the platinum-iridium alloys are best for such purposes.

Naturally all the so-called platinum substitutes are alloys, but not of platinum. For the most part, and so far as they find applications in the electrical industries, they are chiefly used for electrical resistance elements, either in domestic heaters, or in the windings of electric resistance furnaces. For these purposes they are almost invariably nickel-chromium alloys, with or without additional constituents.

Substitutes obtain in pyrometry, but most thermo-couples, and all the best and most reliable makes have platinum as one of the two metals, and usually platinum-rhodium as the other.

Other uses, apart from the many which are made of platinum in the chemical and electro-chemical laboratory, are in galvanometers and in other measuring instruments.

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# SOME NON-FERROUS METALS USED IN THE ELECTRICAL INDUSTRY.

## Progress in Electrolytic Refining of Copper—Copper-Cadmium Alloys—Remarkable New Aluminium Alloy to Replace Steel Cores in Overhead Conductors—Developments in Magnesium Alloys—New Materials for Cable Sheaths.

By A SPECIAL CORRESPONDENT.

WITH a heading so broad and a space so limited as this, the choice has to be made as to which is the most profitable use of that space; to make an effort very briefly to touch upon all the non-ferrous metal applications or to discourse a little more fully upon those of greatest importance and widest application. The latter course has been adopted here.

COPPER.—In industry generally, copper ranks second in importance to iron and steel; but in the electrical industry it is surely of first importance, being the medium wherein electricity is generated, and whereby it is conveyed as power to the elbow of man. Originally, copper was chosen by the electrical engineer solely on the grounds of its high electrical conductivity, and the extent and limitations of its use in the industry to-day are more than ever dependent upon this property.

As a conductor pure and simple it has no competitor among the commercially possible metals, and only when considerations of mechanical strength are in the ascendency is its use ever called into question. Thus it comes that of the world production of copper in 1927, amounting to 1 550 000 tons, about half was absorbed by the electrical industry. In Britain the ratio appears to agree; for in the same year it is estimated that of the home consumption of 144 000 tons, the electrical industry absorbed some 70 000 tons. The scale on which the metallurgical industry must operate to ensure this production will be gathered when it is remembered that copper is smelted almost entirely from ores in which the metal concentration is only about 5%.

If copper has made the electrical industry possible, something of the converse is equally true, for its astonishing consistency both in quality and price throughout the world is largely attributable to the inflexible demands made upon producers by electrical engineers. High electrical conductivity is concomitant with a high degree of purity, and because of this copper has been forced to exist the world over in a state of purity hardly approached in degree or consistency by any other metal. The electrical industry, being to-day more than ever concerned with high efficiencies in generation, distribution and consumption of power, metallurgical research in consequence is directed towards a fuller knowledge of the factors affecting the conductivity of copper.

### Impurities and Conductivity.

Since all the known metals capable of entering into solution in copper have the effect of immediately lowering its conductivity, the chances of producing a superior conductor by alloying are slim indeed; so that the immediate call is for a knowledge of the precise effect on conductivity of the common impurities, and for the development of new or improved refining processes.

TABLE I.

EFFICIENCY OF ELECTROLYTIC REFINING OF COPPER (ADDICKS).

| Element. | Anode before Refining. | Cathode after Refining and Casting. | Original Impurity % | Efficiency of Refining. |
|---|---|---|---|---|
| Copper .. .. | 99·030 | 99·939 | — | — |
| Silver .. .. | 0·1678 | 0·00131 | 0·78 | 99·22 |
| Gold .. .. .. | 0·0051 | 0·000013 | 0·25 | 99 75 |
| Sulphur .. .. | 0·0075 | 0·0029 | 38·60 | 61·40 |
| Nickel .. .. | 0·3200 | 0·0037 | 1·15 | 98·85 |
| Lead .. .. | 0.0567 | 0·0020 | 3·52 | 96·48 |
| Arsenic .. .. | 0·0523 | 0·0015 | 2·87 | 97·13 |
| Antimony .. .. | 0·0409 | 0·0034 | 8·32 | 91·68 |
| Bismuth .. .. | 0·0051 | Trace | — | — |
| Tellurium .. .. | 0·0282 | 0·00015 | 0·53 | 99·47 |
| Selenium .. .. | 0·0682 | 0·00040 | 0·59 | 99·41 |
| Iron .. .. | 0·0181 | 0·0039 | 21·55 | 78·45 |

In the latter direction, the greatest advance of recent years has been the rapid progress in the use of electrolytic refining in place of "fire refining." The process causes the crude or Bessemer copper to be cast into anodes; which, through the medium of a copper sulphate electrolyte, are deposited at the cathode in a highly pure state, the impurities being either taken into solution in the electrolyte or precipitated in the form of a sludge.

The efficiency of the electrolytic refining process is indicated in Table I, and averages upwards of 90% overall, although it will be seen as much higher in the case of the majority of individual impurities.* More than half the world production is now refined electrolytically; of the United States production (1927 = 865 000 tons) it is said that 80% is refined by this process. The table indicates the copper efficiency only; all the impurities held by the solution or the sludge being subsequently recoverable.

### Common Impurities.

The important consideration of the precise effects of the common impurities on conductivity has for some years been a subject of investigation by the British Non-Ferrous Metals Research Association.† The effects of the presence of oxygen, iron, arsenic, nickel and phosphorus have been separately determined, and work is proceeding to measure the combined effect. The standard of comparison in these measurements is cathode copper of 99·98% purity, having a mass conductivity of 102·1 (International Standard). Mass conductivities exceeding 100% are obtained in annealed copper containing less than 0·1 % of oxygen; which is fortunate, since about this amount is essential to give the desired mechanical properties. Iron is deleterious; it is soluble in copper up to a concentration of 0·2% at all temperatures, and this amount reduces the conductivity to 60%.

Arsenic, a common impurity, has a very marked effect; the conductivity falling very rapidly as the content increases. With 0·053% arsenic the conductivity is reduced to 88·5%, while it is further reduced to 20% when the arsenic reaches 1%. Phosphorus, though not a natural impurity in copper, has wide use as a deoxidiser, and it is rather from this source that its presence occurs, by being added to a melt in excess of the amount necessary to reduce the oxides. It has a powerful effect on conductivity; 0·05% reducing the figure to 70%. Nickel has also a marked effect, although in a lesser degree than the cases cited above; the presence of 0·04% causing a fall in conductivity to 96%. Bismuth is found to affect the working properties before any appreciable reduction in conductivity is observed, and therefore the limiting condition here is mechanical. Comparison of these figures with the values given in the table for the occurrence of impurities in the unrefined anode will provide some indication of the improvement in conductivity due to electrolytic refining.

The limit in refining is reached when the impurities remaining have a combined effect on the conductivity less than that due to the cold working necessary to produce the desired form of conductor having sufficient mechanical strength to withstand the processes of manufacture—e.g., in cable making. Beyond this point it is only possible to speculate, and that not very hopefully, since two seemingly impossible alternatives are postulated: the production of a new material having a conductivity superior to that of pure copper at the same price, or the production, by some occult process, of a satisfied electrical engineer.

A comparatively recent development of interest for applications where a high conductivity must accompany mechanical properties superior to those usually possessed by "conductivity" copper is the cadmium-copper alloy now extensively employed for telephone and trolley wire. The cadmium content is of the order of 1%, which is sufficient to increase the tensile strength by 90% while reducing the conductivity only 10%. The economy possible in reducing the frequency of supports, or increasing the storm resistance of an overhead system, is the main justification for the use of this material. It is finding increasing use also for trolley wire, since its resistance to abrasion is increased proportionately as the tensile strength. Its improved resistance to abrasion and the higher softening temperature of cold worked material would seem to justify a wider use for commutator bars.

ALUMINIUM.—In certain applications aluminium is well

* Efficiency here is $\frac{\text{impurity in anode—impurity in cathode}}{\text{impurity in anode}} \times 100$, and should not be confounded with "current efficiency."

† Hanson and Ford at the National Physical Laboratory.

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justified as an alternative conductor, and the extent to which it enters the field can be said to depend upon relations between tensile strength and weight. Its mass conductivity is almost exactly twice the value for copper, its volumetric conductivity being only 60% of copper. While the tensile strength of aluminium is only half that of copper, its strength per unit of weight is 60% greater than that of the latter metal.

Thus, wherever space is of importance, as in all electrical machinery and transformers, aluminium as a conductor is ruled out of consideration. Here also the comparative difficulty in jointing is an important consideration. The metal naturally finds ready application where the strength per unit of weight is a major consideration.

In the case of overhead transmission lines use is made of this advantage, and with the modern practice of reinforcing the aluminium with a steel core it is still possible to show a 50% increase in tensile strength with three-fourths the weight of the equivalent copper conductor. This permits either the use of lower towers for the same span, the sag reduction allowing this to be brought about while maintaining the same ground clearance, or, as is more usual, increasing the span with the same sag as for copper, and thus reducing the number of supports by 27%, and thereby the cost of insulators, foundations, erection and way leaves proportionately.

## Ousting the Steel Core.

"ALDREY."—In this connection interesting developments have recently taken place on the Continent, wherein aluminium alloys are used having sufficient mechanical strength to eliminate steel cores commonly used in pure aluminium overhead conductors. It is claimed that the reduction in weight and increased (overall) conductivity contribute to considerable savings in costs when compared with steel cored conductors. Several alloys are now in use, going under such trade names as "ALMELEC" (notably in France), "ALDREY" and "TELECTAL" (in Switzerland and Germany). All are interesting alloys having generally similar properties; for the sake of brevity, however, only "Aldrey" will be considered here. That the developments are on a practical scale is evidenced by the fact that "Aldrey" was used in Switzerland in 1925-6 to the extent of some 600 tons; or, having in mind the decrease in weight for the same mileage, about equal to the length of overhead conductors required for the Central Scottish Scheme.

"Aldrey" is an alloy of 0·4% magnesium, 0·5–0·6% silicon, and about 0·3% iron with aluminium. As will be obvious from Table II, it very nearly combines the conductivity of aluminium with the tensile strength of copper.

TABLE II.

THE PHYSICAL PROPERTIES OF "ALDREY" ALUMINIUM AND COPPER.

| Wire, 2-3 mm. | Aldrey.* | Aluminium* 99·3% | Copper. |
|---|---|---|---|
| Specific gravity .. .. .. | 2·7 | 2·7 | 8·9 |
| Tensile strength $\frac{\text{tons}}{\text{sq. in.}}$ .. .. | 20—23·3 | 10·9—11·5 | 25—28 |
| Electrical conductivity† .. .. | 31—32 | 34 | 58 |
| Load to give 0·3% elongation tons/in.² | 18·5—21 | 9·5—10·2 | — |
| Load to give 0·03% elongation tons/in.² | 12·75—14·0 | 2·04—3·17 | — |
| Modulus of elasticity lbs./in.² .. | $9{\cdot}32\times10^6$ | $8{\cdot}6\times10^6$ | $16\times10^6$ |
| Coefficient of expansion .. .. | 0·000023 | 0·000023 | 0·0000167 |
| Temporary coefficient of electrical conductivity per °C. .. .. | 0·0036 | 0·0040 | 0·6038—0043 |
| Elongation (20 cms.) .. .. .. | 6—9% | 2—4% | — |

* v Zeeleder and Bosshard: "Zeits fur Metallkunde," XIX., 1927, p. 459.

† $\frac{m}{\text{Ohms. mm}^2}$

Compared with aluminium, "Aldrey" possesses from 80 to 100% increase in tensile strength, according as it is in the annealed or wrought state, and this gain is obtained at the expense of only 10% in conductivity. The loads required to give unit elongations are from 2–4 times those for aluminium: in high tension line design, where mechanical strength is of greater importance from an economic point of view than conductivity, the savings possible by use of the material will be appreciated.

No figures are available on the relative cost of the alloy, but when it is considered that the steel core of an aluminium conductor lends strength at the expense of conductivity per unit cross section and weight, "Aldrey" should easily justify its adoption by the resultant saving in supports, insulators, foundations and erections, etc.

The elements added to enhance mechanical strength would not appear to constitute sufficient "impurity" adversely to affect the corrosion-resisting properties, which are claimed to be substantially the same as for aluminium. Such a material surely warrants closer attention by British engineers; its applications, while not very extensive at present, have been in all cases successful enough to indicate a much wider use in the future.

LIGHT ALLOYS.—Perhaps the largest use of aluminium lies in its increasing application to the products of the "light" side of the industry—telegraphy, telephony (wired and wireless) the closely allied art of supervisory control, and in all branches of instrument making. Aluminium alloys, due principally to their strength, combined with lightness as well as the ease with which they lend themselves to mass-production methods, are universally replacing cast iron and the brasses in these uses; and are in turn themselves being replaced by the new and still lighter magnesium alloys. The former alloys are so widely known that their inclusion here would be superfluous; there is, however, something to be said of the latter.

Of the many magnesium alloys now used "Elektron" seems to have progressed furthest. The principal "elektron" alloys contain about 90% magnesium, with aluminium as the principal addition, while silicon and manganese are present to lend hardness and resistance to corrosion respectively. Production is proceeding at an increasing rate of sand and pressure die castings, forgings and extruded products in the alloy.

It is claimed for "elektron" castings that they are inherently more homogeneous than the aluminium alloys, and recent developments in pickling treatment have very greatly improved their resistance to corrosion. Savings in time and cost are claimed, due to the superior machinability of these alloys; cutting speeds of 3 000 ft. per min. are common, and the speed of 1 800 r.p.m., for example, is employed for drilling ⅛ in. dia. holes. Machining with a tool is done without any lubricant; but grinding is done under water.

## Savings in Die Casting.

It is reasonably held that, in die casting, savings result from the fact that "elektron" does not attack the dies or machines to anything like the extent known in the case of aluminium alloys. In appearance "elektron" die castings are excellent as to finish, and give a high degree of sharpness and accuracy. The metal forges and extrudes well; the alloy for the former containing not more than aluminium 8%, silicon 2·5% and manganese 1%; the latter holds aluminium 10%, zinc 1·5% and manganese 1% in addition to magnesium.

Applications already embrace many different uses, and include under-carriage parts for aircraft, motor crank cases, pistons and omnibus wheels. The latter have been pretty generally adopted by the Berlin Omnibus Co., where front wheels weighing 48 lb. replace steel wheels of 145 lb.: rear wheels weighing 92 lb. replace steel wheels of 246 lb., and make a total saving in weight of 502 lb. The material seems to be giving excellent service in these very rugged conditions where

TABLE III.

MECHANICAL PROPERTIES OF "ELEKTRON" AND ALUMINIUM ALLOYS.

| Alloy. | Condition. | Brinell hardness. | Modulus of Elasticity lb./in² × 10⁶ | Sheer strength tons/in.² | Proportional limit tons/in.² | Elongation: % on 2 in. | Ultimate Tensile stress tons/in.² | Specific gravity. | Uses. |
|---|---|---|---|---|---|---|---|---|---|
| Elektron (AZ) .. | Sand cast | 43–47 | 6·5* $10^6$† | 9 | 5·5–6* | 5–9 | 11–13 | 1·81 | Castings |
| ,, .. | Chill cast | 50–55 | ,, | 9 | — | 5–10 | 13–15 | — | Repetition castings |
| ,, (AS82).. | Forged | 60 | ,, | — | 14–16* | 5–10 | 18–20 | — | Pistons |
| ,, (VIW) | Extruded (heat treated) | 60 | ,, | 10 | 15–17* | 10–12 | 22–24 | — | Highly stressed parts |
| ,, (V.III) | Extruded (hard) | 85–90 | ,, | 12 | 13–15* | 2–5 | 25–27 | — | |
| Y alloy .. .. | Sand cast | 88 | 10·8 | — | 5·0 | 0·5 | 11·0 | 2·79 | |
| Al-Si (Si 13%) .. | ,, ,, | 50 | 10·8 | — | 2·6 | 8·5 | 11·3 | 2·65 | |

† Approximately. * Yield point.

Properties of "Elektron" compiled from figures obtained for German manufacturers (after R. S. Hutton).

Properties of Y alloy and Al-Si alloy, after Archbutt, "Metallurgist," February 28th, 1926.

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axle loads are three tons and five tons respectively on front and rear axles. As a rough indication of comparative costs, it is said that " elektron " castings can be sold at 5 to 6 marks per kilo ; the minimum cost of aluminium alloy casting being 2·6 marks per kilo. It is pointed out, however, that " elektron " parts for the motor industry are being sold and delivered at the same price as similar parts in aluminium alloy. The mechanical properties of " elektron," " Y " alloy and another are compared in Table III. (page 612).

CABLE SHEATHING—IMPROVED LEAD ALLOYS.—Perhaps it is not generally recognised that the electrical industry consumes a tonnage of lead greater than that of copper ; but a fairly accurate estimate places the lead used for cable sheathing in this country at 80 000 tons per annum.

Lead is the ideal material for cable sheaths, except in a single particular, that is rather an interesting example of the way modern conditions of service sometimes force the adoption of a new material. It is prone to a type of failure known as intercrystalline cracking ; the cause and remedy of which has been lately solved in the laboratories of the Research Department, Woolwich.

This type of failure, fortunately somewhat rare, has far-reaching ill effects to users when it does occur. It invariably starts from the inside of the sheathing, and is, therefore, not apparent until complete breakdown has taken place. Failures had been noted under various conditions—on board ship (turbine ships particularly), in submarine and aerial cables, in and adjacent to railway bridges and tunnels, as well as occasionally during transportation of new cable overseas or overland. After disposing, with negative results, of many theories propounded as to its cause, it is definitely established as due primarily, if not solely, to fatigue. A quantitative correlation exists between alternating stress and intercrystalline failure, and the precise type of breakdown may be reproduced at will on specimens submitted to the Haigh fatigue test.

The remedy, which lies in the production of a material having substantially the same working properties as lead, but with a higher resistance to fatigue, is found in the discovery in the later part of the work, of the ternary alloys of either Lead-Cadmium-Antimony or Lead-Cadmium-Tin.* In each series there are several alloys suitable for cable sheathing, but having regard to ease of working as well as improved fatigue resistance, those recommended for commercial use are numbered 1 and 2 in Table IV. Number 3 is entirely special in that it is intended to meet the conditions in H.M. ships, probably not met elsewhere.

TABLE IV.—THE PROPERTIES OF THE TERNARY ALLOYS OF LEAD.

| No. | Composition. | Ultimate Tensile Strength. Tons.sq. in. | Elongation. % | Brinell Hardness Numbers. | Haigh Fatigue Limit. ± Tons./sq. in |
|---|---|---|---|---|---|
| 1 | Cadmium .. 0·25%<br>Antimony .. 0·5 %<br>Lead .. 99·2½% | 1·64 | 52 | 0·5 | 0·74 |
| 2 | Cadmium .. 0·25%<br>Tin .. 1·5 %<br>Lead .. 98·25% | 1·62 | 55 | 5·7 | 0·57 |
| 3 | Cadmium .. 0·15%<br>Tin .. 0·4 %<br>Lead .. 99·45% | 1·35 | 63 | 5·3 | 0·35 |
| | PURE LEAD .. | 0·9 | 80 | 3·2 | 0·18 |

## Advantages of Ternary Alloys.

The advantages of the ternary alloys with respect to fatigue resistance will be seen from the table, and there are others not so apparent. It is known that in the past binary alloys of lead-antimony and lead-tin have been used for cable sheathing, and that these alloys are less prone than is pure lead to this type of failure. In the case of the ternary alloys, the added resistance to fatigue is achieved with an amount of hardening constituent much lower than is necessary for either of the binary alloys mentioned, and thus the ternaries retain, in much larger measure, the ease of working that characterises the use of lead. The essentially high corrosion resisting properties of lead also are not appreciably impaired by the presence of cadmium and antimony to the extent of the contents in the ternary alloys. Because cadmium has approximately three times the hardening effect of tin (for instance) it is possible to maintain a low " impurity " value, and thus difficulties in melting and extruding caused by drossing and segregation are largely overcome.

Although the result, of quite recent research work, the ternary alloys have found application on a considerable scale. The G.P.O. has installed two submarine cables sheathed with the material, and the Admiralty, after extensive trials, has adopted it as a tentative specification for the sheathing of all cables for installation in H.M. ships.

A NEW ALUMINIUM BRASS FOR CONDENSER TUBES.*—A thorough study of the mechanical properties of brass containing additions of aluminium has revealed the exceptional behaviour of these alloys when exposed to corrosive conditions. This led to the manufacture of the material in the form of condenser tubes, and tests were carried out in co-operation with Mr. R. S. May to compare their performance under identical conditions with 70/30 brass tubes.

In one test the tubes were maintained for nine months in a sea water condenser with a water speed of 7 ft. per sec., and under conditions of high aeration and considerable impingement. Subsequent examination of the tubes showed startling results ; whereas the 70/30 tubes were corroded over the whole surface, exhibiting severe dezincification and considerable thinning down due to erosion at the inlet end, the aluminium brass tubes showed no appreciable impingement attack, having the appearance in colour and texture as if the original brass had been lacquered.

## A "Self-Healing" Film.

Further work has indicated this remarkable result to be due to the formation of a film of a highly protective nature, and, of still greater importance, that the film is " self-healing." The formation of this film with its protective property, is the outstanding feature of the new alloy which has the composition copper 76%, zinc 22%, aluminium 2%. These figures can be varied within reasonable limits ; but the desirable homogeneous alpha structure is assured only if the copper content is 70% or above. It is a good working metal for either extrusion or hot piercing having both ductility and tensile higher than 70/30 brass. It resists season cracking equally as well as the latter material.

The claims made here apply only to the stated conditions of test, although success is confidently expected from wider application. A considerable tonnage of tubes is now on trial by the Admiralty and the leading shipping concerns. Its behaviour so far would indicate that it may constitute an important development, not only from the point of view of corrosion resistance, but heat transfer also ; the importance here lying in the fact that the film formed is microscopic in thickness, transparent and flexible and, though no result is yet available in proof of this, it is not unlikely that the designer may, by use of the material, be enabled to assume a " clean tube," and so reduce, if not eliminate, losses consequent upon fouling.

# ELECTRICAL USES OF CADMIUM.

IN a paper read before the Junior Institution of Engineers in London on November 23rd, Mr. C. F. Moore dealt at some length with cadmium, and mentioned that one of the new uses for metallic cadmium is in the manufacture of tungsten electric lamp filaments. Mercury-cadmium alloys have an important applicatiou in the manufacture of standard cells, of which they form one of the principal components.

For use as a high temperature-resister material in electric furnaces, cadmium oxide is finely ground with water, with or without the addition of powdered zirconium silicate, and the paste shaped as desired and heated to 800 deg. C. The oxide then forms a compact mass of high tensile strength, and is particularly suitable for the manufacture of electric furnace resistances on account of its low negative temperature co-efficient of resistance, even at 1 000 deg. C.

A cadmium vapour arc lamp, which gives an intense monochromatic red light, practically that of pure cadmium, by means of the line 6 459, had been devised and constructed by Bates. The lamp is in the form of an inverted U tube of 10 c.c. capacity, and is fitted with two long quartz capillaries at its ends by means of which the tungsten wire electrodes are admitted. The lamp will burn with 3 A at 110 V with a drop of 14 V across the terminals, but is more efficient with a current of 7 A and a drop of 25 V.

Electriccable coverings are very often sheathed with a lead alloy instead of with pure lead. Two new alloys are 98·25 per cent. lead, 0·25 per cent. cadmium, 1·5 per cent. tin, and 99·25 per cent. lead, 0·25 per cent. cadmium, 0·5 per cent. antimony. The introduction of cadmium gives improved mechanical properties to lead.

* Beckinsale and Waterhouse. Journal of Inst. of Metals, 1928, I. Vol., xxxix, p. 375.

* British Non-Ferrous Metals Research Association in the Research Department, Woolwich.

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# SPRAY PAINTING EQUIPMENT.

## Applications in the Electrical Industry—Points to Consider in Choice of Apparatus—Recent Developments in Spraying Equipment.

(FROM A CORRESPONDENT.)

PAINTING under pressure by means of spraying equipment has already found extensive application in many British industries. This method is, of course, being used by quite a number of electrical manufacturing firms, but there is ample scope for its wider adoption in the electrical industry, both on the manufacturing and electricity supply sides.

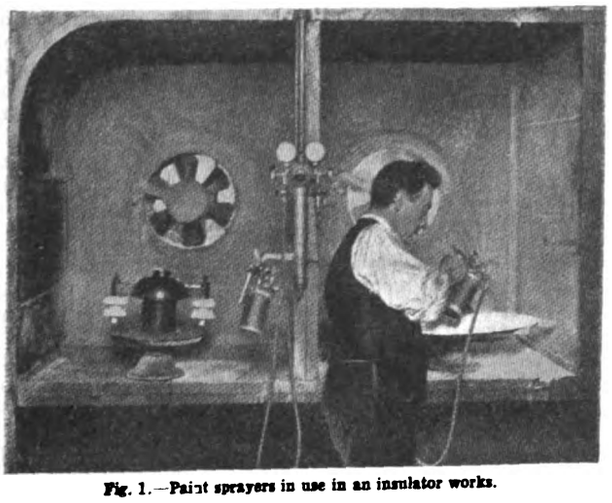

Fig. 1.—Paint sprayers in use in an insulator works.

The use of cellulose finishes has brought many problems in its train, and though these have for the most part been overcome, the actual spraying equipment employed remains the most important factor if a clean and high standard of work is to be maintained.

In the first place, the spraying gun should be of simple construction, easily and quickly cleaned, and well balanced. The air clarifier should be designed so that it will positively free the air from oil and condensation, and the controls should be sensitive and reliable.

The air receivers should be fitted with a condensing tube through the top of the receiver, the air passing through this and out of the lower end; this method relieves the air of much moisture and oil before its exit to the pipe line feeding the sprayers.

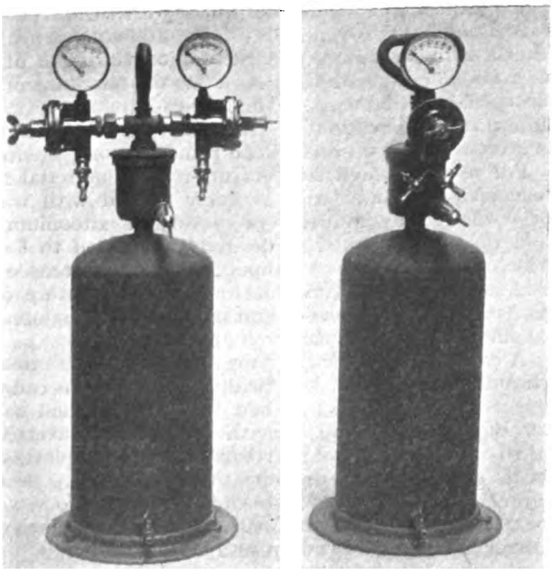

Fig. 2.—Two air control and filtering sets for paint spraying equipments.

Needless to state, the air compressors should be of ample size for the plant installed, and the speed should not be too high. It is a great mistake to try and make two small compressors do heavy duty by speeding up the revolutions of the machine.

Care should be taken that the spraying booths, or other forms of exhaust, are constructed in such a manner that the fan or trunking will not get "caked-up" with the solution. The fan should be independently driven, and the suction should take place through removable plates. This applies to table booths and large bays, and the system has been installed by some of the large electrical manufacturing firms with entire success.

Fig. 3 shows one of the latest improvements in spraying equipment, by Attwood's Spraying Equipment, Ltd., of 76, 78 and 80, Kensal Road, W.10. This single unit equipment is supplied in three sizes, with a working depth of 2 ft. 6 in., and is suitable for the smaller and medium sized articles. The air compressors are air cooled. A 1 H.P. motor is supplied for heavy-type guns, but a ½ H.P. motor serves for the lighter guns. Besides a complete range of larger equipments for big

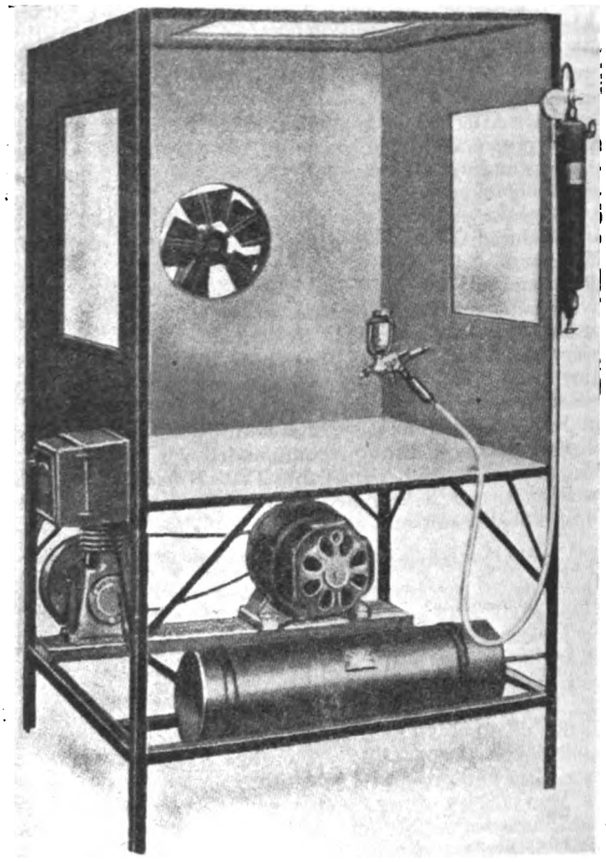

Fig. 3.—A compact single unit paint spraying equipment.

painting jobs, the firm makes a portable outfit specially suitable for structural work.

In Fig. 2 are seen two new control sets for filtering and controlling the air supply in the spraying equipments made by Aerostyle, Ltd., 174, St. John Street, Clerkenwell, E.C.1. The tank is used as an intercooler, which in turn also serves to collect a large proportion of the moisture which is present in all compressed air systems. On the top of the tank a suitable filter is mounted with conveniently arranged and replaceable gauze and other filtering mediums. From this filter air is taken through one or more reducing valves which may be instantly adjusted to give the desired pressure for atomising the material, and also, where used, the requisite pressure feed on the container, so that a steady flow of fluid is obtained. From these reducing valves the air supply or supplies are led to the sprayer, the head of which gives instantaneous adjustment from round spray to fan-shaped spray or vice versa.

Fig. 1 is taken from a photograph of an equipment supplied by the De Vilbiss Co., Ltd., of West Drayton, Middlesex, to a firm of insulator manufacturers.

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# RURAL ELECTRICITY SUPPLY.

## A Cheap Distribution Scheme at Aylesbury—Galvanised Steel Wire for Overhead Lines—Aluminium Alloys and Copper-clad Steel.

AT a meeting of the Overhead Lines Association, held at the Institution of Electrical Engineers, on November 21st, Mr. W. Fennell (the President) in the chair, Mr. W. A. Turnbull read a paper on "Rural Electricity Supply."

The paper dealt with a scheme for extending the rural electricity supply to the north of Aylesbury, in addition to the rural areas already supplied in other parts surrounding Aylesbury. This new district to the north has an area of 106 square miles, containing 3 035 dwellings and a population of 11 579. It is poor and sparsely populated, there being only 109 persons to the square mile. With a view to finding out the possibilities of taking the Aylesbury supply to this area, and making it available to every dwelling, the district was surveyed, and a scheme was ultimately arrived at giving a revenue of £5 171 from 858 consumers at the start. The proposed tariff for the area is that existing in other parts of the Aylesbury rural area.

### Financial Details.

It is estimated that six months will be occupied in obtaining the necessary wayleaves and sanctions, and that two years will be taken to construct the scheme, the second of these two years to be designated the first year of working. It is further assumed that 50% of the 3 000 dwellings will be connected at the end of four years' complete working, and that there will then be a total demand of 1 008 000 kW, at an average price of 2·34d.; revenue £9 810. This gives an average revenue for light of £2 7s. per dwelling connected, as against £3 16s. in Aylesbury itself for private houses and shops.

From an analysis of the Aylesbury load curves it is estimated that the demand from private houses at the time of winter peak will be 140 W per house, giving a demand of 212 kWh for 1 570 consumers at the end of four years' complete working, and allowing 20% lost in distribution this gives 1 260 000 kWh purchased at 265 kW demand. Mr. Turnbull thinks there are few undertakers who could not generate the additional electricity at £3 per kW and 0·3d. per kWh, and the average cost to the undertaking is put at 0·436d. per kWh.

All the constructional work is designed to the recent rules and regulations of the Electricity Commissioners. The main 11 000 V three-phase transmission line, consisting of 7/12 S.W.G. 45-ton galvanised steel wire, will be placed on 11 in. poles 32 ft. long, 400 ft. apart; 11 000 V single-phase branch lines will be carried to small villages and farms, consisting of 7/14 S.W.G. galvanised steel wire placed on 9½ in. poles, 32 ft. long, 360 ft. apart, each pole being earthed instead of using an earth wire.

The cost of these lines is estimated at £240 7s. 7d. and £149 11s. per mile respectively. The low tension distribution will consist of four 0·1 sq. in. copper, three 0·06 sq. in. copper, and two 0·06 sq. in. copper, mounted on 7½ in., 6½ in. and 5½ in. poles spaced 150 ft. apart. The cost of these lines is estimated at £465 4s. 4d., £255 0s. 5d., and £196 18s. 9d. respectively per mile. Transformers complete with fuses and switchgear, erected and ready for working would cost:—10 kVA, £31 4s. 6d.; 25 kVA, £48 14s.; and 50 kVA, £80 13s. 6d. The following is the estimated capital cost:—

| | | |
|---|---|---|
| L.T. DISTRIBUTION. | | |
| 20 miles of 3-wire No. 2, at £255 .. .. | £5 100 | |
| 8 miles of 2-wire No. 2, at £197 .. .. | 1 575 | |
| 2 miles of 4-wire 3/0, at £465 .. .. .. | 930 | |
| | £7 605 | £7 605 |
| H.T. TRANSMISSION LINES. | | |
| 34 miles three-phase, at £240 .. .. .. | £8 173 | |
| 53 miles one-phase, at £149 .. .. .. | 7 926 | |
| | £16 099 | £16 099 |
| | | £23 704 |
| TRANSFORMERS. | | |
| 4–50 kVA, at £80 .. .. .. .. | £322 | |
| 20–25 kVA, at £48 .. .. .. .. | 974 | |
| 33–10 kVA, at £31 .. .. .. .. | 1 030 | |
| | | 2 327 |
| Add 4½ miles of two-wire 0·1 sq. in. l.t. from transformers to farms at £273 per mile .. | | 1 228 |
| SERVICES. | | |
| 1 517 at £3 each .. .. .. .. .. | 4 551 | |
| METERS. | | |
| 1 600 at 30s. each .. .. .. .. | 2 400 | |
| | | 6 951 |
| Clerk of Works, 2½ years £870, and additional management, £200 .. .. .. .. | | 1 070 |
| Total Capital Cost .. | | £35 280 |

The running expenditure is estimated as follows during the fourth year of working:—

| | |
|---|---|
| Repairs, maintenance and operation 1¼% of capital, doubled due to steel wire and sparse population .. .. .. | £870 |
| Canvasser and motor cycle .. .. .. .. .. | 250 |
| Rent, rates and taxes, 1⅛% of capital .. .. .. | 391 |
| Wayleaves—1s. each for 1 200 poles .. .. .. .. | 60 |
| Meter reading .. .. .. .. .. .. .. | 250 |
| Management (additional) .. .. .. .. .. | 500 |
| | £2 321 |

If the capital could be raised at 5% interest, and the interest and loan repayments held over for three years, this would involve an £8 15s. centum per annum charge on a 25 year loan, thus giving a capital charge of £3 088 per annum on the undertaking. With regard to the hire of apparatus, this is hired out at a low rate—namely, cooker with kettle for six persons, 6s. 9d. per quarter; for four persons, 5s. per quarter; "Protos" oven and kettle, 3s. per quarter, all fixing and wiring free. These charges do not cover the capital cost and repairs, therefore ⅛d. per kWh used on other uses is allocated to the hire and maintenance of apparatus—namely, 910 000 kWh at ⅛d. = £475, reducing the revenue from £9 810 to £9 335.

REVENUE REPORT.

| | |
|---|---|
| Cost of electricity .. .. .. .. .. .. | £2 365 |
| Running expenses .. .. .. .. .. .. | 2 321 |
| Total .. .. .. .. .. | £4 686 |
| Revenue .. .. .. .. .. .. .. .. | £9 335 |
| Gross profit .. .. .. .. .. .. .. | 4 649 |
| Sinking fund and interest .. .. .. .. .. | 3 080 |
| Nett profit .. .. .. .. | £1 569 |

Mr. Turnbull comes to the conclusion as the result of his inquiries that it is a profitable proposition to give every home in England and Wales a supply of electricity.

### The Discussion.

Mr. W. M. SELVEY recommended all who were interested to go down and see what had been done by Mr. Turnbull already in the Aylesbury area. He did not believe that the new scheme would fall short of what was anticipated.

Mr. BARTLEY said he presumed it was proposed to use galvanised steel wire for the overhead lines on the ground of low first cost, but there was to be considered the question of the scrap value of such lines, when this galvanised steel wire had to be taken down. He suggested that one of the aluminium alloy conductors should be considered in preference to galvanised steel, because, although these alloys were a little more expensive in first cost, their conductivity and strength was greater, and they had a good scrap value. Moreover, it had been found that such conductors could be used with poles at intervals of 250 ft., as against 150 ft. proposed by the author, thus reducing the total cost. There were various other items, such as reduced wayleave rentals owing to fewer poles per mile and, further, these aluminium alloy conductors were cheaper than copper, which was suggested for the low tension distribution. The objection had been raised that aluminium conductors corrode, but these alloy conductors had been submitted to many corrosion tests, for instance on certain islands off Germany where the conditions were very bad from the corrosion point of view, but they had stood up well for several years. Aluminium alloy cables were at present used in Switzerland and France under actual practical conditions, whilst the French telegraph authorities had signified a willingness to adopt such cables. Hence the use of aluminium-alloy was worthy of consideration.

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Mr. W. P. GAUVAIN, in a long written communication, said he had been responsible, in the Dominions, for works aggregating a capital cost of £1 000 000 of a similar nature to that now proposed by Mr. Turnbull, and he mentioned that the use of galvanised iron wire for such distribution work is not new. He himself had been aware of it in this connection for 16 years for 11 000 V distribution. In some cases its use was an advantage, but he regarded its use as indicative of a want of optimism concerning the possible development of such an area. It would be interesting to know the difference in the cost of copper for this work and its greater carrying capacity. Mr. Gauvain expressed doubts as to whether really efficient transformers can be provided for the figures in the estimates, and also criticised the scheme as regards a number of other details, having regard to the fact that the outstanding feature of rural electrification must be reliability.

Mr. F. H. CLOUGH expressed the view that there is a prospect of making a reasonable profit on the scheme outlined in the paper. He suggested that three-phase distribution should be considered seriously instead of single-phase, on account of the probable development of the motor load and the higher cost of the single-phase motor. The figure of revenue per head of population was a little under £2, and it was interesting to compare this with the £2 10s. given in the Electricity Commissioners' report on rural electrification as being necessary to show a reasonable return on capital for such schemes.

Mr. R. J. JOCELYN SWAN thought the low tension poles proposed were a little on the small side, and incidentally said he would like to know where such poles as those proposed could be obtained for the figure of 24s. each, as stated in the paper. He also agreed with the desirability of running three-phase distribution all over the area.

Major THEODORE RICH congratulated the author on the manner in which he had brought supply to villages and rural areas. The figures given in the paper were comparable with many in other countries. It was no use taking to a village a copper wire capable of carrying very much more current than would ever be demanded, and burdening the undertaking with the extra cost of that copper. Therefore, the use of galvanised steel wire was a wise step. Aluminium alloy cables to some extent piled up the loading on the poles from the point of view of the strain that had to be allowed for, and personally he believed there was a future in this class of work for copper clad steel or some of the copper alloys.

Mr. F. M. LONG did not think we would get very large consumptions in rural areas for cooking and heating, etc,. unless the price was kept near 1d. per kWh, whereas the author had put down 1½d. for this. He doubted whether the author would get his estimated consumption of 175 kWh per head of population per annum if he kept his price for current for " other purposes " at 1½d. As regards conductors he was putting up a line using copper-cored steel wire, which enabled the capacity of a line to be doubled at very little cost. It was a seven-strand cable, the centre strand being copper instead of steel, and enabled the capacity of a line to be doubled for £30 per mile.

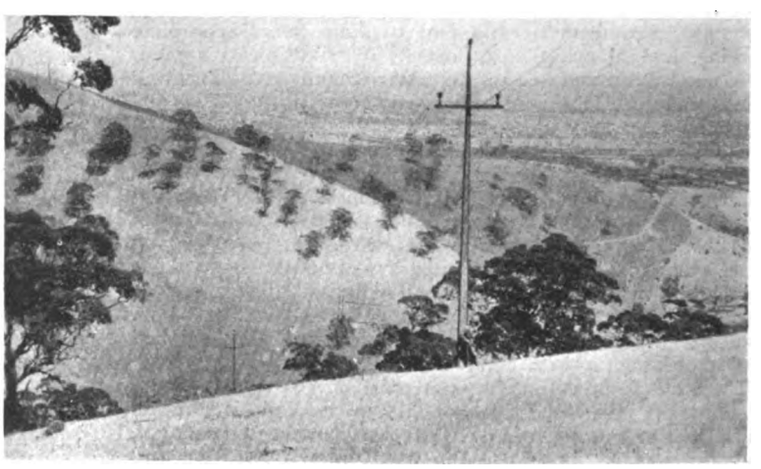
Mr. NAPIER PRENTICE regarded the figures in the paper as conservative except the load factor of 54%, which he thought was on the high side. Even with 33% load factor, however, the scheme would still be a good one.

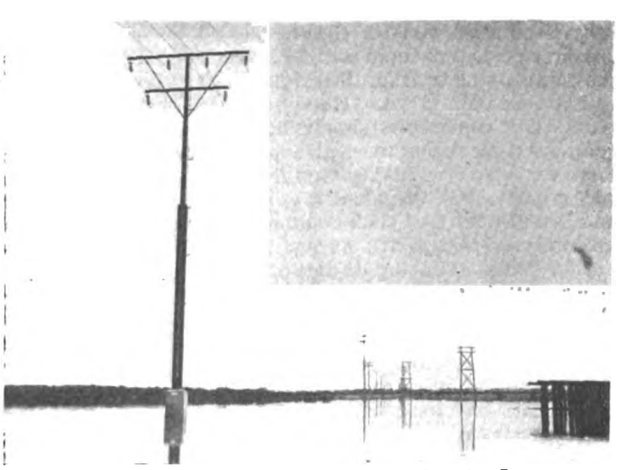
The PRESIDENT, whilst congratulating Mr. Turnbull on having prepared a business like scheme, did not agree with the policy of providing for a supply to every house in the area. This really was not feasible where the houses were miles apart, and, moreover, this policy led to complaints from the consumers in the towns that they were being made to pay higher charges to meet the cost of supplying the outlying areas. Gradual development was the best policy. He agreed to putting the high tension and low tension lines on the same poles, and had done this successfully for three years.

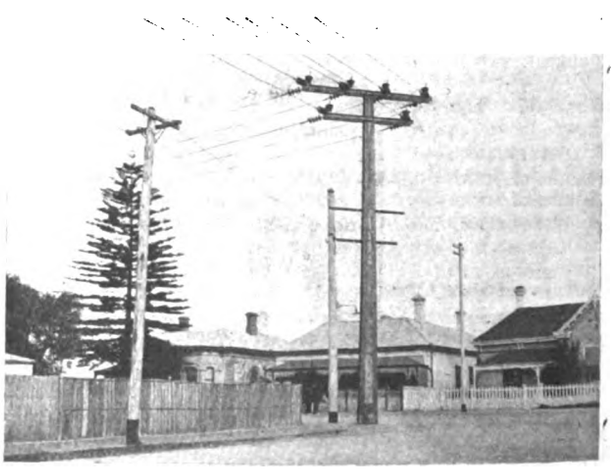
Mr. TURNBULL replied to many of the points raised in the discussion, and defended his scheme in view of the experience he has already had in other districts surrounding Aylesbury.

## *OVERHEAD LINE PRACTICE IN THE DOMINIONS.*

***AS so many illustrations have been published of overhead line practice in the United States of America and on the Continent, pictures showing the practices adopted in the British Dominions are of particular interest. This group of photographs is from Australia. To the right is seen a 36 ft. Stobie pole on a transmission line with 200 yd. spans.***







*ON the left are 80 ft. Stobie poles on the river crossing at Port Adelaide. There are six conductors, 0·1 sq. in. copper, spans of 330 yd., with conductor spacings of 8 ft. The poles are set in 5 ft. dia. concrete pipes set down into the mud-banks. To the right is a 50 ft. corner pole designed for a side loading of 25 000 lb. without guys. The line comprises six conductors, 0·15 sq. in. equivalent steel reinforced aluminium, and operates at 33 000 V.*

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# TENDENCIES IN INSTALLATION WORK.*

## Developing Hotplate Efficiencies—Modern Lighting Ideas—Openings in the Film Industry—Wiring Problems—Improving Design of Accessories.

By DONALD SMEATON MUNRO, M.I.E.E.

(*Concluded from page* 554).

COOKING and baking, whether required on the smallest domestic scale or for large hotel or institution, is most conveniently and certainly done electrically. The electric oven and the grill compete, even in mere running cost, with the older heat agents, and as the demand is forced for properly designed black bottomed but otherwise polished pots and pans, then the water boiling and simmering common to domestic cooking will improve in efficiency. The self-contained kettle or saucepan has an efficiency of about 75%, even when the metal elements are contained between heat insulators like mica or asbestos sheets. There is room for further invention to develop the efficiency of hot plates and the bases of small boiling appliances by the application of carborundum or other direct contact elements such as mixtures of metals and silicates. The best heat element will very probably be a product of the electric furnace.

Other forms of electrical heating applied to welding, cutting, shaping, etc., must develop further as our staple industries revive.

In medicines, electrically produced and induced heat is now in constant demand for external and internal curative and surgical work. Electricity may now be the accompaniment of living from the incubator even to the electric chair, and, beyond, to the incinerator.

A partial enumeration of the growing list of the applications of electricity to heating makes it evident that the installation engineer must constantly adapt his methods to ever changing conditions.

All the problems of illumination come within the purview of the installation engineer. Artificial lighting has gone far beyond its primitive purpose which was to enable the function of sight to be extended into hours and places when and where the Sun's or the Moon's rays were not operative. "Light" was the first demand on which it may be said our whole modern electrical industry was based, and installations of electric light are still a main support.

There is a steady tendency to increase illumination. Factories content with intensities of fractions of a foot-candle some 12 years ago are now closed, or are averaging nearer 30 ft.-candles. There does not appear to be a harmful limit so long as the direct source is concealed or the rays suitably dispersed. The improved effect on output by well lit factories has been noted everywhere. The brilliantly lit shop windows are always crowd-clustered, and the stores which disperse the lumens most lavishly seem to collect the greatest custom. The night aspect of cities has been altered—possibly for the better—by the stimulating habit of advertising by electricity. The floodlighting of exteriors of buildings is now an established feature of town and city life, and already it is having a cheerful influence on architectural materials and façades.

### Architectural Lighting.

A rising standard of illumination in the shops, hotels and public places inevitably induces increased domestic lighting. So there has arisen in the design of fittings and shades and their best disposition a considerable and living craft subject to constant change.

There is to-day a movement to embody fittings in the pillars, cornices, ceilings and walls of the structure, and all the new tints and forms of glass and other translucent materials are being pressed into the service of the installation engineer.

The modern application of cut and rippled glass panels, transparent floors and ceilings, and the use of coloured surfaces for reflected and refracted lighting, provide examples of electric light being employed to produce an effect in itself different from the primary purpose of illumination. The desire for distraction or entertainment by the play of light is well catered for by advertising signs, by carnival and dance hall effects, and in the modern electrically-equipped theatre it reaches great perfection. Stage lighting, with its banks of projectors embodying all the colours of the spectrum and controls for blending and dimming, is itself developing a distinct art for the purpose of affecting the emotions by light. The idea of a "light organ" to render colour effects analagous to music is very old—although there is no direct relation between sound and light waves—but is quite likely to materialise again as modern light sources and methods render the construction more practicable.

The German film "Metropolis" and the glass illumined statuary of the Parisian artist Lalique are good examples of electric light being used to express or influence moods or emotions and indicate electric lighting possibilities far beyond the utilitarian.

The film industry is itself an established feature of modern life, and the cinemas of Britain number many thousands, and are an important source of revenue to the electrical industry. The installation engineer who has now had nearly 20 years' experience of the varied plant requirements of cinemas has to-day further opportunities to fulfil the new demand of the studios. For these a single stand of three-phase arcs may cost about £400, and in our climate it must require many arcs to bring the actinic qualities up to anything approaching those of the Californian sun.

### Sports and Electricity.

Sport always had a hold on English people, and there is a new tendency, ever growing, to provide facilities for many of the older outdoor games to be played after dark. Football, tennis, curling and swimming, athletic meetings and tournaments all call for the attention of the installation engineer. Such novel sports as greyhound and dirt track racing owe their chief popularity to the spectacular effects of electricity, and, in the aggregate, sport must in the future be reckoned with as forming a substantial addition to the profitable lighting demand. To-day the approximate load for the average dog track is in the neighbourhood of 100 kW. Football has been played satisfactorily at night with a minimum illumination of 0·5 ft.-candle, rising to 2 ft.-candles in the neighbourhood of the goals. But here, as in indoor conditions, the inclination will be in the direction of greater illumination. Even now, for aviation fields, lamp units are being used, each taking 50 kW. The electric totalisator now being introduced to British racecourses will provide a "certainty" for the electrical industry.

All these varied outdoor applications, though some are trifling from the viewpoint of supply, have their special problems of distribution, and the electrical appliances associated with them offer further fields to the installation engineer for invention and improvement.

In all the industrial, commercial, domestic, rural and transport applications of electricity wiring plays a necessary and important part. The wiring section of the industry has the distinction of having, one may say, a continuous succession of I.E.E. committees since 1882, endeavouring to make rules for its guidance and control. It is interesting to note that forty years ago there was demand on the one hand for a cheaper system of wiring, and a protest on the other, that prices obtainable were hopelessly inadequate to provide the necessities of good wiring. These two voices have still a familiar ring. So-called "systems" of electric wiring continue to multiply, and most of these fail in some way to meet the requirements which experience has shown to be necessary for sound and lasting work.

To-day we are not only concerned with wiring of the new, but with the rewiring of the older installations. The fact that it is necessary to modify wiring details to suit new standard pressures is only one influence, modern illumination and increased outlet demand is another; but the chief cause urging the rewiring of valuable property is the fact that rubber insulation fitted over 20 years ago has perished. The difficulties and disturbances of removal caused by the nature of some of the older systems have directed more attention to the merits of a complete screwed steel draw-in and draw-out installation, and it is now fairly generally admitted such a method represents the best standard practice. At the same time lead alloy and compound insulation systems have their advantages for certain kinds of work, and the great majority of the many thousands of new small houses are so fitted. The lighter wires are favoured for most of the "free wiring"

* Extracts from the Inaugural Address to the Scottish Centre of the I.E.E.

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and " hire-purchase " schemes which are a prominent feature of our present economic—or uneconomic—system.

There is a constant inclination for the number and nature of wiring accessories to increase, and the introduction of bakelite and similar compounds has added to the variety.

The Home Office Regulations and the British Engineering Standards Association have helped greatly to improve the design of accessories. Much progress has been made in recent years in standardising installed sockets of the 2-pin type, but the annoyance and confusion formerly occasioned by the variety of 2-pin socket now tends to be continued by the too many types of 3-pin socket which have come into use during the last three years. It is unfortunate that the very recently standardised 5 A 3-pin socket is so large that it cannot be fitted within the boxes used for the displaced 2-pin pattern, and it is much too clumsy to become popular for portable lamps in houses. This petty point is illustrative of the multitudinous problems of details which go to make up wiring.

Architects still show a tendency to issue misleading or vague wiring specifications, but are slow to make suitable provision in their plans for the electrical installation. If one looks along the corridors and passages of some of the new buildings, as, say, in the case of a great modern hotel, one is often offended by the haphazard layout of armoured cables and pipes for lighting, heating, refrigerators, lifts, cookers, telephones, fire alarms, etc., and steam pipes, water pipes and ventilating ducts.

### " Tubular Architecture."

We do not demand a new school of tubular architecture, but only intelligent provision for such piping and appliances. Within recent years, supply enlargement and greater capacity of installations have increased the disruption effects on fuses, and H.O. fuse carriers are frequently blown to bits when a lamp cap " shorts." The increased use of relays and coil cut-outs in outer networks tends to be extended to indoor wiring installations even on the smallest circuits, and is sometimes applied in conjunction with fuses as providing finer adjustment for overload.

On larger installations it is usual now to adopt paper lead-covered and armoured cables for the mains and sub-mains and motor wiring and larger conduits with more bunched circuits in the distribution, the switch and fusegear being of the enclosed unit type with channel or tube interconnections. The cable makers are now encouraging the adoption of vulcanised cables for wiring without the familiar protecting layer of pure rubber. The effects of this change are still to be learned.

There are numerous points connected with present day development of wiring which might be touched on, which it would be tedious to enlarge on now, but there are still opportunities for invention in this wide field worthy of the mental equipment and faculties which rejoice to expend themselves on the greater problems of electrical engineering.

At the present time we are passing through a period in which the divisions of our industry are hampered by certain confusion of function, and the reasons are more political and financial than scientific. As an industry, it is our privilege to perform a great and necessary and extending service to our country; as engineers, we must aim at maximum efficiency, therefore, we must eliminate the internal wasteful friction induced by overlapping duties and cross purposes.

I share the opinion that the greatest good to the community shall come by the natural divisions of our industry being sharply defined, that each has a particular duty, and that each is entitled to the assurance that the support of the others is afforded to advance the common cause.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Overhead Electric Lines.

[To the Editor.]

Sir,—It is stated that the " H " and " A " poles are " condemned as unsound and uneconomical." This statement, made in the I.E.E. paper read by Mr. Woodhouse, is open to criticism equally as much as would be the statement that a compound two-pole is better than the ferro-concrete pole for equal life-strength and ultimate cost. Where the greatest life strength is required, in the writer's opinion the ferro-concrete pole should generally be installed in preference to the so-called compound pole recommended by Mr. Woodhouse. Its durability and exceptionally low maintenance costs and other advantages outweigh initial disadvantages which it might have. For most overhead electric line installations, the writer has no hesitation in recommending the " H " frame in particular, with greatly modified bracings and foundations, in preference to the compound pole recommended by Mr. Woodhouse.

The tests made in 1907 by Mr. C. Wade are very commendable, and are no less valuable than the pole and frame tests referred to in the paper by Mr. Woodhouse. If discussion can arise, the tests by Mr. Wade are more reliable because they refer to a fixed and stable condition, whereas the tests referred to by Mr. Woodhouse are for a foundation depth and soil that is known, yet unstable. Moreover, the latter tests do not represent the practice of an actual line, for the reason that where there is any likelihood of a line being subjected to anything near such a condition, there is not an engineer anywhere who would allow it.

If there is any thought of a line being blown over transversely, or pulled over longitudinally—not pulled over as shown, especially by the outer leg for the " H " frame—the ordinary groundman would see the danger and the lineman would stay the pole and line; allowing for a factor of safety, the engineer would not permit a condition such as represented by the tests as actual practice. Even on a long straight run he knows that stays would be placed at every so many spans, that the wires and the longitudinal stress tend to resist the transverse force, and so on.—I am etc.,

London, N.2. William T. Taylor.
November 20th.

### "Hot Spot Temperatures."

[To the Editor.]

Sir,—So far as Mr. Norris's opinion is concerned, it appears that the British Standard Specification might as well be thrown away. As the advice which I have been privileged to give on various occasions has not fulfilled his gloomy prognostications, he is wrong on the facts, but it has occurred to me that we may be talking at cross purposes.

Let me explain that the best practice in designing transformers is to afford the greatest facility for dissipation of the heat from (core and) windings to the oil as compared with the ensuing dissipation from the outer surface of the tank. This is ensured by, among other things, allowing ample unrestricted oil ducts ,and particularly by using a liberal section of copper. The resulting sturdiness enables not only the rated load to be carried with ease, but such diversity of load as is met with in actual operation to be safely withstood. As the Hackbridge designs are invariably of this nature, it explains why I took this for granted.

Transformers designed for the domestic load referred to by Mr. Norris, would, of course, be designed for the worst, i.e., highest, air temperature conditions, and one does not expect, nor did I suggest, that with a lower air temperature, the transformer should necessarily be loaded up to 90 deg. C. oil temperature, but distinctly stated that the B.S. rating was not intended as a basis of maximum loading. I have not yet met the mains engineer who uses his transformer as an oil immersed fuse. Further, even if such a transformer were installed in Spitzbergen in winter, excessive load would be prevented from damaging the transformer and other apparatus in circuit by the usual oil switch with overload trip coils, although such things seem below Mr. Norris's notice.

In other words, transformers should be designed for actual use, and not to scrape through the test requirements, with an indicator to show subsequently what mere percentage of their load they can carry under actual operation conditions. It is not kind to keep sub-station engineers awake o'nights wondering

Now it is possible, by contrast to the above methods, to achieve a certain economy in manufacture by (to take a rough example) putting what I should call a 500 kVA transformer into a larger tank, when it might even pass test, and be legitimately described as a 750 kVA transformer. The generation of heat in conductors increases as the square of the current density, and by thus increasing the density 1·5 times, the heat produced per lb. of copper will be 2·25 times as great. (On the other hand, a low core loss would be shown because of the smaller frame, but the advantage is dearly bought). In such a case, a winding temperature indicator, and even a hot spot indicator may well be advisable in actual operation.

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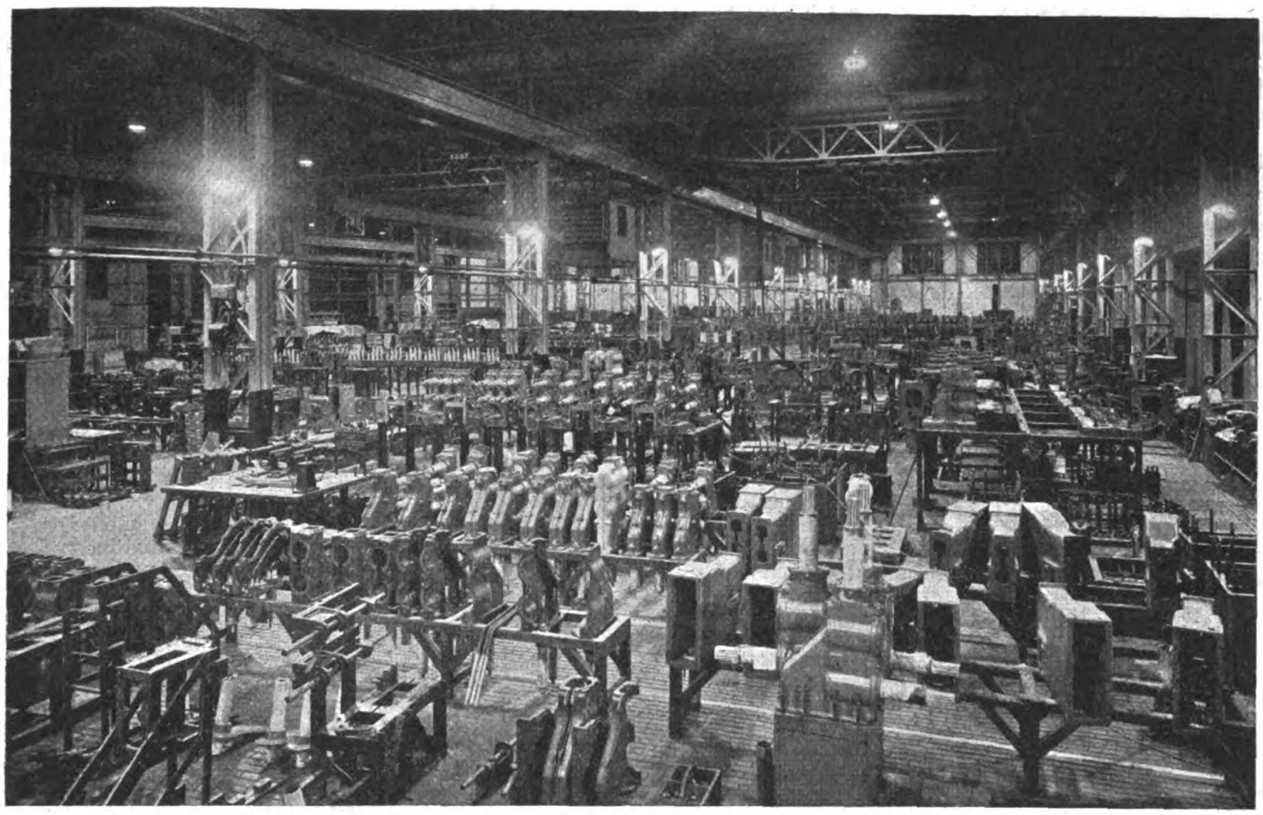

GOOD FACTORY LIGHTING.

*THIS reproduction of an untouched photograph of the Metropolitan-Vickers Co.'s new West Works is a very fine example of good factory lighting. The building, which measures 420 ft. by 220 ft., is provided with ten electric cranes, Mather and Platt fire sprinklers and Plenum air heating and ventilation. It is equipped for the assembly and testing of the largest switchgear units of both metal-clad and outdoor types. The company's present programme includes the development of switchgear up to 230 000 V, and units up to 2 000 000 kVA breaking capacity. A 500 000 V transformer equipment is* ***installed.***

It may be that I have regretfully misunderstood Mr. Norris's viewpoint, for his statement would be agreed to by me for such an example. In extenuation, I would explain that I am accustomed to greater liberality in design than is, perhaps, strictly necessary, and my opinion is that merely "good" thermal design is not enough; one must take a broader view.

Mr. Norris's zeal has outrun his discretion when he states that an indicator is called for on every 132 kV transformer ordered by the Central Board, for it is perfectly obvious that, were these instruments fitted in accordance with his theories, they would also be fitted to the Board's 33 kV transformers, which are subject to the same conditions of loading. As the Hackbridge Company has been awarded an order for the 33 kV transformers, I am in a position to say that such indicators are not specified on them. The reason, I imagine, that they are wisely specified on the former is that British experience on the more heavily insulated windings has of necessity not been copious, and so it is desired to ascertain actual data on them. Moreover, what the Board require to be measured is, in their words, "the highest temperature within the winding," precisely the expression which I have used in contradistinction to hot spots, which the eminent engineers in charge of the Scheme surely do not anticipate.

The best method of ensuring ability to carry load is to rely on existing real experience, as in the case of the 33 kV transformers above, which is amply sufficient; moreover, since simple designing ability may be assumed to be on a parity in first class firms, the comparative weight of active material used in construction affords a valuable indication. Although I would not suggest hampering a designer by specifying a maximum value of current density to be employed, a knowledge of the section of copper which various tenderers propose for their own products will give an approximate indication of their comparative loading capabilities, and will be better than any temperature indicator, since the value shown will be embodied in the active material, and thus be intrinsic.

I fear, Sir, that a considerable digression has been necessary, in view of the matters raised by Mr. Norris, which although irrelevant, must be dealt with to avoid misconception, so I will now return to the point, viz., "hot spots."

It will be recalled that the advertisement to which he objects stated that the advertisers' transformers were designed and constructed without "hot spots." Logically, Mr. Norris's objection must have been due to one of two causes: (*a*) he ascribes an incorrect meaning to the common expression "hot spots," in which case his letter should be withdrawn, or (*b*) he considers that transformers should be made with "hot spots."

Now the words "hot spots" have been used for at least eighteen years, to my certain knowledge, to describe abnormal and harmful localised heating in electrical windings, and they have occurred in numberless purchasers' specifications. If Mr. Norris uses the expression now to mean something entirely different, he has only himself to thank for any confusion resulting. The advertisement and my letter referred only to "hot spots," and I refuse to be drawn into a discussion on any other kind of spot. My final word on the subject is this: Mr. Norris says that certain conditions of loading may be dangerous to a British Standard rated transformer. I go further, and emphatically state that unless a transformer is designed and made without hot spots, for all practical purposes, it is dangerous under any condition of loading, and at any oil temperature. Hence the anti-hot spot advertisement.—I am, etc.,

Chase End
Ashley Road,
Walton-on-Thames.
November 27th.

WILLIAM C. KENNETT.

[Owing to pressure on space, other letters are unavoidably held over.—ED.]

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# NEWS IN BRIEF.

## Electric Pumps' Satisfactory Performance—Overhead Lines Association—Automatic Telephone Exchange at Hull—Presentations to Institution of Electrical Engineers—Extension of Electric Traffic Control in Edinburgh.

CHEADLE and Gatley U.D.C. requires a mains assistant in its electricity department.

An electric light installation has been provided at Bishopsteignton Wesleyan Church at a cost of £60.

It was announced last week that there were 603 760 telephones in use in the London area, an increase of 46 300 for the year.

Equipment for artificial production of ultra-viqlet rays has been installed at Edinburgh Corporation's Portobello Baths. The equipment includes two open arc lamps, and a mercury vapour lamp.

The Newbury telephone area was one of the worst hit by the recent gales. It is reported that 2 030 wires were brought down, ten poles were smashed, and 400 subscribers and 50 junctions circuits were affected.

Automatic electric pumps laid down in connection with Pontefract's Townville sewerage scheme, specified as capable of lifting 300 gallons of unscreened sewage per minute, against a head of 114 ft., have shown an actual capacity of over 400 galls. per min.

It is stated that the provision of an automatic telephone exchange at Sunderland and its linking up with exchanges in adjacent districts will be completed in about two years and will cost about £290 000. The contract has been placed for the erection of the main exchange, in St. Thomas Street, Sunderland.

The next meeting of the Overhead Lines Association will be held on December 19th, at 5.30 p.m., at the Institution of Electrical Engineers, when Mr. C. W. Marshall will give an address entitled "Insulators." Other meetings will be held at the same hour and place on January 16th, February 20th, March 20th, April 24th, and May 8th.

At a recent general meeting of the South Wales and Monmouthshire Branch of the National Association of Colliery Managers and the Western District of the Association of Mining Electrical Engineers, Mr. J. A. B. Horsley, H.M. Electrical Inspector of Mines, read a paper on "Cable Lay-out at Collieries." The author made special reference to the smaller colliery installations.

In a recent address to the Canadian Club, Montreal, Mr. H. G. Williams, Parliamentary Secretary of the British Board of Trade, refuted the belief that Britain has passed her prime. He said in the export of electrical machinery Great Britain, which before the war occupied the third place, with the United States and Germany first, now led both those countries. Statistics showed that 45 per cent. of the population worked for a living in Great Britain compared with 36 per cent. in Canada.

The Electricity Commissioners have approved of the construction and pattern of the meter known as the Ferranti single-phase watthour meter, type "F.D.c," rated sizes 5 and 10 A, 200 to 240 V inclusive, at 50 cycles, for the measurement of electrical energy when supplied on the constant pressure single-phase a.c. system, provided that the meter be constructed as described in specification and drawings deposited at the National Physical Laboratory dated and numbered September 20th, 1928, and No. 122, and in accordance with pattern meter No. 3 053 482.

At King's College, London, recently, Prof. Ernest Wilson delivered a centenary lecture on "The Indebtedness of Industry to Pure Science." After referring to the increase of 41 per cent. in the amount of electricity produced per ton of fuel consumed, which had taken place between 1920–21 and 1925–26, he referred to dielectrics and insulation, breakdowns of which necessitated the spending of about £1 000 000 a year for repairs. A continuation of the research work of the British Electrical and Allied Industries Research Association, might, he said, enable them to cut out a quarter of this.

The Leeds Electrical Club held, on November 9th, a very successful gathering at their headquarters. The first part of the proceedings was a "Hot-pot" supper, when about one hundred members and friends were present. After supper the company enjoyed a smoking concert, the artistes being Mr. Fred Musson's Concert Party. During the evening, in the course of a short speech, Mr. Douglas Green, chairman, announced that the membership had reached 150, and was representative of every branch of the electrical industy. A dance has been arranged for December 7th, at headquart rs.

Pangbourne Sewerage Works are to instal electricity for power purposes.

The Maidenhead Board of Guardians children's home is to be fitted for electric lighting.

Four charge engineers are required at the Singapore Municipal Commissioners' new power station.

London County Council has accepted a tender, amounting to £6 440, for the construction of a switchgear house at Greenwich power station.

Hull Corporation has placed a contract, amounting to £1 360, for alterations and additions to the old chapel in Fish Street for conversion into an automatic telephone exchange.

A Faraday lecture on "How Electricity Does Things," will be given by Mr. L. B. Atkinson before the North Western Centre of the I.E.E. on December 14th, at 7.30 p.m., at the College of Technology, Manchester.

At the annual prize giving of the 56th (1st London) Divisional Signals (T.A.) at the Bridge House Restaurant, on November 23rd, Col. Fox appealed for recruits with a knowledge of electrical, cable and wireless subjects.

It is announced that the Shawinigan Water and Power Co. has just brought into operation in its power house No. 2 at Shawinigan Falls an additional 33 750 kW generator. A further unit of the same size is to be completed early next year.

The intermediate and final examinations prescribed by the Board of Trade under the Register of Patent Agents Rules 1920 and 1926 will be held by the Chartered Institute of Patent Agents at Staple Inn Buildings, London, W.C.1, in April next.

The North Western Students' Section of the I.E.E. will visit the East Union automatic rotary converter sub-station of Stretford U.D.C. on December 8th. Mr. W. Kelly will read a paper entitled "The Commercial Testing of Large Induction Motors, etc.," on December 4th, at the Engineers' Club. Mr. L. H. A. Carr will preside.

At the ordinary meeting of the Institution of Electrical Engineers to be held at 6 p.m. on December 6th, Sir George Sutton will present to the Institution an oil painting of Wheatstone by Sir William Llewellyn. At the same meeting there will be presented to the Institution by Mr. R. W. Paul an oil portrait of Volta painted by Signor G. Palanti.

The Director-General of the Swedish Administration of State Canals and Water Powers states that no extended exploitation of Swedish waterfalls by the construction of new hydro-electric power stations is planned for next year. Farmers are using electric power to an increasing extent. The efforts of the Department in the immediate future will be concentrated upon the consolidation of the existing water power developments and the increase of their efficiency.

The L.C.C. Education Committee reports that, as an experiment, the installation of a special system of electric lighting known as "Restlight" was authorised at certain rooms at the London School of Printing, Lambeth. The results have proved satisfactory, and, in view of the special nature of the instruction given at this school, involving the use of a large amount of machinery with moving reflecting surfaces, the Committee proposes to instal the system throughout the remainder of the school at a cost of £240.

In his recent Budget speech to the Federal Council of the Federated Malay States, Mr. W. Peel, the Chief Secretary, forecast the early introduction of carrier telephony. He said an order had been placed with the Crown Agents for two complete sets of carrier telephone apparatus, one each for Kuala Lumpur and Ipoh. On the success of this section would depend whether two further sections would be started next year. The Standard Telephone and Cables, Ltd., had been requested to send out an engineer to instal the apparatus.

Automatic electric traffic control equipment is to be installed at 16 additional street junctions in Edinburgh. The experimental apparatus in use at the junction of Broughton Street and Picardy Place has given satisfaction. The Chief Constable reports that there have been no accidents at that point since the system was adopted two months ago. It is hoped that, apart from capital expenditure, a saving of about £4,000 per annum will, in course of time, be effected at the 17 points referred to, as a result of the removal of constables therefrom.

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# PERSONAL.

MR. H. K. Beale has been appointed Chairman of Birmingham Electricity Committee.

Lord Queenborough has accepted the chairmanship of the board of Siemens Bros. and Co.

Ald. C. W. Beardsley has been appointed Chairman of Sheffield Tramways Committee.

Ald. A. G. Ellaway has been appointed Chairman of Birmingham Tramways Committee.

Grays Urban Council has appointed Mr. A. S. Hoppell, as assistant engineer at the electricity works.

For the 27th year, Ald. Sir Harry Hatt was on November 21st elected chairman of Bath Electricity Committee.

Mr. Philip E. Clarke, has been appointed manager and engineer of Newry Urban Council's electricity scheme.

Mr. R. J. Wilder, of Messrs. R. J. and H. Wilder, electrical engineers, of Wallingford, Berks, has been sworn in as a Justice of the Peace.

Mr. F. Atkinson, generation and sales engineer to Burnley Electricity Department, has been appointed assistant in the consumers' department of Birmingham Electric Supply Department.

Stepney (London) B.C. is recommended by the Selection Committee to appoint Ald. Henry Lazarus as its nominee to hold office as one of the members to serve on the London and Home Counties Joint Electricity Authority.

Mr. C. H. Woodward, borough electrical engineer, has been appointed public lighting superintendent by the Bournemouth Corporation in succession to the late Mr. N. Wright. Mr. Woodward will retain his electrical appointment.

The following appointments in connection with the Potteries Electric Traction Co., Ltd., have been made: Mr. O. C. Power, to be managing director; Mr. W. Thom, to be a director, having resigned the position of general manager; Mr. H. Kingsbury, becomes a director and secretary; Mr. J. Lindsay Wood is appointed traffic manager, and Mr. A. C. Dimmack, engineer.

Fulham (London) B.C. is recommended to appoint Coun. D. S. Van den Bergh, chairman of the Electricity and Lighting Committee, as one of the Council's representatives on the Conference of Local Authorities owning electricity undertakings in Greater London, in succession to Major A. Baggs, who has ceased to be a member of the Council. It is also recommended that Ald. A. Cook be appointed as the Council's representative to attend a meeting of representatives of the constituent authorities of the District Joint Board of Employers, and members of staff, Electricity Supply Industry Area No. 10, Greater London, on December 7th, with a view to his nomination and election as a member of the Board.

## Obituary.

MR. R. M. FITCH, on November 27th, at Sydney. He was secretary to Sir Hugo Hirst, with whom he left England in August.

MR. ARTHUR HIDER, aged 24 years. He was in charge of the refrigerating and other electrical plant of the African Electrical Trust at Accra.

MR. ARCHIBALD R. DAYSON, on November 19th, aged 57 years, general manager and engineer of the Sunderland Corporation Tramways. Mr. Dayson, who had not been in good health for some time, served his apprenticeship with Ferranti, Ltd., and was tramways engineer at Plymouth before being appointed assistant manager and engineer at Sunderland in 1903. A year later he was appointed to the position of general manager. At the time of the funeral on November 22nd the Corporation tramcars were all stopped for a period of one minute.

### REDUCTION OF CHARGES.

The following reduced charges for electricity have recently come into operation: *Grays:* alternative tariff to private houses, for lighting, heating, cooking, etc. 10 per cent. of rateable value, plus 1¼d. per kWh. *Crewe:* lighting 4d., instead of 4½d., less 2½ per cent. for prompt payment, *Sutton Coldfield T.C.:* where electricity is used for lighting and heating or cooking, fixed charge based on rateable value (payable in each quarter), 15 or 12½ per cent. plus 1¼d. per kWh in winter quarters, and 1d. per kWh in summer; lighting, under 750 kWh per quarter, 5½d. per kWh, 751 to 2 000 kWh, 5¼d.; over 2 000 kWh, 4d.

# FACTORY LIGHTING.

## Progress of the E.D.A. Campaign—Over 2 000 Inquiries Received.

THE Factory and Workshop Lighting Campaign is making continued progress, and the E.D.A. reports that sixty lecture-demonstrations have so far been given to industrial consumers, factory owners and works managers in all parts of the country. Though a total of 115 lecture-demonstrations has been arranged, others will later be added to the list. Details of these will be published shortly. The total number of inquiries received in response to the campaign propaganda was, up to the end of last week, 2 240. Arrangements have been made for all inquiries to be followed up, and the Association is daily receiving evidence of considerable business arising out of the campaign. During December no fewer than seven lectures on factory lighting will be delivered throughout the country; the places at which these will be given, and their dates, are as follows:—London, December 3rd; Tamworth, December 5th; Birmingham and Darlington, December 6th; Paisley, December 12th; and Bolton, December 17th. On January 21st a lecture will be given at Cambridge.

The lecture-demonstration to be held in London on December 3rd, will take place in the E.L.M.A. Lighting Service Bureau. Invitations have been issued to the owners of factories and workshops, and to shop stewards and firemen in the boroughs and areas of Beckenham, Bermondsey, East Ham, Hackney, Hampstead, Hendon, Islington, Poplar, St. Pancras, Shoreditch, Stepney, Walthamstow, West Ham, Westminster and Willesden, which are co-operating. Arrangements have been made for a second and concurrent lecture to be given by Mr. W. J. Jones.

### Visit to New Works.

In spite of the inclement weather over 350 people attended the demonstration at the new switchgear works of the Metropolitan-Vickers Electrical Co., at Trafford Park, on November 22nd. The visitors were entertained in the Staff Canteen by the company, when Mr. J. S. Peck, one of the directors, extended a welcome to them. The party then proceeded to the new switchgear works when Mr. R. C. Hawkins, the E.D.A. officer for the North Western Area, gave a lecture dealing with the economics of modern factory lighting.

At the conclusion of the lecture Mr. L. Romero, the Chairman of the Manchester and District E.D.A. Electric Circle, under whose auspices the lecture was arranged, proposed a vote of thanks to the Metropolitan-Vickers Co.

The lecture was actually held in one bay of the new works which has recently been completed (see page 619). The installation consists of 30, 1 000 W lamps in concentrating reflectors, mounted 40 ft. from the floor and 92, 500 W lamps in angle reflectors, mounted 16 ft. from the floor. The average intensity in the works is about 9 foot-candles.

On Thursday, the Midland Council of the National Union of Manufacturers organised a meeting at Birmingham, and Mr. J. L. H. Cooper delivered an address. It is interesting to note that in their invitation card the members of the council of the Union pointed out that they "have been considering the effect of the lighting in factories upon industrial fatigue, accidents, and production, and are convinced that by good lighting the manufacturer and his employees have much to gain."

### THE SOCIAL SIDE.

The staff of the Mullard Radio Valve Co., Ltd., attended their first dance of the season on Monday, at the Royal Horticultural Hall, London. A photograph of some of the staff and their friends is given on page 628.

A very successful performance of Oscar Wilde's comedy "The Importance of Being Earnest," was given by the Magnet Operatic and Dramatic Society, of the Witton Works, at the Club House, Erdington, Birmingham, recently.

On December 7th, the staff of Dyson and Co., Ltd., electrical factors, Bradford, will hold a dance at Sherwood House, Bradford, and the number of tickets already sold augurs well for the success of this function. Mr. Harry Moss will act as M.C. at the proceedings.

The employees of L. McMichael, Ltd., radio manufacturers, of Slough, held another fancy dress dance in the Rotunda Ballroom, Slough, a feature of which was beauty competitions for both ladies and gentlemen. Mr. and Mrs. McMichael were among those present, the latter being responsible for distributing the prizes.

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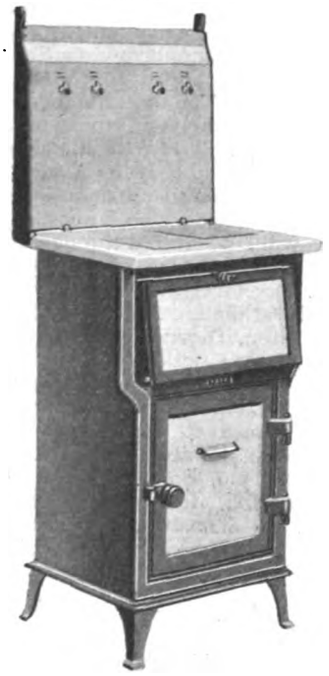
# SELLING LINES.

ATTRACTIVE lines of hand-painted shaped squares are being manufactured by ELECTRIC ART SHADES (1928), LTD., Witham, Essex. This type of shade represents a change from the standard design, and is particularly suitable for the Christmas trade.



One of the new "Manor" cookers.

The MANOR ELECTRIC OVEN AND FIRE CO., of 303, High Road, Chiswick, W.4, has introduced a special cooker model which has been designed for hire purposes. The door, front frame and the drop door to the grill are constructed of fine cast iron, the doors being fitted with white, vitreously enamelled panels. The body of the cooker is made of mild steel, the outer walls being of 16 gauge and inner walls of 18 gauge. The space between the inner and outer walls is lagged with slag wool, and a white, vitreously enamelled crown plate is fitted in the plate heating space. All steel parts are treated with rust-preventive compound, the exterior is finished in stove black enamel, and the oven is fitted with blue planished steel removable interiors with rounded corners. The hob is of ⅛ in. steel plate, vitreously enamelled fine mottled grey. Four models are offered in two slightly different sizes. The remaining cookers in the Manor range are finished in porcelain glazed tiling, and these are available in a number of sizes, including models fitted with 2 kW combined grill and boiling plates 7 in. square, one 1 kW boiling plate 4½ in. square, with an oven loading of 1 600 W; a similarly loaded cooker with combined grill and boiling plate of the same size, with a 2 kW boiling plate 7 in. square and with the same oven loading. Another model is fitted with one 2 kW combination griller and boiling plate 7 in. square, a 2 kW boiling plate also 7 in. square, one 1 kW plate 4½ in. square, with an oven loading of 2 000 W. Models with two 1 kW 4½ in. square boiling plates with similar combination grill and boiling plates are also made. Table cookery sets with oven loadings of 1 600–2 000 W are offered, the 2 kW combination of a 7 in. square grill and boiling plate being common to all. Electric fires, water and table heaters, breakfast cookers, etc., are also included in the Manor range.

The ST. ALBANS MOULDING CO., LTD. has sent us a specimen of the "K" threadless bakelite C/Q, S/S holder. This unit is made in two pieces, one containing the spring grip terminals and cord grip hooks, and the other serving as a cover. This latter is cut to accommodate the pins of the holder itself, and the fitting of the lamp takes up all looseness. The inside of the cover is grooved to prevent the interior portion from turning, while on the outside is fitted a rubber ring for carrying a shade. The holder is extremely simple to wire, and by virtue of the fact that the two pieces fit one into the other without lock-nuts or other threaded device, the holder is quickly assembled. The same company also manufactures a batten holder on the same principle, the latter however being a one-piece unit. Threadless 2-plate ceiling roses, and threadless 2 and 3-pin wall sockets, etc., are, we understand, in course of manufacture.

We have received from A. H. HUNT, LTD., two samples of a new line of "Midget" fixed mica condensers which have recently been added to the range of Polymet products. The size of the components is 1¼ in. by ⅝ in., including tags, and the capacities available are from 0·0001 to 0·002 μF. Each condenser is guaranteed with a tolerance of 15% plus or minus its rated value, while it is claimed that each has passed a 1 000 V breakdown test. The components are enclosed in moulded bakelite and sell at a low figure. The two condensers sent to us are of 0·0003 and 0·001 μF., and on test gave every satisfaction. Their small dimensions and rigid tags are of advantage in present congested designs for radio receivers, though we would like to see some other means of securing these components than by the tags, either by soldering them in circuit, or passing screws through the tags themselves.

The "M.6" multiple toaster by ELECTRICAL UTILITIES, LTD., is a neat and attractive appliance by means of which a number of slices of bread can be toasted rapidly at the same time. The toaster contains six heating elements, suitable for rapidly toasting on both sides and at the same time five slices of bread. Although the M.6 is capable as mentioned of toasting five slices at the same time, it is not, however, necessary to employ all the elements if fewer slices are wanted. The appliance is provided with three switches, each switch controlling two elements, and by turning these on or off, the number of elements in use is increased or reduced accordingly. The end reflector plates are movable and can be adjusted to ensure the maximum efficiency from the portion in use. The heating elements consist of mica lined spirals, of iron-free nickel-chrome wire, rigidly secured in porcelain strips, which are supported in polished aluminium. The base encloses all the wiring, thus hiding it from view. The device is made for all standard voltages, its consumption is 2½ kWh and the overall dimensions are 14 by 11¼ by 8½ in. The weight is 12 lb.

We have received from METRO-VICK SUPPLIES, LTD., (sale concessionaires) a sample of the "Climax" house service box. This component has a capacity of 30/60 A at 250 V and has no cast iron or porcelain incorporated in its construction, the box being made of insulating material. It is claimed that no earthing is required, while the enclosed fire-proof fuses will clear a dead short-circuit without limiting resistance at double the rated voltage. The working current is given as 30 A, the fusing current 60 A, and short-circuit current 3 000 A. The construction of the unit is such that there is plenty of space in the box and sealing chamber for the dividing and sealing of the supply cable, while the risk of damage to the cable insulation is very considerably reduced in that the cable need not be bent at sharp angles when connecting up. The box occupies a comparatively small space, while the contacts and terminals are of heavy section. It is pointed out by the makers that the fuse supplied is one of the chief features, and tests made at the test house of one of the large corporations on 500 V circuit without any limiting resistance and on "dead short" conditions resulted in the fuse clearing without damage to fuse ends, tube or contacts. The fuse can be rewired on site. See page 625.

One of the floor polishing units of Finnell System, Ltd.

FINNELL SYSTEM, LTD., of 114–116, Southampton Row, W.C.1, has on the market an electically operated scrubber, waxer and polisher. The model illustrated has a brush ring diameter of 18 in., it is fitted with five brushes and has a speed of 230 r.p.m. The motor fitted is a ½ H.P. International G.E.C. waste packed, and the drive is a worm gear ball-bearing throughout. The water is hand controlled, and there is a tank capacity of three gallons. The feed is inside the brush ring. The cable is No. 16 gauge, rubber covered, and the wheels are 8 in. diameter double disc, fitted with Tinken bearings and Clincher rubber tyres.

One of the latest fires of CARRON COMPANY is the "Clyde," illustrated on page 635. This type falls within the Carreflex series and incorporates a patented reflector and plug-in element. The fire has a total loading of 2 250 W, and is available in five different finishes. Its capacity as a heater is such that the makers' recommend it for an apartment approximately 18 ft. by 14 ft. The dimensions of the fire are 15¼ in. wide, 6¾ in. deep and 20 in. high. Chromium plated reflectors loaded to 3kW are also available.

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# IN PARLIAMENT.

## Discussion on Motion for Second Reading of Imperial Telegraphs Bill.

THIS Bill, which authorises the sale of the Government's submarine cables to the Communications Company, which is to be formed in connection with the cables and wireless merger scheme (see Report of Imperial and Wireless Conference in THE ELECTRICIAN of August 3rd, 1928) came before the House of Commons on Wednesday of last week, when Mr. A. M. Samuel, Financial Secretary of the Treasury, moved its second reading. Mr. Samuel said the Pacific Cable was to be sold on the basis that the Communications Company took over the loan debt and paid a lump sum in cash or capital of £577 000, which was divisible between the partner Governments. The Dominions were interested to the extent of 13-18ths and the home Government of 5-18ths. The West India Cable was owned by Great Britain, Canada, and some of the West Indian Islands. The partner Governments had suffered losses every year since it started. There was a debt still outstanding on the original capital of £379 000. That cable would be sold for £300 000. The remaining property was known as the Imperial Cable, consisting of two cables across the Atlantic operated by the Post Office, one of them an ex-German cable. These had made a small profit of about £6 000 a year, but in the last completed year there was a profit of only £1 300. These cables would be sold for £450 000. Thus, if they took the partner Governments together they would be relieved of a debt of £1 233 000, and would receive in cash £1 267 000. Apart from that they received an annual payment in respect of the beam of £250 000 and £60 000 besides. The cables might be a better earning asset if put into the hands of a large cable and wireless combination.

Mr. Ramsay MacDonald moved the rejection of the Bill, on the ground that it sacrificed public utility to private gain by disposing of valuable State undertakings to private interests, and that the introduction by the Government of such a measure in the last days of a dying Parliament violated sound constitutional practice.

Capt. Wedgwood Benn asked permission to move the adjournment of the debate until the House had the full terms of the contract before it. The motion was defeated by 219 votes to 113.

The Secretary for Scotland, Sir John Gilmour, replying for the Government, said there would be British control of all the companies, and the Governments would have power to assume control of cable and wireless, either in war or in a national crisis. There would be certain safeguards for the fighting services. It could not be said of the Government or any of the other Governments concerned that they had sold public interests too cheaply or had not made adequate safeguards for the community.

Mr. MacDonald's amendment was rejected by 258 votes to 134, and the second reading was agreed to.

### Replies to Questions in House of Commons.

The following are points from answers to questions in the House of Commons :—

The Minister of Transport is aware that a considerable proportion of railway carriages are still lit by gas. The Board of Trade and the Ministry of Transport have taken the view that the use of electricity for this purpose is desirable in the case of all new and reconstructed passenger stock, and the companies as a rule have in recent years ceased to fit ordinary passenger carriages with gas lighting equipment, but the risks arising from the use of gas have not been held to warrant its absolute prohibition as an illuminant in railway carriages.

The Postmaster-General knows of no system which is at present capable of transmitting moving pictures of actual events for satisfactory reception by wireless listeners. He has not refused permission for the use of the British Broadcasting corporation's stations for television tests. The Governors of the corporation decided after a demonstration by the Baird Company who hold an experimental licence, that the system did not at present fulfil the conditions which would justify a public trial through one of their stations. The Postmaster-General has recently received an application from the Baird Company for further facilities. This application is at present under consideration, and he is not yet in a position to say anything further.

Mr. D. H. Hacking, Parliamentary Secretary of the Department of Overseas Trade, replying to a question as to the duties payable on motor vehicles imported into Australia, stated that duties at variable rates are payable on the various parts and accessories. In a table of such duties, printed in "Parliamentary Debates," the following are included: Battery (*a*, under British preferential tariff), 40% ad val.; (*b*, under general tariff), 60%; headlights (*a*), 2s. each or 25%; (*b*) 3s. each or 40%; other lamps (*a*), 25%, (*b*) 35%; electric generators up to 75 kW, when for lighting only, (*a*) 45% (*b*) 60%.

For its most recent order the Post Office received only two tenders of British timber suitable for use as telegraph or telephone poles. Both tenders were accepted; but together they covered only 5% of the quantity required.

There are seven wireless beacons in operation on or around the coasts of Great Britain and the Irish Free State, and seven are in course of erection. In addition, the erection of wireless beacons at Tory Island and Mizen Head has been sanctioned.

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In the House of Lords on November 8th, the Earl of Plymouth said the gas supply industry was in a state of high efficiency, and he saw no reason for the suggestion that gas was to be replaced by electricity. In face of the competition of electricity the gas industry had at the same time expanded to a very considerable extent. One industry acted as a spur and incentive to the other.

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The Ulster House of Commons on November 8th approved the Special Order made by the Electricity Commissioners for Northern Ireland and confirmed by the Ministry of Commerce, in respect of the urban district of Holywood and parts of the rural district of Castlereagh.

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# LEGAL INTELLLIGENCE.

## Edison Accumulators, Ltd., and Reduction of Capital Confirmation.

IN the Chancery Division on Monday, Mr. Justice Eve had before him a petition of Edison Accumulators, Ltd., for confirmation of a reduction of capital of the company from £250 000 to £27 927. Mr. Bischoff appeared for the company.

His lordship said this seemed to be a case where there was a bad loss.

Mr. Bischoff assented. The company's capital, he said, consisted of 225 000 £1 preference shares, and 500 000 1s. ordinary shares, making £25 000. The reduction would wipe out all the ordinary shares and reduce the preference to 2s. shares. It was then proposed that the reduced 2s. shares should be consolidated again into £1 shares and become a single class of ordinary shares. Some preference shares were to be forfeited. The lost capital, amounting to £222 073, was proved by the managing director, and it appeared, from his affidavit, that no value was to be attached to the goodwill and licences which had been previously put at £20 000. Then there was a debit of £183 732 on profit and loss account. The shares held in a subsidiary company called Electric Cars, Limited, were written down as valueless, and among the assets in the last balance sheet was an item of £29 000, which included plant and machinery, tools and stock taken from Electric Cars, Limited, in part satisfaction of money due from that company to this company in the hope that the latter might be able to sell the same. It had been found impossible, however, to effect a sale, and as keeping the stock and plant, etc., involved a heavy expense, they had all been returned to the Electric Cars Company, so that there was a further reduction of £18 000. His lordship confirmed the reduction.

In the Chancery Division on Monday, Mr. Justice Eve confirmed the reduction of capital of the British Arc Welding Company (Bristol Channel) Ltd., from £20 000 to £10 000.

Mr. Buckmaster, for the company, said it was proposed to write off £4 600 from the issued capital, and at the same time reduce the unissued capital.

His lordship: That is 10s. on each share.

Counsel agreed, and said there were only 9 000 shares issued.

### British Thomson-Houston Patents.

Mr. Justice Maugham, in the Chancery Division, on November 20th, gave judgment for the British Thomson-Houston Co., Ltd., in the case of the company against Antrobus. Mr. Trevor Watson, for the company, said he moved for judgment in default of defence. The action had reference to the company's patents for electrical lamps which had been held valid by the House of Lords.

His Lordship granted a perpetual injunction against infringement.



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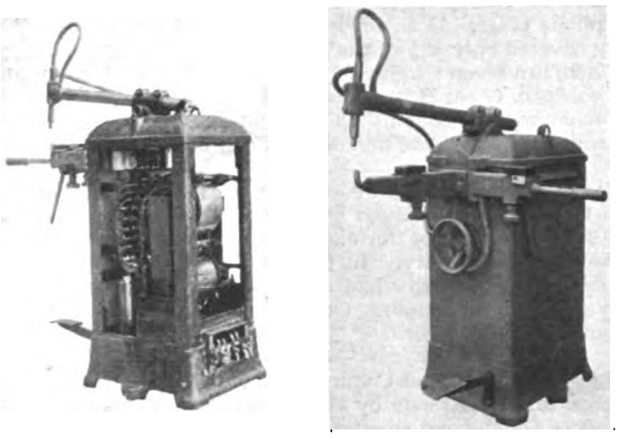
# ARC WELDING.

## Electric Welding Equipment for Manufacturing Purposes.

WE were recently afforded an opportunity of examining the arc welding equipment of the British Secheron Co., Ltd., including portable a.c. sets, and a universal arc, spot and butt welding machine, type U.S. A special feature of these two



Showing on the left an interior view of the type U.S. electric welding machine, by the British Secheron Co., Ltd., with an external view on the right.

machines is an automatic device for stabilising the arc and regulating the voltage to the correct value for the current being used. The type U.S. machine, two views of which are given on this page, is designed for use as an auxiliary for manufacturers and iron workers for carrying out electric arc spot and butt welding, and for annealing miscellaneous parts, for heating rivets, etc. It is claimed that the results obtained, from the point of view of quality and of economy, are at least as good as those which are obtained with special machines. The current used for welding can be adjusted in eight steps, an indication of its value being given by a pointer on the disc in front of the machine. This arrangement renders measuring instruments unnecessary, while a patented device incorporated in the machine ensures that the weld can be carried out with the same simplicity at every step.

The set is designed in such a way that the operation of reducing the welding current automatically increases the open circuit voltage, and by a single adjustment on the regulating hand-wheel to the highest notch, the highest current and simultaneously the lowest open circuit voltage is obtained by one and the same movement. Inversely, the lowest current and simultaneously the highest open circuit voltage is obtained on the lowest notch. This, it is claimed, ensures the perfect stability of the arc over the whole range.

The universal machine is provided with three windings; that is, a primary and secondary winding for arc-welding, and a tertiary winding for resistance welding, the operation of the machine being such that the windings are re-grouped by means of the regulating hand-wheel according to the different classes of work to be done. The various contacts of the machine for arc-welding, butt welding and spot welding are interlocked in such a manner that the machine cannot be misused by attempting to carry out two different operations at one time. The interlocking arrangement isolates the resistance welding portion when the arc-welding contact is being used, and vice versa.

### PAISLEY ELECTRICAL ENGINEERS.

A meeting of the members of the Paisley Association of Electrical Engineers was held at the Town Hall on November 21st, with Mr. J. R. Bisland, president, in the chair. Mr. J. S. Kilpatrick, of Paisley Electricity Department, read a paper on "Heating by Electricity." Mr. Kilpatrick treated his subject comprehensively, and by the aid of sections of electrical heating apparatus and various types of electric fires he made comparisons of modern apparatus as compared with apparatus that was in use ten or twelve years ago. The author dealt at length with the growth and development of heating by electricity, the theory of heat transmission, the improvements that had been effected in the heating of buildings, such as churches, schools, institutions, cinemas, etc. At the close of his paper a discussion was entered into by Messrs. J. R. Bisland, H. R. Heys, A. B. Haran, W. R. Bruce, H. Aberdein and A. Todd.

# BUSINESS ITEMS.

TUNGSRAM Electric Lamp Works (Great Britain), Ltd., announce that the prices of their gasfilled lamps of over 150 W have been reduced.

A radio and electrical exhibition is to be held in the Corn Exchange, Tunbridge Wells, from December 3rd to 8th, by Mr. W. J. Marchant, of 12, Mount Sion.

The British Thomson-Houston Co., Ltd., has opened an additional trade counter at Crown House, Aldwych, London, W.C.2., the entrance being in Drury Lane.

The Hotpoint Electric Appliance Co., Ltd., is showing on Stand No. 45 at the Food and Cookery Exhibition, which opened at Olympia last week. The closing date is December 1st.

Petters, Ltd., will be showing among their exhibits at the Sheffield Show, lighting plants, with or without storage batteries, from ¾ kW upwards. The Alpha-Petter plant which will be exhibited is a lighting set of simplicity, well adapted for farm and house lighting. It consists of a 1½ B.H.P. Petter petrol or paraffin engine belted to a 750 W dynamo carried on the same bedplate. The switchboard is also of a simple nature. The exhibition opens on December 10th for four days.

Marconi's Wireless Telegraph Co., Ltd., announces that the beam wireless stations have successfully withstood the test of the recent heavy gales. The safety devices included in the design of the aerial system have worked perfectly, and where interruption in the services has taken place it has been due to interruptions in land-lines, the stations being able to communicate between themselves throughout the gale. This, we understand, was rendered possible by the special design of the aerial wires at the beam stations, which, normally tightly strained, are so arranged that when the wind reaches hurricane force and undue strain is placed on the masts the tension of the wires is automatically reduced at the lower end.

Venner Time Switches, Ltd., have drawn our attention to their efforts to bring the question of late shop window lighting into increased prominence before electrical undertakings and the shopkeepers themselves. For some time now they have been lending a specially trained representative to various supply authorities for a week at a time to canvass shopkeepers in their districts. He works under the authority of the undertaking, and as coming from them, and in addition to securing business for the supply of time switches for the purpose, we are informed that he has been putting in valuable propaganda for the movement generally. In connection with this work, Venner Time Switches, Ltd., circularise lists supplied by the authorities, with suitable literature as issued by the E.D.A., to the number of about 100 a week in each area. Each week, for three weeks prior to the representative's call, the shopkeeper receives an E.D.A. card, in each case overprinted with some suitable remark, and a few days before the visit, a final approach letter is sent out. In many cases the authority provides a supply of its own official stationery for

A recent scene at the sorting office at the G.P.O. headquarters, Mount Pleasant. In the foreground will be noticed several packages of Osram Lamps.

this purpose, and the letter reaches the shop-keeper from the chief engineer. In other cases, the authority sends the letter. Where the installations are carried out by local contractors, we are advised that efforts are made to get in touch with as many of these as possible, informing them of the possibilities of business accruing from the campaign.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

NORTH-EASTERN COUNTIES FRIENDLY SOCIETIES.—Wiring and supplying and installation of fittings for lighting the Societies' Convalescent Home, Lindale Road, Grange-over-Sands. Specifications, etc., from the secretary, Mr. A. Bird, 15, Ninth Avenue, Heaton, Newcastle-on-Tyne.

STOCKPORT GUARDIANS.—Electric light installation at Shaw Heath Institution. Particulars from the Clerk.

CENTRAL ELECTRICITY BOARD, November 30th.—Supply and erection of 33 000 V transformers, in connection with South East England Electricity Scheme, 1927. Specification (No. S.E.E.-S.T.1) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, November 30th.—Extra high tension link kiosk and transformer switch and distribution kiosk (contract 42). Specifications from Mr. R. W. Willis, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

MANCHESTER CORPORATION, November 30th.—Supply and erection of a grit arrester for No. 51 boiler chimney at Stuart Street power station. Specification (No. 227) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

PLYMPTON ST. MARY RURAL DISTRICT COUNCIL, November 30th.—Electric light installation in 38 houses at Honicknowle. Forms of tender from the Clerk, Mr. Percy T. Loosemore, Council Offices, Plympton, South Devon.

ELY RURAL DISTRICT COUNCIL, December 1st.—Supply and installation of 550 W, 110 V dynamo 80 V, 50 Ah battery, switchboard and cables, for lighting pumping station and engineer's house, at Mildenhall, Suffolk. Further particulars from the Surveyor, Council Offices, 11, Lynn Road, Ely, Cambs.

PORTADOWN URBAN DISTRICT COUNCIL, December 1st.—Electric light installation in connection with the reconstruction of the Shambles. Specification may be seen and form of tender obtained at the office of Mr. H. Sewell, town clerk. Town Hall, Portadown.

SALFORD CORPORATION, December 1st.—Electrical rewiring of Nos. 10 and 12, Encombe Place; Salford. Specifications from Medical Officer of Health, 143, Regent Road, Salford.

GLASGOW CORPORATION, December 4th.—Supply of aerial electric cable for street lighting. Specification, etc., from the Inspector of Lighting, 20, Trongate, Glasgow.

WEST RIDING EDUCATION COMMITTEE, December 4th.—Electric light installation in two schools at Rawmarsh. Particulars from Mr. A. Adcock, Godstone Road, Rotherham.

STOKE-ON-TRENT CORPORATION, December 5th.—Supply and erection of natural draught cooling tower, at central power house, Hanley (contract 2 833). Specification, etc., from City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

STEPNEY (LONDON) GUARDIANS, December 6th.—Electric light installation at Bromley House Institution. Specification, etc., from the Clerk, Administrative Offices, Bancroft Road, Mile End, E.1; deposit £1.

HALIFAX CORPORATION, December 7th.—Supply and erection of 6 500 kW M.C.R. turbo-generator and auxiliaries, at Foundry Street generating station, Halifax. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall Street East, Halifax; deposit £2.

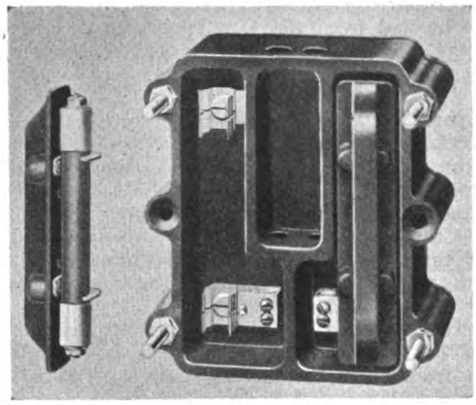
HALIFAX CORPORATION, December 7th.—Supply and erection of two water-tube boilers, with superheaters, mechanical stokers, economisers, air heaters, and feed pumps, and steel building for housing same. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall Street East, Halifax; deposit £2.

SALFORD CORPORATION, December 8th.—Fire alarm installation in Public Health Department at Salford House. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

SURREY COUNTY COUNCIL, December 10th.—Electric wiring and fitting for Brookwood Mental Hospital, Woking. Particulars from the engineer, Mr. E. L. Burne, 28, Victoria Street, Westminster, S.W.1; deposit £3 3s.

SWINDON CORPORATION, December 10th.—(*a*) Installation of new street fire alarm call bell system (19 pillar type fire alarm call boxes), switchboard and wiring; (*b*) supply and fixing of the equipment, but exclusive of wiring. Street plan may be inspected at the office of the Borough Surveyor, 34, Regent Circus, Swindon.

LIVERPOOL CORPORATION, December 11th.—Electric light installation at Old Swan Washhouse, and alterations to lighting fittings in the plunges at Queen's Drive (Walton), Lister Drive, Picton Road and Garston Baths. Specification, etc., from the Baths Manager, 75, Dale Street, Liverpool.



*THE Climax house service box for which Metro-Vick Supplies, Ltd., are sale concessionaires. A description of the box is given on page 622.*

MANCHESTER CORPORATION, December 11th.—Supply of steel girder tramway rails. Specifications, etc., from the Secretary, Corporation Tramways Department, 55, Piccadilly, Manchester.

STOKE AND WOLSTANTON GUARDIANS, December 11th.—Installation of electric fire alarm system and wiring at the Turnhurst Road Institution, Chell, near Tunstall. Specification, etc., from Mr. T. Wood, Clerk, Union Offices, Stoke-on-Trent, deposit, £1.

STRETFORD URBAN DISTRICT COUNCIL, December 11th.—Supply and erection of three 3-phase transformers of 10 000 kVA capacity each, with equipment for voltage regulation. Specification, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

BROMLEY (KENT) CORPORATION, December 12th.—Electric wiring of 91 houses at Southborough. Particulars from the borough engineer, Mr. Harold Cliffe; deposit, £1 1s.

BARNOLDSWICK URBAN DISTRICT COUNCIL, December 15th.—Complete electricity distribution scheme. Specifications, etc., from Mr. R. W. Fenton, Clerk of the Council, Town Hall, Barnoldswick, via Colne; deposit £1 1s.

PLYMOUTH CORPORATION, December 15th.—Supply of motor-driven rotary boiler feed pump. Specification, etc., from the City Electrical Engineer, Electricity Works, Prince Rock, Plymouth, before December 10th.

CENTRAL ELECTRICITY BOARD, December 17th.—Oil filtering and storage equipment for 13 outdoor transforming stations, in connection with the Central Scotland Electricity Scheme. Specification (No. C.S.-P.S. 1A) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit, £2 2s.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc., from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-

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phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300 V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52) 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

INDIA STORE DEPARTMENT, November 30th.—Schedule 1.—66 000 V transmission line equipment. Schedule 2.—500 kVA. 6 600 V transformers; and 66 000 and 6 000 V outdoor and indoor type switchgear. Schedules (5s. for each) from the Director-General, Belvedere Road, London, S.E.1.

IXELLES COMMUNAL AUTHORITY, November 30th.—Removal of present turbine and supply and erection of a 5 000 kW 3 000 r.p.m. turbine (to be connected to existing generator). (Reference B.X. 4 856.)

SOUTH INDIAN RAILWAY CO., LTD., November 30th.—Supply of l.t. transmission line materials. Specifications, etc. (10s.) from the Company's Offices, 91, Petty France, Westminster, S.W.1.

BELGIAN POST AND TELEGRAPH DEPARTMENT, December 4th.—Supply and laying of telephone cables in Antwerp district. Cahier des Charges Special No. 3 374 (conditions of contract, etc.), from the Belgian Post and Telegraph Department, La Salle Madelaine, Brussels, price 7 francs.

COPENHAGEN LIGHTING DEPARTMENT, December 4th.—Supply of 10 000 kVA transformer, for Faelledvej sub-station. (Reference 4 862.)

DUBLIN BOROUGH COMMISSIONERS, December 4th.—Electric lighting and heating, where specified, in 485 houses in Emmet Road housing area. Further particulars from the City Treasurer, Exchange Buildings, Lord Edward Street, Dublin; deposit, £1 1s.

EGYPTIAN STATE RAILWAYS, December 4th.—Supply of telephones and switchboards (estimated cost between £E17 000 and £E17 500. Further information from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Reference No. E.S.R. 264, 3/34.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 4th.—Supply of submarine telephone and telegraph cable, or supply and installation of the cable. (Schedule C. 379). (Reference B.X. 4 818.)

STELLENBOSCH (SOUTH AFRICA) MUNICIPALITY, December 4th.—Supply of transformers, motors, fans, switchgear and meters. (Reference B.X. 4 864.)

EGYPTIAN STATE RAILWAYS, December 5th.—Supply of 30 tons of h.d. copper live wire. Particulars from the Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1. (Refeernce E.S.R. 7 830.)

MELBOURNE CITY COUNCIL, December 5th.—Supply of insulated, fire-resisting cable (Specification No. 962). (Reference B.X. 4 822.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 6th.—Supply of five-ton Diesel electric caterpillar crane (contract 1 350.) (Reference A.X. 7 015.)

RATHMINES AND PEMBROKE JOINT HOSPITAL BOARD, December 8th.—Installation of electric bells at the Isolation Hospital, Clonskeagh. Specification from the Matron.

DUBLIN CORPORATION, December 10th.—Supply, erection, etc., of e.h.t. switchgear and accessories. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

VICTORIAN ELECTRICITY COMMISSION, December 10th.—Supply, etc., of one 65-ton electric overhead travelling crane (specification 28/103). (Reference A.X. 7 116.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of instrument cords (schedule C. 374). (Reference B.X. 4 811.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of telephone generators (schedule C. 375.) (Reference B.X. 4 812.)

VICTORIAN RAILWAY COMMISSION, December 12th.—Supply of d.c. polarised relays (Contract 42 137). (Reference B.X. 4 886.)

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of seven-ton electrical overhead travelling crane (tender No. 1 347.) (Reference A.X. 6 989.)

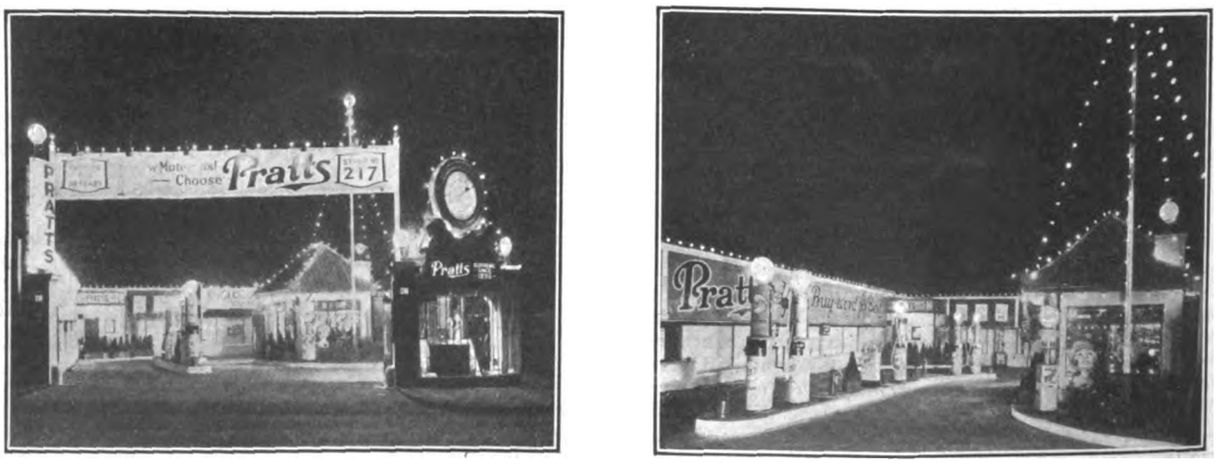
SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of one electrically-driven, geared, maximum service, double housing planing machine (tender No. 1 356). (Reference A.X. 7 064.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/69.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically-operated deep dredger, for Yallourn Brown Coal Works (specification 28/94). Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, December 18th.—Supply of 50 000 metres of rubber covered field telephone wire. (Reference A.X. 4 849.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)




*A NIGHT view of the Anglo-American Oil Co's., Ltd., petrol filling station outside Olympia, London, during the recent Motor Show. On the right is seen the illumination of the runway and kerbing. Osram lamps are used throughout.*

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of lamps, lamp caps and lamp sockets. Schedule C. 378.) (Reference B.X. 4 819.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of motor generating sets (schedule C. 377). (Reference B.X. 4 810.)

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of metal filament traction lamps (contract 91). (Reference B.X. 4 891.)

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of tram tracks and electrical equipment for tramcars (contract No. 80). Reference A.X. 7 113.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd. —Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd. —Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd. —Supply of two hydraulic pumps and electric motors. (Reference A.X. 7 150.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of switching equipment and relays, for use in automatic telephone exchanges (schedule C. 381). (Reference B.X. 4 880.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of protective apparatus for telephone equipment, including fuses, heat coils and arresters (schedule C.380). (Reference B.X. 4 881.)

SOUTH AFRICAN RAILWAYS AND HARBOURS (extension of date), January 10th.—Supply of five electrically-driven traversers and one 5-ton hand-operated crane. (Tender No. 1 344.) (Reference A. 7 023.)

VICTORIAN ELECTRICITY COMMISSION, January 14th.— Supply of 11 000 V transformers and spares (specification No. 29/1). (Reference B.X. 4 900.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 15th.— Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Telephone transformers (schedule C. 383.) (Reference B.X. 4 878.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Supply of loading coil pots. (Reference B.X. 4 879.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Supply of timing clocks (schedule C. 382). Reference B.X. 4 905.)

VICTORIAN RAILWAY COMMISSION, January 16th.—Rotary converter or rectifier set, for Glen Waverley sub-station. (Reference B.X. 4 893.)

GRAHAMSTOWN (SOUTH AFRICA) MUNICIPALITY, January 22nd.—Supply and erection of centrifugal pumps, motors and cable (Contract B. of 1928). (Reference A.X. 7 187.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Supply of telephonists' telephones. (Reference B.X. 4 888.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Telephone transmitters and associated parts (schedule C. 386). (Reference B.X. 4 889.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Telephone receivers and associated parts (schedule C.387). (Reference B.X. 4 890.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 29th.—Accumulator batteries and counter E.M.F. cells (schedule C. 390). Reference B.X. 4 906.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.— Supply of 11 000 V switchgear, in connection with the Yallourn power station extensions (Specification No. 29/5). (Reference B.X. 4 897).

VICTORIAN ELECTRICITY COMMISSION, February 4th.— Supply of 11 000 V switchgear, for installation in the Richmond Terminal Station (specification No. 29/3). (Reference B.X. 4 898.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.— Supply of 22 000 V switchgear and accessories, for Richmond Terminal Station. (Reference B.X. 4 901.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

INDIA STORE DEPARTMENT, February 15th.—Supply of hydro-electric plant, comprising four 12 000 kW water-wheel driven alternator sets, auxiliaries and spares (schedule 4). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.— Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Referenze B.X. 4 873.)

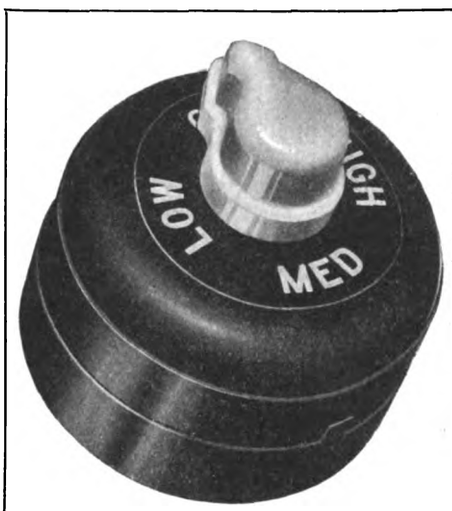
## Tenders Accepted.

CAPE TOWN CORPORATION.—H. C. Pead, re-wiring City Mansions, £315 15s.

TYNEMOUTH CORPORATION.—Hackbridge Cable Co., Ltd., supply if 220 yards of cable.

BASINGSTOKE CORPORATION.—Greenwich Cable Co., laying new distribution cables, £112.

WALTON-ON-THAMES URBAN DISTRICT COUNCIL.—Parfitt and Reed, laying cables, £493.




*ONE of the new double and single pole 3-heat series-parallel switches, rated at 35 A at 250 V, or 42 A, 125 V, by the Hart Manufacturing Co., Ltd.*

WAKEFIELD CORPORATION.—J. E. Fowler, electric ligh installation at Lupset housing estate.

DEWSBURY CORPORATION.—W. Angus, electric light installation in extensions to covered market, £47 16s.

ESSEX EDUCATION COMMITTEE.—F. R. Skeels, electric light installation at Dagenham Halbutt School, £322.

INVERNESS CORPORATION.—English Electric Co., Ltd., supply of generating and converting plant, £14 212.

HERTFORD CORPORATION.—North Metropolitan Electric Power Supply Co., supply of motor at Port Hill, £355.

SCARBOROUGH CORPORATION.—International Combustion, Ltd., additional plant for generating station, £46 302.

SOUTHEND CORPORATION.—Equipment and Engineering Co., Ltd., two miles of trolley wire, £287 (approximate).

EPSOM URBAN DISTRICT COUNCIL.—W. Christie and Grey, Ltd., supply of insulating material, £258. (Recommended.)

CHELSEA (LONDON) GUARDIANS.—T. Clark and Co., Ltd. electrical work at nurses' home and hospital chapel, £185 12s

PENISTONE GUARDIANS.—G. Hinchliffe and Co., maintenance of electrical installation at the Institution for six months).

LONDON COUNTY COUNCIL.—Electric Power Installation Co., electric light installation at Dockhead fire station, £156.

BRADFORD CORPORATION.—Moore and Wright, electric lighting installation at City Hospital, Leeds Road, Bradford, £1 249.

ROTHERHAM GUARDIANS.—Smith Bros., two Phillips' wireless sets, with four Celestion loud speakers and accessories, £75 net.

BECKENHAM URBAN DISTRICT COUNCIL.—Babcock and Wilcox, Ltd., provision of chain-grate stokers, at the electricity station.

HAMPTON URBAN DISTRICT COUNCIL.—Radio, Ltd., installation of wireless receiving apparatus at Isolation hospital, £59 10s.

CANNOCK URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., e.h.t. overhead line for the supply of electricity to Penkridge.

LONDON COUNTY COUNCIL.—G. D. Peters and Co., Ltd., supply of special equipment for experimental tramcars on hilly routes.

ENNISCORTHY URBAN DISTRICT COUNCIL.—Pulsometer Engineering Co., Ltd., supply and erection of pumps and electric motors, £611.

LEICESTER CORPORATION.—J. Kilpatrick and Son, electric light installation at Abbey pumping station, superintendent's house, offices and workshops, etc.

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LONDON COUNTY COUNCIL.—Holt and Willetts, provision of electric lift at weights and measures offices, Euston Road, London, £450.

TAUNTON CORPORATION.—Richardsons Westgarth and Co., Ltd., supply and erection of 2 500/3 000 kW turbo-generating plant, £12 500.

HULL CORPORATION.—Watshams, Ltd., supply, erection, etc., of 33 kV overhead transmission line, and outdoor switchgear, £17 250.

HULL CORPORATION.—Power and Lighting Cables, Ltd., supply of cable, for Telephones Department, £350 13s. 7d. (Recommended).

WESTMINSTER CITY COUNCIL.—Coleby and Co., maintenance of electrical installations at public libraries, £39 per annum. (Recommended).

SALFORD EDUCATION COMMITTEE.—Price and Sons, of Higher Broughton, electric light installation at Lower Kersal School, £347 8s.

METROPOLITAN WATER BOARD.—W. T. Glover and Co., Ltd., cable and fittings for Kempton Park works, £812 10s. 10d, (Recommended.)

STAFFORDSHIRE EDUCATION COMMITTEE.—Coley and Swinnerton, Ltd., electric light installation at Slater Street Council school, Darlaston.

NEWTON ABBOT RURAL DISTRICT COUNCIL.—H. A. Thomas, electric light installation in 32 houses to be erected at Kingsteignton, £112 15s.

NANTWICH RURAL DISTRICT COUNCIL.—South Wales Electrical Power Distribution Co., public lighting at Shavington, £3 6s. 6d. per lamp.

METROPOLITAN ASYLUMS BOARD.—Newton and Wright, Ltd., supply and fixing of new X-ray apparatus at Goldie Leigh Homes, £372.

GUILDFORD EDUCATION COMMITTEE.—Guildford Corporation Electricity Department, electric lighting installation, at Bellfield School, £136.

SANDOWN URBAN DISTRICT COUNCIL.—Isle of Wight Electric Light and Power Co., Ltd., electric light installation at Town Hall, £46 10s.

AIR MINISTRY.—General Electric Co., Ltd., three months' supply of Osram vacuum and gasfilled lamps and Robertson carbon filament lamps.

BATTERSEA (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., supply and erection of switchgear, for 30 000 kW turbo-alternator, £3 982.

HULL CORPORATION.—C. F. Procter, electric light installation and fittings for new East Hull Clinic, Durham House, Holderness Road, Hull, £506.

LONDON COUNTY COUNCIL.—Woolwich B.C. Electricity Department, electrical installation at Ealdham Square School, Woolwich, £621 2s. 6d.

GREAT WESTERN RAILWAY.—General Electric Co., Ltd., 12 months' supplies of Osram vacuum and gasfilled and Osram vacuum train lighting lamps.

LEICESTER CORPORATION.—James Kilpatrick and Son, Ltd., electric lighting and auxiliary power supply at Abbey pumping station and Beaumont Lees farm, £3 089 12s. 5d.

WALTHAMSTOW URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., six tram car electrical equipments, each equipment including two 500 V tramcar motors of 41 H.P. on one hour rating.

METROPOLITAN ASYLUMS BOARD.—Watson and Sons (Electro-Medical), Ltd., supply of radium containers, etc. (item of £4 008 for radium, subject to variation of 5 per cent. either way), £4 083.

SHEFFIELD CORPORATION.—T. A. Ashton, Ltd., maintenance for 12 months of internal telephone and bell installations at Lodge Moor, Winter Street, Crimicar Lane and Moor End hospitals, £61.

BEXHILL CORPORATION.—Enfield Cable Works, Ltd., supply of cable for six months; Higgs Motors, supply of electric gear, for driving stove-cleaning plant, £60 10s. 3d. (Both recommended.)

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Hackbridge Electric Construction Co., Ltd., two 750 kVA three-phase transformers, £649; J. G. Statter and Co., l.t. switchboards for Highgate sub-station, £388.

GLASGOW CORPORATION.—Consolidated Brake and Engineering Co., Ltd., 300 car sets of air brake equipment for tramcars. The same company has previously supplied 500 similar sets to the Glasgow Tramways Department.

PORTLAND URBAN DISTRICT COUNCIL.—Pirelli-General Cable Works, Ltd., underground cables and overhead lines, £6 191; Yorkshire Electric Transformer Co., Ltd., transformers, £1 206; Measurement, Ltd., supply of meters, schedule prices.

PRESTON CORPORATION.—Callender's Cable and Construction Co., Ltd., overhead cables, £14 508; W. T. Glover and Co., Ltd., underground cables, £28 244; English Electric Co., Ltd., transformer plant, £35 093, in connection with increased supply of electricity to Blackpool.

CRAYFORD URBAN DISTRICT COUNCIL.—H. J. Creffield, electric lighting installation at the Municipal Buildings, Crayford Road, £261. Also tendered:—S. Gibson and Sons, £265; Heat and Light, £275; A. H. Room, £310; W. F. Blay, £310; S. and A. Freed, £373, A. Ling and Co., £390; Cash and Co., £418.

LONDON COUNTY COUNCIL.—Attwater and Sons; British Central Electrical Co., Ltd.,; Butterfield and Renton; Connollys (Blackley), Ltd.; Hamnett and Andrew; Mica and Micanite Supplies, Ltd.; Micanite and Insulators Co., Ltd.; Rykneld Mills Co.; A. A. Sample and Siemens Bros. and Co., Ltd., insulating materials.

BARKING URBAN DISTRICT COUNCIL.—Davis, Lawrence and Co., electric light installation work in 196 new houses and flats on Upney Farm housing estate, £1 390 (Recommended). Also tendered: H. D. White, £2,521; E. C. Porter, £2 297; Jackson and Co., £2 004; F. W. Jameson, £1 795; H. D. Godfrey, £1 728; Ilford Electrical Co., £1 575; E. Beckwith and Co., Ltd., £1 501; H. J. Edwards, £1 476; W. H. Sugden and Co., Ltd., £1 400. E. Beckwith and Co., Ltd., electric light installation work in 26 new houses, including five shops, in connection with Parson's Row improvement scheme, £244. (recommended). Also tendered: H. D. White, £395; E. C. Porter, £378; Jackson and Co., £326; F. W. Jameson, £292; H. D. Godfrey, £282; H. J. Edwards, £260; W. H. Sugden and Co., Ltd., £260; Ilford Electrical Co., £247; Davis, Lawrence and Co., £226.

*THE first Mullard dance of the season was held at the Royal Horticultural Hall on Monday. A presentation of a gold wristlet watch and a set of cuff links was made to Mr. S. R. Mullard, whilst Mrs. Mullard was presented with two bouquets. The above group shows a small section of the happy assembly.*

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# WORK IN PROSPECT.

ACCRINGTON.—Additional 78 houses, for the Town Council. Particulars from the Borough Surveyor.

AMOTHERBY (YORKS).—Parish Hall. Particulars from the vicar, Rev. H. Ward.

ASHBOURNE.—Housing scheme for the Urban Council. Particulars from the Surveyor.

AYLESHAM.—Central school, for Kent Education Committee. Particulars from education architect, Mr. W. H. Robinson, Sessions House, Maidstone.

BANNOCKBURN.—Housing scheme, for Stirlingshire County Council. Particulars from the Clerk, Stirling.

BRIGHTON.—School, Moulscombe, to cost £13 188. Particulars from the contractors, R. Cook and Sons, Crawley.

BURNLEY.—Additional 224 houses, for the Town Council. Particulars from the Borough Surveyor.

CATERHAM.—Depot extensions, to cost £2 245, for the Urban Council. Particulars from the contractor, Mr. G. W. Hitchcox.

COLCHESTER.—Additional housing scheme (337), for the City Council. Particulars from the City Surveyor.

CUCKFIELD.—Nurses' Home, to cost £4 000 for the Board of Guardians. Particulars from the Clerk.

DUDLEY.—Housing scheme (126), for the Town Council. Particulars from the Borough Surveyor.

EPSOM.—Premises for mental patients, to cost £47 817, Manor Estate, for the London County Council.

EVESHAM.—Senior school, for Worcestershire Education Committee. Particulars from the Director of Education, Worcester.

FAREHAM (HANTS).—Church House, to cost £5 000, for Holy Trinity Parochial Church Council. Particulars from the Secretary.

FRINTON-ON-SEA.—Parish church, to cost £28 000. Particulars from rector, Rev. J. V. S. Bird.

GLOUCESTER.—Church, for Brunswick Road Baptist Trustees. Particulars from the pastor, Rev. E. Rusling.

GOOLE.—Houses (50), for the Urban Council. Particulars from the contractor, Mr. J. G. Whittington, Doncaster.

HAMPTON.—Recreation ground pavilion, to cost £2 453, for the Urban Council. Particulars from the contractors, A. Mason and Co.

HERNE BAY.—Premises, Town Hall site, to cost £18 000, for the Herne Bay Estates Co., Ltd.

ILMINSTER.—Housing scheme, for the Urban Council. Particulars from the Surveyor.

## THE BLUE BOOK.

### A Feature in the 1929 Edition which will Interest Manufacturers and Electricity Suppliers.

WHAT can be regarded as one of the most complete lists of electrical contractors ever published will be found in the new edition of the Electrical Trades Directory, now in active preparation, and which will be ready on January 26th, 1929. The list will show all contractors who are enrolled on the National Register of Electrical Installation Contractors, members of the Electrical Contractors' Association, and members of the Electrical Contractors' Association of Scotland, all distinctively marked. This feature, whilst materially adding to the general value of the Blue Book, will in particular be of considerable use to all manufacturers who desire from time to time to acquaint contractors of their new products, and as the list of names and addresses has been compiled with the co-operation of the various associations concerned, its users will have the advantage of an absolutely up-to-date and accurate mailing list. The Blue Book, besides retaining all its well-known features, has undergone a most thorough revision, and at 26s. post free, constitutes a fine investment. Orders for copies should be sent to Ernest Benn, Ltd. (Annuals Department), 154, Fleet Street, London, E.C.4.

### BOILER DESIGN.

In our report on page 577, column 2, of the November meeting of the Junior Institution of Engineers, at which Mr. J. K. Muir, of Babcock and Wilcox, Ltd., exhibited a kinematograph film showing the construction, erection and operation of a watertube boiler, the date given in line 7 should be 1817 and not 1917 as printed. Also the word drains in line 17 should read drums.

# THE ELECTRIC VEHICLE.

### Its Place in Municipal Cleansing Departments—A Birmingham Test.

THE final session of the Public Health Congress at the Agricultural Hall, London, on November 24th, was devoted to discussions on the place of petrol and electric vehicles in the cleansing services of public authorities.

Mr. James Jackson, general manager of the Birmingham Corporation Salvage Department, said that if the averages disclosed by the statistics of ninety-three municipalities were applied to the whole country, the horse was still predominant in cleansing services. But it was not suggested that each type of transport had found its economic level in this work, and there was no doubt that the present preponderance of the horse would be more seriously challenged in future.

The proportions of horse and mechanical cleansing vehicles in the ninety-three towns were: horse, 63·27; electric, 16·37; petrol, 15·73; container system, 4·01; and steam, 0·61.

Once the serious difficulty of comparatively high initial cost, coupled with the necessity of providing adequate charging facilities, could be removed, it was probable that the electric vehicle would gain in favour. These disadvantages were more apparent than real, and wherever an authority possessed a destructor sufficiently large to generate the current required at a point near to where the vehicles were garaged, no real difficulties need be anticipated. In his department the percentage of efficiency of the electric cleansing vehicles was 93, and of the horse service 85·32. A test in Birmingham showed that the electric vehicle beat the horse vehicle for refuse collection work from every point of view. The percentages in favour of the electric vehicle were: reduction in total expenses, 8·43; increase in weight collection, 3·29; increase in visits made, 5·5; reduction in men's day work, 14·38.

## TRANSFORMERS FOR X-RAY EQUIPMENT.

### A New Specification for the Electrical Performance of Transformers for X-Ray Purposes.

A NEW British Standard Specification, the first to be issued dealing with X-ray apparatus, has been published. It applies to the main high-tension transformers of X-ray installations, the subject being dealt with along lines very similar to the British Standard Specification for the electrical performance of transformers for power and lighting. The most important feature is the definition of the rating of the transformer, this being in terms of the R.M.S. milli-ampere output when the rated peak voltage is being produced across the terminals. The usual method of expressing the output of a transformer in kVA is thus departed from, the reason being that the intensity of the X-ray output is dependent upon the peak voltage rather than the R.M.S. voltage. The R.M.S. value of the current output is retained, however, as it is this value which determines the internal heating. In addition to the rating, the specification deals with the types of cooling, standard sizes, primary voltage, regulation, etc., limits of temperature rise, and the quality of the insulating oil. The tests to be applied to the transformer are also included, one of which—viz., the switching test—is of special importance in the case of X-ray transformers.

Copies of this specification No. 326, 1928, may be obtained from the Publications Department, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

### TESTS FOR SAFETY LAMPS.

By arrangement with the Home Office and the Mercantile Marine Department of the Board of Trade respectively, the facilities existing at the Mines Department Testing Station, Sheffield, will in future be available for testing safety lamps designed for use (*a*) in petroleum spirit stores or in the presence of petroleum spirit vapour, and (*b*) on board ship in places where there may be danger from inflammable vapour. Any type of safety lamp approved by the Secretary for Mines under Section 33 of the Coal Mines Act, 1911, for use in mines may, *ipso facto*, be regarded as safe for use in petroleum stores or in ships provided, of course, it is used properly and maintained intact and in good repair. In recent years, however, lamps have been designed specially for these latter purposes, and manufacturers of such lamps will now be able to submit them for official test.

Applications for the test of such lamps should be made by letter to the Under-Secretary for Mines, Mines Department, Dean Stanley Street, Millbank, London, S.W.1.

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# ELECTRICITY SUPPLY.

## Exeter's Plant Extension—Assisted Wiring at Colwyn Bay—Increased Supply from Preston to Blackpool—Peterhead Supply to be Commenced Shortly—Battersea's Plant Extension—New Turbo-Alternator at Belfast.

BENWORTHAM (Lancs) P.C. is raising a loan of £440 for public lighting.

Barnes U.D.C. has applied for a loan of £10 500 for electricity purposes.

Walsall Electricity Committee is to extend mains, at an estimated cost of £2 230.

Exeter City Council is recommended to apply for sanction to a loan of £37 500 for an extension of its generating plant.

The Twickenham and Teddington Electric Supply Co. is to carry out mains extensions at Station Road, Hampton.

Nantwich R.D.C. has entered into a 10 years' agreement with the North Wales Power Co. for public lighting at Shavington.

Edward Lloyd, Ltd., and the Weald Electricity Supply Co., have offered to supply electricity in Milton Regis urban district.

To ensure more economical working Eston Electricity Committee recommends the installation of isolating links at certain points at a cost of £300.

With a view to assisting tenants to have their houses wired for electric light, Colwyn Bay Council has appointed a committee to prepare a scheme.

Mr. Dan Jones, of Graigwen, has erected a small power house near Berws Falls for water power generation of electricity to be supplied to Ysdyty Ystwyth.

In connection with the change over in the Abbotswood district, Guildford Electricity Committee has voted £450 for meters, £63 for motors and £128 for appliances.

The Electricity Commissioners have granted an Order for the supply of electricity in Weardale rural area. The supply is to be given by the Cleveland and Durham County Electric Power Co.

Douglas (Isle of Man) Electricity Committee has fixed a special charge of 4d. per kWh, with an additional charge for special meter and time switch, for shop window lighting after closing hours.

Paignton U.D.C. has asked the Clerk to report on the tender of the Paignton Electric Light and Power Co., for the future lighting of the streets, and to invite the directors to discuss the matter with the Council.

Weymouth Electricity Committee has authorised mains extensions at a cost of £900. The Committee has fixed the following charges for the added areas :—lighting, 6½d. per kWh, with discount, plus 25 per cent. ; heating and power, 1½d.

Preston Electricity Committee has agreed to two additional lines being laid along the existing road to Blackpool, to afford an increased supply, at an estimated cost of £93 000, exclusive of switch gear building. Each of the two coporations will bear half the cost.

Londonderry Lighting Committee has adopted a report by the Electrical Engineer that it will now be necessary to apply to the Electricity Commissioners for sanction to the borrowing of another capital sum for connecting additional consumers and extending supply cables. The amount required is estimated at £15 000.

The annual report of Croydon Electricity Committee states that in 1920–1 the lbs. of coal used per kWh were 5·18, but in 1927–8 the coal used had decreased to 1·85 lbs. per kWh. The working economies of the new plant and the increased use of electricity by consumers have materially assisted in reducing production costs.

Stoke-on-Trent Electricity Committee has arranged to provide a supply to the housing estate at Cornhill, at a cost of £2 600.—The Committee has decided to equip a sub-station at Stoke Railway Station, at a cost of £1 750, in order to give a supply to the L.M. and S. Railway, and a sub-station at Porthill, at a cost of £2 100.

Cape Town Corporation Standing Committee recommends the allocation of £26 000 from the electricity accounts for the relief of rates.—The Council has voted £8 500 for heavier switchgear necessitated by the use of heavier cables from the generating station to certain main distributing centres to meet the rapid growth of demand.

Canterbury Lighting Committee is to lay a cable to the works of Messrs. Frank Cooper (Canterbury), Ltd., for power purposes, at an estimated cost of £2 500, subject to the Company agreeing to pay a minimum charge of £400 per annum for ten years. It is also proposed to relay the cable from Stone House to the Sanatorium at a cost of £1 000.

The Peterhead electricity scheme is nearing completion, and it is expected that the contractors, Peterhead Electricity Supply, Ltd., will be in a position to supply light for houses and business premises early in the New Year. The power station is to be erected at Ugie Street. The charges will be 9d. per kWh for lighting and 2½d. for power and heating.

Darlington T.C. has received sanction to a loan of £13 500 for new boiler plant for the electricity works. The Cleveland and Durham County Electric Power Co., has applied to the Commissioners for the revocation of the Fringe Order by which the Corporation is supplying electricity to premises in the Garden Suburb District. The Council is opposing the application.

In the Corn Exchange at Chard, on November 20th, the mayor, Mr. H. E. Dening, switched on the current for the South Somerset and District Electricity Co., Ltd., the authorised distributors for a considerable portion of the county of Somerset. The electrification of Axminster, Chard, Chardstock and Forton has already been completed, or is nearing completion, and similar developments will follow in less popular areas.

The Electricity Commissioners have given consent to the extension of the Battersea (London) Borough Council's generating plant by the addition of one 30 000 kW turbo alternator, two 65 000 lb. boilers, and two 125 000 lb. boilers, with the necessary additions to buildings.—The Committee is to carry out electricity services to 132 premises, £1 343 ; extensions of mains for private services, £765 ; extension of mains for public lighting, £220 ; and substitution of armoured cable for old vulcanised bitumen distributors in various roads, £1 505.

Col. F. Gordon Tucker held a Ministry of Transport inquiry on November 20th regarding the objections of Ulverston R.D.C. to the proposal of Barrow T.C. to erect an overhead transmission line from Cark Viaduct to Grange-over-Sands and Meathop. The Town Clerk said the Corporation had received an application for a supply of electricity to the sanatorium at Meathop, and the only economic way of giving that supply from Barrow was by overhead lines. It was intimated that Grange U.D.C. had decided to support the application. For the R.D.C. it was contended that the proposed line would pass over an unpopulated and unproductive district in which no improvement could be expected, and that the district was a public playing ground, the amenities of which should be protected.

The profit on the past year's working of the St. Pancras (London) electricity undertaking is £47 348. The 1926 Electricity Act limits the amount that can be applied in aid of rates to 1½% of the outstanding debt, and after March, 1930, no sum must be applied in aid of rates unless the reserve fund amounts to more than one-twentieth of the capital expenditure. If after devoting the permitted amount (£12 882) to relief of rates, the balance of £34 466 were placed to reserve, the statutory amount for that fund would be reached two years before its time. As the present working balance is frequently exhausted, owing to the fact that the outgoings are paid monthly, the Electricity Committee has suggested that the working balance be increased by £20 000, and that £24 466 be placed to reserve. The Finance Committee has approved the suggestion.

The new 18 750 kW 3 000 r.p.m. turbo-alternator at Belfast Corporation's Harbour power station was formally started on November 22nd by the lady mayoress, Lady Turner. Major Hall-Thompson, chairman of the Electricity Committee, after whom the new set is named, said the capacity of the station would now be 55 000 kW, and when necessary they could treble the present capacity and hold their own with either the Shannon or Bann schemes. A hired wiring scheme was about to be introduced. They anticipated helping the Bann scheme during its development period and during months when the water of the Bann might be insufficient for its needs. It was the aim of the two undertakings to have an interlinked transmission system. He wished to express the Committee's appreciation of the work of the contractors, the Metropolitan-Vickers Electrical Co., who supplied the new plant.

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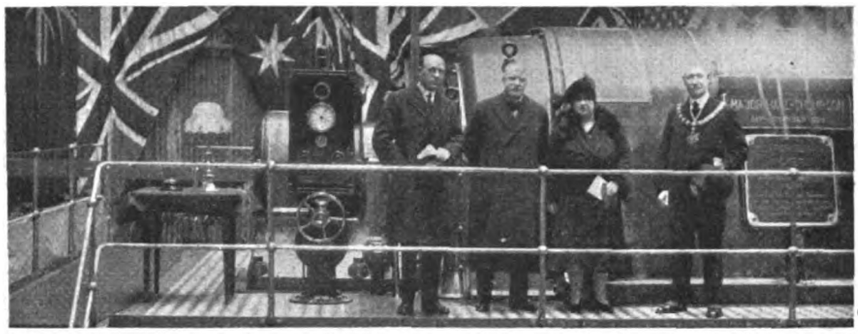
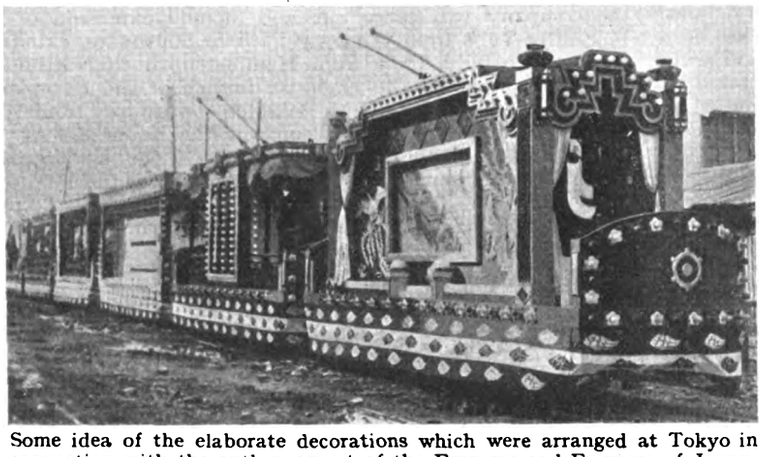
## ELECTRICAL NEWS OF THE WEEK IN PICTURES.

The elevation of the new building which is to be erected in Portland Place, London, W., on the Foley House site, as the headquarters of the B.B.C.



This group, taken on the occasion of the starting up of the new 18 750 kW set at Belfast, shows (left to right), Major Hall Thomson (Chairman of the Electricity Committee), Mr. F. H. Whysall (City Electrical Engineer), Lady Turner (the Lady Mayoress) who started the new machine, and the Rt. Hon. Sir William Turner (Lord Mayor).



Some idea of the elaborate decorations which were arranged at Tokyo in connection with the enthronement of the Emperor and Empress of Japan, may be gathered from this line of tramcars. Electric lighting played a not inconsiderable part in the decorations, and some hundreds of lamps may be counted in this picture alone.

The all-electric house at Edinburgh which was described in our last issue. This is the third year in which a labour-saving house has been opened in the district, some 20 000 people having visited each of the previous exhibits.

The Commissioners have waived the objections of the Yorkshire Electric Power Co. to Earby Council's proposal to accept the tender of Nelson Corporation for a bulk supply, and it is proposed to proceed with the scheme.

It has been reported to Stretford Electricity Committee that work on the Barton-Urmston scheme has made good progress. The number of consumers connected is 397 and the total number of applications received is 666.

Darlington T.C. is to supply the London and North Eastern Railway works in Darlington with electricity for the next 15 years. It is intended to extend the mains to Four Riffs, Hains Street, Beaumont Street and Stooperdale Avenue.

Mains extensions are to be carried out in Dalby Road by Fulham (London) Electricity Committee at a cost of £150. The Electricity Commissioners have sanctioned the utilisation of part of the surplus revenue for the provision of sub-stations.

Durham County Council has consented to the proposal of the Cleveland and Durham Electric Power Co. for the erection of electric lines over Brenda Road, West Hartlepool, along the main road in the village of Wolviston and the village of Greatham.

Denbighshire County Council has appointed a sub-committee to consider the question of inviting the six North Wales counties to appoint representatives to a joint committee to endeavour to secure lower charges for the supply of electricity from Dolgarrog.

The proposal of Oxford City Council to purchase the Oxford electricity undertaking will shortly come before the Council for confirmation. The Oxford Electric Co. has made a voluntary reduction of the price of electricity for lighting from 10d. to 7½d. per kWh.

The Works Committee of the Woolwich (London) B.C. reports that the experimental scheme of lighting Well Hall Road by lamps suspended from span wires attached to the tramway standards has proved so satisfactory that it has been decided to follow the same course for lighting the Eltham Road, at an estimated cost of £680.

Croydon Electricity Committee has received sanction to the borrowing of £8 996 for sub-station buildings, mains and plant. In view of the development of an estate near Croham Hurst and the continued building in the Sunnybank district, the Committee proposes to erect sub-stations at Hurst Way and Eldon Park. Mains extensions are to be carried out at an estimated cost of about £1 975.

The Weston-super-Mare and District Electric Supply Co. has applied to Weston-super-Mare T.C. for consent to an alteration of the system of supply from d.c. to a.c. The Corporation has agreed that such consent be given subject to the company carrying out, at its own expense, the necessary alterations to consumers' existing apparatus to suit the altered system and pressure of the supply, or to pay to each consumer injuriously affected such sum as may be agreed upon.

Notts County Highways Committee reports that Electrical Distribution of Yorkshire, Ltd., has made application for consent to open main roads for the supply of electricity to Lord Barnby's estate at Blyth. The company and the Notts Electric Power Co. have both applied to the Electricity Commissioners for an Order to supply electricity to an area which embraces the parish of Blyth, and the Committee therefore recommends no action in the matter until it has been decided to which company the Commissioners are prepared to issue the necessary Order.

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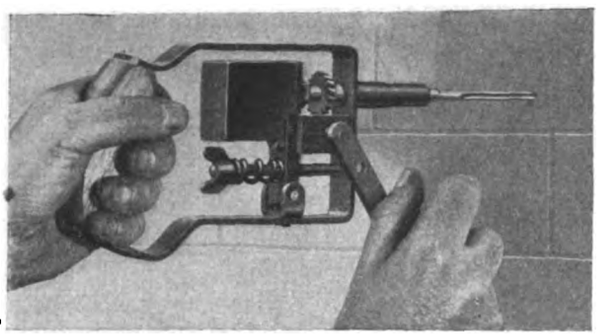
# A NEW WIRING TOOL.

WILLIAM GEIPEL, Ltd., have sent us particulars of an automatic tool called the "Rapper," the purpose of which is to make holes in walls, etc., to accommodate wall plugs. The common practice of securing fittings, brackets, etc., to walls by means of wood screws driven into expanding linings,



The "Rapper" tool, by William Geipel, Ltd.

has hitherto necessitated the driving of a small punch-tool into the wall by means of a hammer, in order to make the hole to accommodate the plug. The process is usually tedious, and the result not very workmanlike. The Rapper has been designed with a view to making such holes rapidly and accurately, and consists of a percussive rotating drill, operated by hand, and weighing 1¾ lb. Its operation is dependent upon an ingeniously designed combination of a drill, hammer head, and a worm which raises and releases the hammer head, at the same time rotating the drill at uniform speed. By the use of a stubborn spring moving through a short distance, blows are imparted to the hammer head at a high velocity. Some idea of the effect of this may be gained from the claim that it is equivalent to blows of a hand hammer at the rate of 600 to 800 per min. The weight of the blow is adjustable for various materials and should be heavy for hard materials and gentle for friable materials. All wearing parts are made of special steel, suitably case-hardened, and are renewable. It is claimed that brick, Portland stone, cement, etc., may all be worked, while tiles and similar materials may also be drilled with safety.

# COMING EVENTS.

**Friday, November 30th.**

INSTITUTION OF MECHANICAL ENGINEERS.—Storey's Gate, St. James's Park, London. Thomas Lowe Gray Lecture by Prof. W. E. Dalby, F.R.S., on "The Possible Vibration of a Ship's Hull Under the Action of an Unbalanced Engine." 6 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—Royal Technical College, Glasgow, Lecture before the Royal Technical College Civil Engineering Society on "Factory Lighting." 7.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE).—Grand Hotel, Birmingham. Annual dinner. 7 *p.m.*

**Saturday, December 1st.**

ELECTRICITY SUPPLY RIFLE LEAGUE.—Talbot Restaurant, London Wall, E.C. Annual Dinner. 6 for 6.30 *p.m.*

**Monday, December 3rd.**

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE),—University. Edmund Street, Birmingham. Paper by Mr. F. H. Rosencrants on "Practice and Progress in Combustion of Coal as applied to Steam Generation." 7 *p.m.*

**Tuesday, December 4th.**

INSTITUTION OF ELECTRICAL ENGINEERS (EAST MIDLAND SUB-CENTRE).—Technical College, Leicester. Paper by Mr. H. Cotton on "Polyphase Commutator Motors and their Application." 6.45 *p.m.*

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS.—39, Victoria Street, Westminster. Paper by Mr. W. S. Kennedy, on "Some Aspects of the Electricity Act, 1926." 7.15 *p.m.*

**Wednesday, December 5th.**

ELECTRICAL ASSOCIATION FOR WOMEN.—46, Kensington Court, Kensington. Lecture-Demonstration by Mr. S. C. Hurry on "Domestic Electric Water Heating in Old and New Houses." 3 *p.m.*

WOMEN'S ENGINEERING SOCIETY.—Lyceum Club, 138, Piccadilly, London. Film-talk on "Modern Steam Plants" by Mr. P. E. Rycroft. 6.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (WIRELESS SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Messrs. R. H. Barfield and G. H. Munro on "Attenuation of Wireless Waves over Towns." 6 *p.m.*

**Thursday, December 6th.**

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy Place, Victoria Embankment, London. Paper by Messrs. A. E. Foster, P. G. Ledger and A. Rosen on "The Continuously Loaded Submarine Telegraph Cable." 6 *p.m.*

SCOTTISH ELECTRIC LIGHTING SERVICE BUREAU.—20, Trongate, Glasgow. Eighteenth Illumination Design Course. Lecture on "Architectural Lighting." 7.30 *p.m.*

**Friday, December 7th.**

INSTITUTION OF ELECTRICAL ENGINEERS (METER AND INSTRUMENT SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. W. Holmes on "Load Levelling Relays and their Application in connection with future Metering Problems." 7 *p.m.*

# ELECTRIC TRACTION.

## Proposed New Tramway Route for the London Area.

LONDON County Council Highways Committee reports that it has been informed by the Improvements Committee that the Ministry of Transport desires that the work of proceeding with the section of the South Circular Road between Well Hall Road and Burnt Ash Hill, including a connection with St. Mildred's Road, should be put in hand and that the work should be carried out by the Council in anticipation of a grant of 50 per cent. from the Ministry. If it is proposed to use this arterial road for a tramway route, it is desirable that the tramways should be laid before the new road is finally made up. The Committee recommends that application be made to Parliament in the session of 1928–29 for authority to enable the Council to construct tramways from a point near Grove Park station to Well Hall Road, Eltham, *via* Baring Road and the South Circular Arterial Road.

Belfast Tramways Department will shortly recondition the tramcars on modern lines, introducing up-to-date features in the mechanism and furnishing.

It is stated that in the event of the Underground Electric Railways Co. and London County Council's proposals in reference to the co-ordination of London passenger-carrying facilities being sanctioned by Parliament, the projects which the company will carry out will include extension of the Piccadilly Tube from Finsbury Park to Southgate, extension of the Piccadilly Tube from Hammersmith to Northfields, extension (later) of the Highgate branch of the Hampstead Tube northwards and of the Bakerloo southwards from Watford, and other tube extensions in the suburbs. At the present time the only extensions which the Underground Group have in contemplation are extensions of the Piccadilly Railway—from Finsbury Park to Southgate, and from Hammersmith to Northfields. In the former case it is proposed to provide intermediate stations at Turnpike Lane (Hornsey), Wood Green, and Bowes Park. This would relieve the present congestion at Finsbury Park, probably the most congested station on the system. These extensions are estimated to cost about £6 000 000.

## CLYDE VALLEY CO.'S CHARGES.

UNDER the Clyde Valley Electrical Power Co.'s new tariff, which is to come into force in January, the charges under the two-rate tariff will be 4½d. and ½d. per kWh for houses, and 5d. and ½d. per kWh for business premises, etc. The low rate is reduced from ¾d. to ½d. The company admits that, although the reduction of electricity charges will benefit the large majority of consumers, the average price paid by some under the new method of fixing the number of high rate units may be slightly increased unless advantage is taken of the low rate to extend the use of electricity by using electric irons, sweepers, cookers, fires, etc. The company states that the existing method of assessing the demand on the number of lights fixed has not proved satisfactory, and that the method of fixing the proportion of the high rate units to be used each quarter is also unsatisfactory. Under the new method the number of kWh at the high rate will be calculated on the size of the premises, and this fixed number will require to be consumed each year before the low rate is obtained. The assessment is based on the number of apartments, such as living rooms, lounge halls, bedrooms, and kitchens, but vestibules, pantries, rooms unsuitable for use as living rooms or bedrooms, and the usual domestic offices, are excluded. Each apartment is assessed at 65 kWh per annum at the high rate, thus a consumer with a four-apartment house will require to use 260 kWh at the high rate (4½d.) before the low rate (½d.) is obtained. Shops and other business premises are assessed at 150 kWh for the first 100 sq. ft. of floor area and 15 kWh for each additional 20 sq. ft. or part thereof, i.e., a shop of 200 sq. ft. is assessed at 225 kWh per annum at the high rate (5d.), which will require to be consumed before the low rate (½d.) comes into force.

The fixed charge for houses under the domestic rental tariff is 5s. per quarter for each assessed apartment, plus the low rate (½d.) for all current consumed. If paid yearly in advance, 5% is allowed off rental portion. The charge for shops and other premises under the rental tariff is £2 10s. per annum for the first 100 sq. ft. of floor area, and 5s. for each additional 20 sq. ft. or part thereof, plus the low rate (½d.) for kWh consumed.

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# TRADE PUBLICATIONS.

AN expensively produced publication devoted to the Louvre stoker has been published by the Underfeed Stoker Co., Ltd. The issue contains 31 pages and is profusely illustrated.

"The Christmas Lighting Opportunity" is the title of an article appearing in the November issue of the "Osram G.E.C. Bulletin."

A short study of the design and construction of earthing systems is given in a new publication entitled "Earths and Earthing Devices," published by the Paragon Electrical Co.

Falk, Stadelmann and Co., Ltd., have issued leaflet No. P. 1303 concerning the Efesca trickle charger, and leaflet No. P. 1301 giving the reduced price of the Waterloo wireless set. The latter leaflet is for insertion in Catalogue No. 611, which brings the issue up to date.

Out of the fullness of his heart, one of the staff of Venner Time Switches, Ltd., has set forth in leaflet form some reasons other than technical ones why Venner switches should be used. The leaflet is entitled "Atmosphere," and its reading is both entertaining and informative. The response of the staff to the treatment of Messrs. R. C. Graseby and E. E. Sharp is clearly illustrated.

The Nickeloid Electrotype Co., Ltd., 10, New Street Hill, London, E.C.4, have issued an attractive booklet setting out their prices for the various kinds of process blocks, electrotyping and stereotyping. Details and prices are also included for photogravure plates and other specialities. A further brochure on "Half-Tone Process Engravings and their Uses" will be sent to readers applying on business letter-headings.

In September, 1923, the Metropolitan-Vickers Electrical Co., Ltd., published a pictorial issue of "The Gazette," which illustrated the newest of the company's designs and types of apparatus at that time. During the five years which have elapsed, considerable further progress has been made, and it is of interest to see once again a modern record in pictures of machines and applications of later date as published in the current issue of the same book. The illustrations should be regarded as typical, though many types of apparatus have, of course, had to be omitted for lack of space.

The Oerlikon "Bulletin" No. 84–85 deals with various developments in steam turbine design. A study is made of the improvements in thermal efficiency obtained by resorting to intermediate superheating, while the question of increasing the capacity of installations through the provision of h.p. back-pressure turbines in series with existing plant is fully discussed. A further article is devoted to compressors and vacuum pumps, and describes some recent developments in the design of this plant. "Bulletin" No. 87 reviews the progress made in the design of commutators of traction motors, and gives details of some of the latest developments in this direction. A second article discusses the relative importance of the individual inductances in d.c. machines and the extent to which they are reduced by massive iron parts. A short notice deals with the introduction of ventilated motors on tramcars, and describes some of the advantages to be derived from the use of these motors in this connection. "Bulletin" No. 88 is entirely devoted to the study of the Oerlikon yoke drive for electric locomotives, and shows the behaviour of this drive under various conditions of service.

# METER ENGINEERS.

## Final Gathering of the Association's Members at "Smoker."

A SMOKING concert took place at the White Horse Restaurant, High Holborn, London, on November 24th, to commemorate the "exit" of the Meter Engineers' Technical Association, which is to become the Meter and Instrument Section of the Institution of Electrical Engineers. Mr. Geo. D. Malcolm, president of the Association, and meter engineer of the Stepney (London) Electricity Department, presided, and an excellent entertainment was provided by Messrs. Allkins, Dennis Dodson, Casson, A. Murray McCall, Eric Thorpe, W. E. Warrilow (who told amusing stories), and a band composed of friends of members of the Association. In the course of the evening the president made a few remarks on the work and the present position of the Association, and, although we are precluded from quoting figures which he gave for the information of the members, we may at least mention that the transfer of members to the I.E.E. is making good progress and that the nucleus of a committee for the new section and a programme of its activities have been arranged. Mr. Malcolm said although they were outwardly gay and light hearted, there was in many hearts a tinge of sadness and regret that the happy family was breaking up. It was perhaps invidious to draw a distinction between the workers in any cause. The workers in their cause had been numerous, but the first name that came to his mind was that of Mr. G. F. Shotter, who was their first president and occupied that position for two years. During the time he was in command the Association grew into a not inconsiderable body, which became known throughout the world. Their vice-president and assistant honorary secretary, Mr. E. W. Hill, had also put in a great amount of work. With his wonderful grip of the English language, his keen sense of finance, and his almost uncanny gift of doing the right thing at the right time, he had been a spur to the honorary officials. He tendered to Mr. Hill his sincere thanks for his wonderful assistance and co-operation.

Mr. A. Middleton, the honorary secretary, also deserved the utmost credit for the enormous amount of work he had done during the last two years. The clerical work had grown tremendously, particularly with the additional work arising out of the negotiations with the Institution. He had carried out his work unselfishly, and with a degree of success which members would all appreciate in time.

No association could get on without a certain amount of financial trouble, and Mr. W. E. C. Alliss, who had had charge of their exchequer from the inception of the Association, had done their financial work well. He had a genius for getting in money without giving offence.

Mr. F. C. Knowles, the honorary assistant secretary, had rendered useful assistance by making comprehensive records of the proceedings.

Mr. Malcolm also paid a tribute to Mr. C. H. W. Gerhardi and Mr. E. Mathews.

*A COLLECTION of lamp publicity material which has been prepared by the Tungsram Electric Lamps Works, Ltd., of Commerce House, 72, Oxford Street, London, W.1. Treated in colours, these cards make attractive window or show-room display matter and are now available to the trade.*

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# COMPANY NEWS.

## Marconi International Marine Shares Rising—Recent Issues of Capital—Directors' Reports and Dividend Announcements—New Companies Registered—Points from Municipal Electricity Undertakings' Accounts.

MARCONI'S International Marine shares have been an active market during the past week, and the price is approximately 15s. higher at 68s. 9d. Eastern Telegraph stock is 5 points up. In the manufacturing section, Metropolitan Vickers £2 preference shares have improved 1s. 3d., and Thomson-Houston debentures have hardened, but Ever Ready shares have fallen 1s. 6d. to 25s. 6d. and Johnson and Phillips 1s. 3d. to 38s. 9d., while smaller declines are shown by Henley's and General Electrics.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest. |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 91½* | 92½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 27/- | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/6 | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord... | 30,7½ | 30,7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/- | 44/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 42/6 | 42/6 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | N'castle-upon-Tyne Elec. Sup. Ord. | 25/- | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P... .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James' & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops, Worcs. & Staffs Power B. Ord. | 34/4½ | 36/3 | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/- | 35/6 | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk... | 124* | 126 | 152½ | 24 |
| 6 | ,, ,, 6% Pf. Stk. | 127½* | 129 | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb... .. | 79 | 79 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 77½ | 77½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk... | 74½* | 72½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb... | 79½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. | 62 | 62 | 82 | 30 |
| 4½ | Met. Elec. Trams, 4½% Deb. .. | 72 | 72 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. | 66 | 66 | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 80 | 79½ | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 81½ | 81½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 116½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. | 27/- | 27/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 82/6 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P... | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb | 104½ | 103 | 109½ | 92 |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 82/6 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P.... .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf | 19/- | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord. (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 20/10½* | 27/6 | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6* | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 25/6 | 27/- | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord... .. .. | 41/6 | 42/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 115/9 | 117/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 38/9 | 40/- | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 18/9 | 28/9 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 55/- | 53/9 | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. | 27/6* | 28/1½ | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25/- | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 250½ | 254½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 79½ | 78½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 26 | 26 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 29 | 29 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 78/1½ | 77/6 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. | 68/9 | 54/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 26 | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7⅛d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus.

AEONIC RADIO, LTD.—Subscriptns. for an issue of 1 150 000 2s. shs. at par were invited on Monday, and the issue was heavily over-subscribed.

LANCASHIRE ELECTRIC LIGHT AND POWER CO., LTD.—Half-yearly div. to Nov. 30 at rate of 6% p.a., tax free, on 1st pref. shs. is announced.

CANADIAN GENERAL ELECTRIC CO., LTD.—Qrtrly. div. of 1¾% for three mos. ending Dec. 31, being at the rate of 7% p.a., on pref. stk. will be payable on Jan. 1.

WESTERN TELEGRAPH CO., LTD.—Transfer books will be closed from Dec. 3 to 10, inclusive, preparatory to paymt., on Dec. 20, of a div. of 5s. p. sh., tax free, in respect of qrtr. ended Sept. 30, 1928.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—An issue of 250 000 6½% C. pref. shs. of £1 each is offered to shhldrs. at par. Applications, on forms obtainable from the London Secretary, must be lodged by Dec. 1.

BRITISH RADIO GRAMOPHONE CO., LTD.—Subscriptions have been invited during the present week for an issue of 50 000 8% cum. participatg. pref. shs. of £1 each at par, and 100 000 dfd. shs. of 1s. each at par.

RADIO CORPORATION OF AMERICA.—Gross income for qtr. ended Sept. 30, $23 643 332; surplus pfts. for qtr., after deductg. estimated income tax, etc., $5 221 145; aggregate surplus for nine mos. to Sept. 30, $9 745 924.

EVER READY TRUST AND FINANCE CO., LTD.—Monday was the last day for shhldrs. in the Ever Ready Co. (Great Britain), Ltd., to apply for shs. in the Ever Ready Trust and Finance Co., Ltd. The issue was greatly over-subscribed.

COLUMBIA GAS AND ELECTRIC CORPORATION.—Qrtrly. div. of $1.50 p. sh. on cum. 6% pfd. stk. and $1.25 p. sh. on no par value common stk. were paid on Nov. 15. Gas and electricity sold in third qtr. of year show substantial increases.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Coupon No. 9, for the half-yearly int. due Dec. 1 on the con. 6½% prior lien bds. will be paid on and after Dec. 1 by J. Hy. Schroder and Co., 145, Leadenhall Street, London, E.C.3. Coupons to be lodged three days previous to payment.

COMMONWEALTH EDISON CO.—Operating rev. for qtr. ended Sept. 30, 1928, $17 607 054, agst. $16 314 516. Net income, after provision for taxes, int., etc., $2 501 113, agst. $2 257 511. Gross rev. for year ended Sept. 30, $76 656 369, agst. $70 439 615; net income $15 274 914, agst. $13 405 381.

STOCKHOLM SWEDISH ELECTRIC CO.—A "Financial Times" correspondent states that this co. is constructg. a large factory in Jaroslav (Russia), where electric motors up to 700 H.P. will be constructed. It is stated that the factory will be comlpleted in September, 1929, and will produce 30 000 motor yeary, averaging 10 kW.

PINCHIN JOHNSON AND CO., LTD.—The co. is to acquire the whole of the issued sh. cap. of Robert Ingham Clark and Co., and the undertakgs. of Robert Kearsley and Co., Tabor Trego and Co., and R. Gay and Co. The shhldrs. are to be asked to agree to an increase of cap. to £1 493 843 by the creation of 143 843 £1 ord. shs. A further increase of cap. to £2 000 000 is also proposed.

BUENOS AYRES LACROZE TRAMWAYS CO., LTD.—Gross receipts for year ended June 30, 1928, $7 973 709 m/n., a decrease of $35 393, and after provisn. for workg. exes., blce. is $2 773 875, plus $135 186 brt. in. Deductg. int. on debs., amortisation and sundries, and placing $350 000 to special renewal fd., net blce. is $1 358 161. To res. $61 149 (5%), to the board $61 149 (5%), to shhldrs. $1 000 000, to extraordinary res. $200 000; fwd. $35 863.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The fin. instalmt. of $18 in respect of the new ord. shs. of $100 each included in certificates of subscriptn. must be paid on Dec. 1. Rate of exchange must be ascertained from the Canadian Bank of Commerce, Lloyds Bank or the Bank of Scotland (London), with whom certificates of subscription must be lodged when the first instalment is paid, in order that definitive certificates for ord. shs. of no par value may be issued in exchange on the basis of four shs. of no par value for each $100 fully-paid sh., included in the certificates of subscriptn. surrendered.

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MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Followg. the publicatn. of statemts. purportg. to give particulars of the allocation of shs. in the cable-wireless merger co. among the shhldrs. of the Marconi Co., the directors of the latter co. have issued an intimatn. that such statemts. are unauthorised, and that until the merger co. has bn. formed it is impossible to say what offer that co. will make to the shhldrs. The positn. of the board of Marconi's Co. was defined in a statemt. published on Aug. 3 that the directors would not agree to any scheme which was not fair and equitable as between the different classes of shhldrs.

CEARA TRAMWAY, LIGHT AND POWER CO., LTD.—Net rev. for year ended June 30, 1928, £27 571, agst. £28 537. Deb. int. £9 993; to res., £12 500. Divs. on ord. shs. 5% (same as last year). Fwd. £7 733. Rpt. shows decrease in gross receipts of about 3%, mainly due to drop of about 5% in tramway receipts, rev. from sale of current for ltg. and power having increased slightly. This decrease was, in currency, offset by a saving in generatg. cost due to coming into full operatn. of new power plant, but net receipts in sterling are lower by £2 258, owing to fall in average rate of exchange. Receipts from passengers have bn. affected partly by omnibus competitn. and partly owing to political disturbances connected with Presidential electn. campaign.

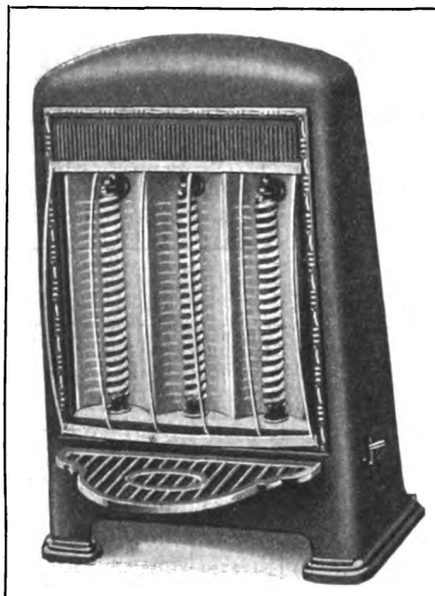
TOKYO ELECTRIC LIGHT CO., LTD.—The report for the half year ended May 31st, 1928, states that the maximum load was 523 337 kW. The electric light rev. for the six months was Yen 24 947 751, electric power, Yen 19 409 776; electric heating, Yen 703 671; and rent of electrical apparatus, Yen 2 326 406; electric tramway revenue, Yen 143 013. Total receipts, including rev. from gas supply, sales of machinery and tools, int., and divs., etc., were Yen 66 204 937 (£2 910 108 at present rate of exchange), and after provision for all disbursements, including cap. charges, reserves, etc., net pft. was Yen 17 043 062 (£749 144). The directors state that at the date of the report the capacity of the company's generating stations was 515 071 kW, and the energy purchased was equal to 275 916 kW.

DELAGOA BAY DEVELOPMENT CORPORATION, LTD.—Mr. H. K. Heyland, presiding at the mtg. last week, said electricity sold by the co. during the past year for lighting was 969 000 kWh, compared with 832 000 kWh in 1923–4, and for power, 770 000 kWh, against 513 000 in 1923–4. Tramway and omnibus passengers carried were 2 594 000, compared with 2 350 000 (tramway only). Over £700 000 had been spent on the corporation's various undertakings in Lourenco Marques, the only return to the shareholders having been £21 392, extending over a period of 22 years, whereas the Government of Mozambique and the municipality and public of Lourenco Marques had alone reaped the benefit of that heavy expenditure in being provided with up-to-date and well-equipped services of water supply, electric lighting and electric tramways. The report and accts. were adopted, and the dividend of 2% to the ordinary shareholders was approved.

SOUTHERN BRAZIL ELECTRIC CO., LTD.—Net pft. for 1927, £9 055, agst. £390 for 1926. Income from investmts., £42 823, agst. £32 030; pfts. earned in Brazil £16 414, agst. £14 449. No income has been received from two subsidiary cos. in wh. the co. holds the majority of the shs. On the other hand, £5 332, accrued int. on £200 000 7% prior lien debs. issued in Aug. 1927, appears to debit pft. and loss acct. During current year int. has bn. paid in full on that stk., and paymt. of int. on the original 6% deb. bds. at the increased rate of 6½% has been commenced. The proceeds of the 7% prior lien issue of £200 000 made in Aug. 1927, provided fds. for repaymt. of certn. liabilities, and also for extensn. purposes. Amount of capl. advances to subsidiary cos. in Brazil was increased during year by £61 583. So far negotiations with municipal authorities for revisn. of rates, to wh. subsidiary cos. are entitled in consequence of depreciatn. of Brazilian currency, have not been concluded. Net available blce. of £9 055 has bn. utilised in reducg. debit blce. of £48 108 to £30 053.

BURMA ELECTRIC SUPPLY CO., LTD.—Rpt. states that exchange value of rupee has been raised to 1s. 6d. Receipts from tramways and omnibuses for year ended July 31, 1928, were £26 694 (agst. £26 123), lighting and power £35 024 (agst. £29 385), sundries, Mandalay, £769—total, £62 487. Workg. exes. were £37 274, compared with £31 683. Income tax reserve absorbs £2 532 (agst. £1 600). After adding int. on investmts., etc., £1 946, and £7 241 brt. in., there is left £31 235. To gen. res. and depreciatn. fd. £10 000, makg. £75 112. Fin. div. on ord. shs. 3%, makg. 6% for year (agst. 8%). Fwd. £6 835. Earngs. of tramways have been seriously reduced by bad trade, but more particularly during the second half of the year by the increasing competition from motor omnibuses on the streets of Mandalay. Such competitn. has been unfair to the co.'s tramways due to the fact that, while providing a regular service throughout the day, they are burdened with the payment of track rent to the municipality and the heavy cost of the upkeep of the track.

COMPANIES TO BE STRUCK OFF THE REGISTER.—The following cos. will be struck off the Register of Joint Stock Companies,



*THE Clyde fire, by CarronCompany The loading is 2·25 kW., and a variety of finishes are available. See page 622.*

unless cause to the contrary is shown before Feb. 13, 1929: Acme Radio Valve Co.; Burke Electrical Mfg. Co.; Johnson Radio Co.; Lang Squire Wireless Mfg. Co. The following will be struck off the Register unless cause to the contrary is shown before February 16th: Benbat Radio Co.; Boston Wireless and Electrical Co.; Excelsior Electrical Co.; Lumos Radio Valve Co.; New Wireless League; Radiobats; Southampton Wire and Cable Mfg. Co.; "Walco" Electrical Co.; The following will be struck off the Register unless cause to the contrary is shown before February 20th: Albert Electrical Co.; Atelan Wireless Co.; British Gramophone and Wireless Co.; Compare Secret Radio Telegraph Co.; Freshwater and District Electric Supply Co.; Norton Electric; Princess Electrical Co.; Radio Recorders; Reliance Electrical Supplies; Switchgear and Electrical Productions; Travelling Electric Night Signs; Trust Electrical Accessories Mfg. Co.; Wavelengths; Westminster Battery Co.; Wireless and General Engineers; Wireless Waves Co.; Brotherton Ediswan Tubes and Conduits; Electro-Hydro; Electropeds; Radieco; Radio Gramophones; Wireless Equipment.

## New Companies.

VELLUM LAMP SHADES, LTD.—Cap., £1 000. Makers of and dealers in lamp shades and vellum goods, electricians, dealers in electrical goods, etc. Reg. office: 19, Rathbone Place, London, W.1.

J. H. KEY, LTD.—Cap., £2 000. Manufacturers of and dealers in electrical and wireless apparatus, electricians, etc. Solicitors: Peter Thomas and Clark, 1, Bush Lane, Cannon Street, London, E.C.

PERFECTAVOX, LTD.—Cap., £108. Manufacturers, importers and exporters of and dealers in gramophones, radio gramophones, etc. Solicitor: G. C. Peake, 24, Basinghall Street, Leeds.

CELEBRITONE, LTD.—Cap., £160 000. Manufacturers of and dealers in electrical reproducing gramophones, combined radio and gramophone instruments, wireless sets, etc. Solicitors: Soames, Edwards and Jones, Lennox House, Norfolk Street, London, W.C.2. (Public co.)

MASTER ENGINEERING AND SIGN CO., LTD.—Cap., £4 000. Electrical and general engineers, manufacturers of signs, etc. Solicitors: Frere, Cholmeley and Co., 28, Lincoln's Inn Fields, London, W.C.

LEO TAYLOR, LTD.—Cap., £1 000. To acquire business of manufacturer of and dealer in wireless instruments, apparatus and accessories now carried on by J. L. Taylor at 6, Kensington Road, Ansdell, Lytham.

CLIFFORD AND SNELL, LTD.—Cap., £1 000. Manufacturers of and dealers in wireless apparatus and accessories, electricians, electrical engineers, etc. Reg. office: 63, Sumner Road, West Croydon, Surrey.

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TURNER AUTOMATIC MACHINES, LTD.—Cap., £250 000. Manufacturers of and dealers in automatic vending machines, electrical and general engineers, etc. Reg. office: 16, St. Helens Place, London, E.C.3. (Public Co.)

STURTEVANT ENGINEERING CO. (ARGENTINA), LTD.—Cap., £20 000. Mechanical and electrical engineers and contractors, ventilating, heating, and electrical apparatus manufacturers and dealers, electricians, etc. Reg. office: 147, Queen Victoria Street, London, E.C.

ATOMIC ELECTRICAL DISPLACEMENT CO., LTD.—Cap., £100. Electricians, manufacturers of and dealers in electricity, motive power and light, batteries, accumulators and storage cells, etc. Reg. office: 20, Kingsley House, 77, Lower Thames Street, London, E.C.3.

MOTOR, ELECTRICAL AND GENERAL TRUST, LTD.—Cap., £100. To acquire business of advertising contractors and printers known as "The Preston Publicity Co."; and the controlling interest in Sphinx Electric Supplies (Ireland), Ltd.; Coal By-Products, Ltd., and Electrovite, Ltd. Reg. office: Sphinx House, 47, Hatton Garden, London, E.C.

# MUNICIPAL FINANCE.

## Points from the Past Year's Accounts of Electricity Undertakings.

THE total revenue for the year 1927–8 of the 49 undertakings included in the following table and the 168 in the tables which appeared in our issues of August 17th, September 14th and October 26th was £29 657 056. The gross profit on the year's working of the 217 undertakings was £13 874 104, and the aggregate sales of electricity amounted to 4 652 059 932 kWh, while 91 undertakings out of the total number have contributed an aggregate of £511 989 to the relief of rates.

| Authority. | Total Revenue. £ | Gross Profit. £ | Net Profit or deficit. £ | (a) Working Costs per kWh sold. | Total Cost per kWh (inc. capital charges). | Electricity sold (kWh). | Increase (+) (or) Decrease (−) in kWh sold. | Maximum Simultaneous Load in kW. | (k) Load Factor. | Radiators and Cookers Connected (total) in kW except where otherwise stated. | Other Domestic Appliances connected (total) kW. | Contributed in Aid of Rates. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Atherton U.D.C. | 25 741 | 4 409 | + 1 612 | 0·924d. | 0·967d. | 6 264 804 | + 687 185 | 3 300 | 21·67 | — | — | — |
| Battersea (London) B.C. | 171 040 | 80 219 | + 23 701 | 0·799d. | 1·297d. | 27 274 012 | + 3 245 328 | 11 080 | 28·00 | (b) 6 874 | See footnote (b) | — |
| Beckenham U.D.C. | 62 048 | 32 434 | (n) + 20 085 | 1·550d. | 2·370d. | 3 980 871 | + 807 739 | 2 300 | 19·80 | (b) 5 460 | See footnote (b) | 1 609 |
| Bethnal Green (London) B.C. | 63 650 | 30 225 | + 13 687 | 1·114d. | 1·665d. | 7 200 485 | + 1 229 443 | 3 910 | 22·26 | (b) 851 | See footnote (b) | — |
| Birkenhead T.C. | 170 528 | 71 534 | + 20 290 | 1·335d. | 2·024d. | 17 852 514 | + 2 078 410 | 8 993 | 22·60 | (b) 13 539 | See footnote (b) | 5 602 |
| Bredbury and Romiley U.D.C. | 5 677 | 2 941 | + 592 | 1·450d. | 2·650d. | 452 941 | + 190 039 | 275 | 21·65 | (c) 300 | (c) 100 | 592 |
| (d) Bury St. Edmunds T.C. | 17 163 | 7 370 | + 4 399 | 2·520d. | 3·270d. | 935 681 | (d) + 354 602 | 660 | 16·20 | 40 | 4 | 1 000 |
| Caerphilly U.D.C. | 4 163 | 1 709 | 700 | 3·970d. | 5·570d. | 148 286 | + 18 285 | 148 | 14·09 | — | — | — |
| Cannock U.D.C. | 29 713 | 9 201 | + 1 937 | 0·910d. | 1·269d. | 5 111 282 | + 469 802 | 2 885 | 27·50 | 988 | 778 | — |
| Dewsbury T.C. | 40 691 | 14 145 | + 8 048 | 1·520d. | 1·870d. | 4 172 051 | + 807 494 | 2 372 | 24·00 | 1 630 | See footnote (e) | 1 042 |
| Dorchester T.C. | 8 636 | 4 187 | + 619 | 3·250d. | 5·450d. | 328 000 | + 45 000 | 325 | 11·48 | (b) 406 | See footnote (b) | — |
| Ebbw Vale U.D.C. | 16 028 | 2 084 | + 336 | 3·300d. | 4·200d. | 800 882 | + 45 063 | 638 | 19·70 | See footnote (f) | See footnote (f) | — |
| (g) Edinburgh C.C. | 556 887 | 244 304 | + 16 371 | 0·640d. | 1·270d. | 101 597 659 | + 10 112 920 | 48 403 | 23·90 | — | — | 16 371 |
| Eston U.D.C. | 18 000 | — | — 96 | 3·000d. | 4·970d. | 846 421 | + 92 678 | 461 | 21·00 | 120 | 883 | — |
| Gloucester C.C. | 55 466 | 22 893 | + 11 745 | 1·270d. | 1·710d. | 6 147 297 | + 695 219 | 3 205 | 26·79 | See footnote (f) | See footnote (f) | — |
| Gravesend T.C. | 74 387 | 42 407 | + 12 885 | 0·550d. | 1·061d. | 13 875 005 | + 1 007 412 | 5 100 | 30·97 | — | — | — |
| (g) Greenock T.C. | 192 465 | 103 779 | + 17 207 | 0·847d. | 1·549d. | 25 122 576 | + 4 652 443 | 15 152 | 22·01 | (b) 9 512 | See footnote (b) | — |
| Halifax T.C. | 198 378 | 97 186 | + 27 372 | 0·840d. | 1·420d. | 28 975 575 | + 3 069 362 | 16 100 | 20·40 | 2,934 | (h) 740 | 8 000 |
| Hastings T.C. | 103 250 | 50 509 | + 10 972 | 0·620d. | 2·000d. | 10 574 800 | + 2 128 537 | 6 550 | 22·13 | (i) 9 496 | 665 | 2 000 |
| Hebden Bridge U.D.C. | 10 436 | 2 651 | + 705 | 1·690d. | 1·890d. | 1 103 500 | + 114 200 | 650 | 23·00 | See footnote (f) | See footnote (f) | 162 |
| Hindley U.D.C. | 4 272 | 2 235 | — 399 | 1·670d. | 2·610d. | 291 985 | + 39 308 | 230 | 14·45 | 114 | 26 | 1 500 |
| Hornsey T.C. | 80 978 | 50 587 | + 10 031 | 0·993d. | 3·324d. | 5 122 066 | + 683 355 | 4 350 | 10·80 | See footnote (f) | See footnote (f) | 2 000 |
| Ilford T.C. | 145 836 | 43 052 | + 8 791 | 1·400d. | 2·080d. | 14 288 962 | + 2 257 741 | 7 992 | 20·35 | 13 733 | 3 863 | — |
| (p) Knaresborough U.D.C. | 4 550 | 1 798 | + 862 | 3·120d. | 4·183d. | 211 392 | — | 107 | 16·00 | 40 | 20 | — |
| Londonderry T.C. | 43 352 | 27 698 | (o) + 4 816 | 1·150d. | 3·180d. | 3 219 994 | + 473 766 | 2 150 | 21·08 | See footnote (f) | See footnote (f) | 3 306 |
| Long Eaton U.D.C. | 25 054 | 8 127 | + 2 206 | 1·521d. | 2·052d. | 2 669 307 | + 912 909 | 1 246 | 24·90 | 980 | 310 | — |
| Luton T.C. | 131 758 | 54 119 | + 15 517 | 0·590d. | 0·885d. | 31 466 810 | + 6 195 461 | 14 595 | 24·60 | (b) 14 838 | See footnote (b) | — |
| Maidstone T.C. | 94 367 | 33 220 | + 6 206 | 0·769d. | 1·138d. | 17 573 183 | (k) − 2 162 289 | 7 235 | 27·70 | 6 200 | 1 200 | 3 750 |
| Mexborough U.D.C. | 19 928 | 6 296 | + 2 347 | 1·290d. | 1·540d. | 2 045 438 | + 210 680 | 817 | 28·60 | 679 | — | — |
| (g) Motherwell and Wishaw T.C. | 41 363 | 15 534 | + 822 | 1·270d. | 1·530d. | 7 636 267 | + 1 448 128 | 3 027 | 31·00 | (b) 2 130 | See footnote (b) | — |
| Mountain Ash U.D.C. | 22 446 | 10 748 | + 7 210 | 2·080d. | 2·750d. | 1 165 001 | + 121 745 | 800 | 22·00 | — | — | — |
| Newton-in-Makerfield U.D.C. | 18 000 | 6 176 | + 3 266 | 1·105d. | 1·377d. | 2 568 056 | + 1 433 213 | 1 370 | 23·08 | — | — | — |
| Normanton U.D.C. | 4 759 | 2 693 | + 625 | 0·632d. | 4·500d. | 220 232 | + 66 820 | 167 | 17·22 | (b) 182 | See footnote (b) | — |
| Plymouth C.C. | 170 716 | 91 493 | + 32 980 | 0·996d. | 2·842d. | 17 564 115 | + 2 363 266 | 9 414 | 26·60 | — | — | — |
| Pontypridd U.D.C. | 29 442 | 9 474 | + 3 947 | 1·703d. | 2·135d. | 2 734 454 | + 292 710 | 2 041 | 20·05 | (b) 4 018 | See footnote (b) | — |
| Rathmines U.D.C. | 31 014 | 1 218 | — 3 170 | 4·210d. | 4·830d. | 1 697 778 | + 238 734 | 1 069 | 18·00 | See footnote (f) | See footnote (f) | — |
| Sale U.D.C. | 15 620 | 8 029 | + 4 693 | 1·050d. | 1·660d. | 1 311 607 | + 220 274 | 625 | 25·90 | See footnote (f) | See footnote (f) | — |
| Sleaford U.D.C. | 4 625 | 2 558 | + 1 335 | 3·280d. | 5·710d. | 149 455 | + 23 869 | 162 | 15·40 | (b) (c) 20 | See footnotes (b) (c) | — |
| South Shields T.C. | 116 396 | 67 805 | + 13 803 | 0·610d. | 2·060d. | 10 597 778 | + 2 296 817 | 5 488 | 22·04 | (l) 47 | (m) 207 | 7 000 |
| Southend T.C. | 198 361 | 88 587 | + 13 594 | 1·740d. | 2·930d. | 15 172 258 | + 1 264 554 | 7 925 | 21·90 | 3 300 | See footnote (f) | — |
| Spenborough U.D.C. | 23 739 | 6 761 | + 691 | 0·950d. | 1·660d. | 3 343 887 | + 507 201 | 1 263 | 33·27 | (b) 448 | See footnote (b) | — |
| Stepney (London) B.C. | 324 377 | 165 319 | + 27 526 | 0·649d. | 1·213d. | 55 421 173 | + 7 357 522 | 29 750 | 24·76 | (b) 5 116 | See footnote (b) | — |
| Taunton T.C. | 27 936 | 11 271 | + 4 967 | 1·736d. | 2·393d. | 2 304 274 | + 301 412 | 1 360 | 19·29 | — | — | — |
| Thornton-Cleveleys U.D.C. | 5 527 | 2 752 | + 250 | 1·780d. | 3·420d. | 367 348 | + 148 279 | 195 | 24·90 | — | — | — |
| Tonbridge U.D.C. | 16 646 | 6 638 | + 2 768 | 1·770d. | 2·540d. | 1 193 827 | + 191 634 | 756 | 20·00 | (b) 420 | See footnote (b) | — |
| Tynemouth T.C. | 61 938 | 24 079 | + 10 345 | 1·544d. | 2·098d. | 7 676 098 | + 269 071 | — | — | — | — | — |
| West Bromwich T.C. | 89 670 | 24 826 | + 3 712 | 1·253d. | 1·661d. | 12 416 975 | + 1 832 282 | 6 430 | 21·98 | (b) 709 | See footnote (b) | 1 776 |
| Winchester C.C. | 40 782 | 15 512 | + 3 000 | 2·081d. | 3·326d. | 2 411 994 | + 273 683 | 1 510 | 18·11 | — | — | — |

(a) Usually include management, repairs and maintenance, rates and taxes and special charges. (b) Including other domestic electrical appliances. (c) Approximate. (d) Owing to financial year end being altered to December 31st, comparison is for 12 months in 1927 against 9 months in 1926. (e) Two washboilers. (f) Not available (g) Year ended May 15th, 1928. (h) Water heaters 59 kW; washboilers 681 kW. (i) Radiators 8 500 kW; cookers 996 kW. (k) Due to loss of large temporary consumer taking 3½ million kWh per annum. (l) Cookers only. (m) Boiling rings 202 kW; grillers 5 kW. (n) Special expenditure out of net profit on capital account, £8 698. (o) Paid into reserve fund, £1 500. (p) Fifteen months ended March 31st, 1928.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

COOPER, James, 44, Delafield Road, Charlton, electrician. £22 16s. October 13th.

FREER, Mr. H., 110, Humberstone Drive, Leicester, wireless dealer. £15 14s. 1d. October 5th.

HAYWOOD, W. G, AND CO., 30/2, Seaton Street, St. Pancras, N.W., electrical engineers. £14 0s. 9d. June 7th.

JAUNDRILL, Alec., 21, Duke Street, St. Helens, radio expert. £17 4s. October 19th.

KEWLEY, Frederick Ernest, 27, Grosvenor Court, Acton Hill, electrical engineer. £11 3s. October 17th.

RAE, CHARLES AND CO., 303, Balham High Road, S.W., electrical engineers. £14 13s. 8d. October 15th.

TAYLOR, Mr. F. G., 816, Bristol Road, South Northfield, Birmingham, electrical engineer. £21 14s. 10d. October 11th.

## Bills of Sale.

MAYOR, Arnold Bennett, 3, Skipton Road, Anfield, Liverpool, electrician. Dated November 22nd, filed November 24th. £60.

CAREY, Harold James Paulet, The Acorn, Walsall Road, Four Oaks, electrical engineer. Dated November 17th, filed November 22nd, £70.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

LANGS (WIMBLEDON), LTD., electrical engineers.—Registered November 13th, £500 debentures, to L. J. Mathias, Bronnadarn, Aberystwyth, major H.M. army (retired); general charge.

RADI-ARC ELECTRICAL CO. (1927), LTD., London, W.—Registered November 6th, £925 mortgage, to Woolwich Equitable Building Society; charged on 199, Argyle Road, Ealing.

RED TRIANGLE ELECTRIC CO., LTD., London, S.W.—Registered November 12th, £2,500 debenture, to W. F. Baker, 93, Mortimer Street, W.; general charge.

REJUVENOS, LTD., London, S.W., manufacturers of electrical appliances. Registered November 16th, series of £10 000 debentures present issue £10; general charge.

WEALD ELECTRICITY SUPPLY CO., LTD., Tunbridge Wells. Registered November 13th, £50 000 debentures, balance of £100 000; general charge. *£50 000. September 25th, 1928.

## Satisfaction.

RADIO SERVICE (LONDON), LTD.—Satisfaction registered November 7th, £125, part of amount registered July 26th, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

AYLIFFE, V. A., LTD., electrical contractors, Manchester. The statutory meeting of the creditors of the above was held recently at the Mitre Hotel, Cathedral Gates, Manchester. Mr. A. T. Bowden, of 29, Corporation Street, Manchester, reported that the liabilities were £482, of which £382 was due to unsecured creditors, and there was a contingent claim of £100 which was expected to rank. According to the books the assets totalled £629, and they were estimated to realise £201. From the latter figure had to be deducted £11 for preferential claims, leaving net assets of £190 or a deficiency of £292. The assets consisted of cash in hand, £1; book debts, £30; stock, £150; and capital expenditure £20. The issued capital of the company was £100, all of which was fully paid. The company was registered on December 3rd, 1926, and commenced a new business. No directors' fees had ever been paid, and the present position was attributed to losses incurred on contracts, and the general trade depression. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Bowden as liquidator.

The following are creditors:—Gratrix, Saml. Jnr. and Bros., Ltd., Manchester, £81; Macintosh Cable Co., Ltd., Manchester, £52; General Electric Co., Ltd., Manchester, £37; Holt Electric Supplies Co., Manchester, £32; Lee and Swindells, Manchester, £24; Philips Lamp Co., Ltd., London, £22; Gill Matt, Ltd., Manchester, £18; Henleys, W. T. Telegraph Works Co., Ltd., London, £16; Electrolier Co., Manchester, £14; Siemens-Schuckert (Great Britain), Ltd., Manchester, £12; Edison and Swan Electrical Co., Ltd., Manchester, £10.

## London Gazette, etc.

### Companies Winding-up Voluntarily.

DEAL AND SANDWICH ELECTRICAL CO., LTD. By reason of its liabilities. October 16th. F. Paul, Bath House, 57–60, Holborn Viaduct, London, appointed as liquidator.

RADIOLAND, LTD.—By reason of its liabilities, November 21st. W. Boniface, 10, Serjeants Inn, Fleet Street, E.C.4, Chartered Accountant, appointed as liquidator. Meeting of creditors at liquidator's office, 12 noon, Monday, December 10th. Creditors' claims by December 10th.

### Bankruptcy Information.

MARCHANT, Charles Henry, electrical engineer, 9, South Street, Tarring, Worthing. Receiving order, November 21st. Debtor's petition.

### Notice of Dividend.

HODDINOTT, Henry Joseph, 3 and 5, Cathedral Yard, Manchester, trading as HODDINOTT AND CO., electrical fittings supplier. First and final dividend, 2s. 5d. per £, payable December 3rd, Official Receiver's offices, Byrom Street, Manchester.

### Notice of Intended Dividend.

SPEKE, Herbert Henry, electrician, 12–17, Bilston Street, Wolverhampton. Last day for receiving proofs, December 11th. Trustee, F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

### Partnerships Dissolved.

ALDRICH AND EDWARDS (Frank Henry ALDRICH and George Herbert EDWARDS), electrical contractors, 13B, Ram Yard, Round Church Street, Cambridge, by mutual consent as from October 31st, 1928. Debts received and paid by F. H. Aldrich at 13B, Ram Yard, Round Church Street, Cambridge, or G. H. Edwards, at 93, King Street, Cambridge.

SIDNEY HATHAWAY AND CO. (Sidney Francis HATHAWAY and George Frederick TAYLOR), factors in wireless accessories, 397, Poolstock Lane, Wigan, and at Bold Place, by mutual consent as from July 13th, 1928. Debts received and paid by S. F. Hathaway.

MIDLAND ELECTRICAL CO. (Austin Davenport POCHIN and William Percy YOUNG, wholesale electrical factors, 1, Charles Street, Leicester, by mutual consent as from October 31st, 1928. Debts received and paid by A. D. Pochin.

## Bankruptcy Proceedings.

SOUTHWOOD, Thomas Southwood Smith, Westland Villa, Hunston, near Chichester, lately Pound Farm, Whyke Road, Chichester, Sussex, electrical engineer. The public examination of this debtor was held on November 21st at the Court House, Brighton, when a statement of affairs was produced which showed liabilities of £418, against assets estimated to realise £170. The debtor attributed his failure to losses on contracts and jobbing works, in consequence of inexperience in estimating, and using capital in building a house which ought to have been applied to payment of trade debts. The examination was adjourned for closing.

STEPHENS, Henry Sydney, and WEILL, Simon, trading as STEPHENS AND WEILL, wholesale accessories merchants, late of 55, Great Eastern Street, London, E.C. The affairs of this firm came before Mr. Registrar Mellor, in the London Bankrutpcy Court, on Tuesday, on the hearing of an application for discharge by the debtor Weill. The adjudication in bankruptcy took place in August, 1927, and the Official Receiver, in his reading report on the application, said that the trustee in bankruptcy considered that the debtors' estimate of their joint ranking liabilities at £36 770 was approximately correct. Their joint assets valued by them at £1 487, had realised £1 208, and a further £16 was expected. The trustee anticipated payment of a dividend of 4½d. in the £. The Official Receiver said the debtors' books could not in all respects be considered satisfactory. The applicant had admitted that he realised that the firm was insolvent in January, 1926, when the German manufacturer, whom the firm had financed, went into liquidation. All their trade debts were afterwards contracted. The applicants' drawings from the business during 1924 were £1 915, during 1925 £2 636 and during 1926 £1 195. Having regard to the position of the firm, such drawings were unjustifiable. His Honour decided to adjourn the appoication until December 10th in order that the trustee might have an opportunity, if he so desired, of adding to the allegations made by the Official Receiver, while the applicant could have an opportunity of challenging the allegation made by the Official Receiver of fraud and misconduct. The Official Receiver stated that the debtor Stephens had already applied for his discharge, which had been granted, he not having been concerned with the transactions which led up to the charge of fraud and misconduct.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

299 823 W. C. Davey. Intercommunication telephone systems. (29/7/27.)
299 749 A. Reyrolle and Co., Ltd., and H. W. Clothier. Apparatus for measuring electric currents. (30/7/27.)
275 624 Siemens and Halske Akt.-Ges. Feeding of thermionic valves from a source of current containing disturbing components. (4/8/26.)
275 628 Landis and Gyr Soc. Anon. Device for obtaining a sliding tariff, particularly on electricity prepayment meters. (7/8/26.)
299 906 British Thomson-Houston Co., Ltd., H. W. H. Warren, R. I. Martin and A. E. Smith. Insulating material. (3/8/27.)
299 907 A. Reyrolle and Co., Ltd., W. Anderson and N. Cooke. Electric oil-break switches. (4/8/27.)
280 858 Schneider et Cie. Synchronous electric motor. (17/11/26.)
299 908 W. C. De Tanner. Thermionic valve circuits. (4/4/27.)
299 914 P. O. James. Electric inductance coils. (5/8/27.)
299 916 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Telephone and like signalling systems. (5/8/27.)
299 917 J. M. Stewart. Glareless lamps. (5/8/27.)
299 922 W. E. Evans (R. F. H. Suhr). Screens or filters for high-power lights. (8/8/27.)
299 915 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Secret signalling systems. (5/8/27.)
299 927 A. Willmore and O. H. Purchase. Devices for taking-up slack in flexible elements, such as electric leads, cores, and the like. (10/8/27.)
299 931 S. G. S. Dicker (N.V. Philips' Gloeilampenfabrieken). Gas-filled incandescent cathode discharge tubes. (12/8/27.)
276 365 British Thomson-Houston Co., Ltd. Electric waffle-irons. (23/8/26.)
276 089 Instrumenti di Misura C. G. S. Soc. Anon. System for making electrical measurements in direct-current circuits. (26/8/26.)
299 946 S. Robson. Sealing of gas-chambers entered by electric conductors carrying high-tension current. (6/9/27.)
299 953 T. Broadbent and Sons, Ltd., and B. L. Broadbent. Electrically driven machines. (13/9/27.)
299 955 Siemens Bros. and Co., Ltd., and H. E. Humphries. Key-senders in automatic and semi-automatic telephone systems. (14/9/27.)
299 959 Siemens Bros. and Co., Ltd., D. A. Christian and D. P. Long. Telephone systems. (21/9/27.)
299 967 A. A. G. Jensen and W. Wadsworth and Sons, Ltd. W. Electric lifts. (28/9/27.)
299 968 T. D. Berry. Devices for testing and locating the defective insulators in electric power lines. (28/9/27.)
299 978 H. F. McLoughlin. Junction-boxes for use in electrical wiring systems. (6/10/27.)
299 982 R. F. Bruce and Saxonia Electrical Wire Co., Ltd. Insulated electric cables and the like. (11/10/27.)
299 998 S. Z. De Ferranti, J. Turner and Ferranti, Ltd. Radiators or cookers. (22/10/27.)
300 000 S. W. Hamlyn. Electric lamp bracket fittings. (25/10/27.)
300 002 General Electric Co., Ltd., and B. Pochobradsky. Elastic-fluid turbines. (27/10/27.)
300 003 H. Hitchen. Electric batteries. (28/10/27.)
295 314 Soc. Anon. D'Ougree-Marihaye. Manufacture of coke and electrodes therefrom, chiefly for use in electrometallurgy. (9/8/27.)
280 209 M. Buchholz. Method of protecting transformers, choking-coils, switches, motors, generators, and other electrical apparatus. (2/11/26.)
300 005 General Electric Co., Ltd., and F. G. Quance. Electric coupling elements. (3/11/27.)
281 262 Radiotechnique. Electron-emitting cathodes. (26/11(26.)
291 420 Soc. Anon. le Carbone. Accumulators. (4/6/27.)
300 024 General Electric Co., Ltd., and A. T. Bartlett. Lubrication of bearings. (24/11/27.)
282 646 Warner Electric Brake Corporation. Brake construction. (22/12/26.)
282 397 Fabrique D'Appareils Electriques F. Sauter Soc. Anon. Controlling arrangements for refrigerating systems. (14/12/26.)
300 038 K. Baranowski. Construction of electroplating vats or troughs. (21/12/27.)
300 042 E. Hanff. Fastening of electrical leads or wires. (4/1/28.)
300 043 E. V. Hayes-Gratze. Electroplating with chromium or the electro-deposition of chromium. (5/1/28.)
300 050 H. Ringsdorff. Electrical connections for carbon brushes. (25/1/28.)
300 053 Etablissements Tourtellier. Electric hoisting-gear of the single-drum type, with concentric, compact and weatherproof assembly. (13/12/27.)
287 545 General Electric Co., Ltd. Manufacture of light-diffusing glass. (24/3/27.)
300 060 I. Ainstein. Preparation of organic articles for electrolytically covering them with a metallic layer. (22/2/28.)
300 064 Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). Controllers for electric motors. (5/3/28.)
287 566 British Thomson-Houston Co., Ltd. Methods of and apparatus for blowing glass bulbs. (25/3/27.)
289 086 International General Electric Co., Inc. Protective devices for electric circuits. (23/4/27.)
289 481 Metropolitan-Vickers Electrical Co., Ltd. Electrical measuring instruments for alternating current circuits. (29/4/27.)
292 583 Forges et Ateliers de Constructions Electriques de Jeumont. Cascade-connected asynchronous electrical machines. (23/6/27.)
292 624 British Thomson-Houston Co., Ltd. Methods of and apparatus for shaping silica. (23/6/27.)
293 861 Westinghouse Electric and Manufacturing Co. Radio coupling devices and conductors therefor. (15/7/27.)
295 027 M. Von Ardenne. Thermionic valve circuits for wireless reception. (6/8/27.)
295 277 Akt.-Ges Brown, Boveri et Cie. Means for the suppression of back-fires in mercury-vapour rectifiers. (8/8/27.)
299 488 R. Eck and F. A. R. Gabel. Methods of and apparatus for controlling electrically operated windlasses. (8/7/27.)
299 591 P. Porscke. Galvanic cells. (8/7/27.)
299 742 O. Wild. Electrical mascots and toys. (26/7/27.)
299 752 British Thomson-Houston Co., Ltd., H. N. Sporborg, A. P. Young and A. T. Ward. Sound-reproducing records. (27/7/27.)
300,183 J. L. Baird and Baird Television Development Co., Ltd. Light-sensitive electric devices. (7/5/27.)
278,314 Samgamo Electric Co. Electrically wound clocks. (4/10/26.)
300 293 Birmingham Electric Furnaces, Ltd., and A. G. Lobley. Annealing and other furnaces, muffles and the like. (6/7/27.)
274,086 O. Schumacher. Electric arc welding apparatus. (6/7/27.)
300 295 Electric Control, Ltd. Electrical control systems containing switches and relays. (8/7/27.)
300 160 C. W. Cox and C. E. C. Shawfield. Electric fuses. (27/7/27.)
300 148 G. M. Wright and S. B. Smith. Picture and the like telegraphy. (27/7/27.)
275 630 Meyer Akt.-Ges., Dr. P. Selective electric relays. (6/8/26.)
300 152 F. Berg. Electric control switches for high-tension cables. (6/8/27.)
300 154 G. M. Wright. Electric transformers. (6/8/27.)
300 155 F. G. Hunt. Holders for electrical apparatus. (6/8/27.)
300 223 General Electric Co., Ltd., and C. E. Cutting. Electric signalling systems. (8/8/27.)
300 305 B. Hesketh. Variable electric inductances. (11/8/27.)
276003 E. A. O. Viel and J. Amiot. Electrical transformers, particularly those fo use in wireless telegraphy and telephony. (11/8/26.)
276 656 Associated Telephone and Telegraph Co. Telephone systems. (26/8/26.)
300 307 Callender's Cable and Construction Co., Ltd., and P. V. Hunter. Conduits or ducts for electric cables. (12/8/27.)
300 315 L. Miller and Metropolitan-Vickers Electrical Co., Ltd. Electric motors and control systems therefor. (16/8/27.)
300 317 British Power Railway Signal Co., Ltd., S. L. Glenn, and E. E. Pierce. Electric switches and control mechanism particularly suitable for rail signalling-apparatus. (18/8/27.)
300 320 F. H. Royce. Electrical turning-gear for starting internal-combustion engines. (19/8/27.)
300 323 Macintosh Cable Co., Ltd., and D. R. F. Milner. Means for attaching or securing electrical conductors, cables, or the like to walls or other supports. 20/8/27.)
300 326 W. A. Stevens. Safety device for electrically-driven vehicles. (23/8/27.)
280 862 H. Andre. Conductors of high negative temperature coefficient. (17/11/26.)
300 347 E. Meier. Switch device for electrically-heated apparatus and the like. (19/9/27.)
300 353 C. R. Cook. Electric terminals, couplings, and the like. (24/9/27.)
279 806 De Forest Phonofilms, Ltd. Microphones and like devices. (29/10/26.)
300 363 General Electric Co., Ltd., and W. J. Paddock. Electric motor control systems. (1/10/27.)
300 368 Siemens Bros. and Co., Ltd., and H. M. Mathieson. Electric cables. (12/10/27.)
300 371 Butlers, Ltd., and A. Reeves. Electric switches. (14/10/27.)
300 372 S. G. S. Dicker. (N. V. Philips' Gloeilampenfabrieken). Devices for rectifying and smoothing alternating current. (15/10/27.)
300 377 Callender's Cable and Construction Co., Ltd., and C. F. Whitehouse. Multi-way conduits for electric conductors. (24/10/27.)
296 420 Blaw-Knox Co. Transmission towers. (2/9/27.)
300 383 R. M. Ellis and P. W. Baker. Battery eliminators for use with wireless apparatus. (2/11/27.)
280 562 Siemen and Halske Akt.-Ges. Electric remote-control devices. (11/11/26.)
280 563 N. L. Mortensen. Controllers for electric motors. (10/11/26.)
300 397 Electroflo Meters Co., Ltd. (Republic Flow Meters Co.) Signalling-devices. (24/11/27.)
300 399 British Insulated Cables, Ltd., and A. E. Perkins. Concrete electricity transmission line masts. (24/11/27.)
300 403 S. R. Mullard (N. V. Philips' Gloeilampenfabrieken). Thermionic valves or electron discharge tubes. (5/12/27.)
300 419 R. Haddan (Steatit Magnesia Akt.-Ges.). Electric insulators. (29/12/27.)
298 970 Steatit-Magnesia Akt.-Ges. Devices for attaching hangers or bolts to electric insulators. (18/10/27.)
283 905 International General Electric Co., Inc. Electric heating machines, such as rivet heaters. (19/1/27.)
300 433 E. Schmidt. Electric switches more particularly for battery lamps. (3/2/28.)
300 446 J. A. Baker. Automatic signs for tramcars, trolley-buses, railway, and the like vehicles. (30/11/27.)
286 728 A. C. J. Guenee. Electromagnetic rail-road switch-operating devices. (11/3/27.)
290 595 Siemens-Schuckertwerke Akt.-Ges. Safety electric switches (16/5/27.)
287 847 Soc. des Telephones Grammont. Filter for preventing distortion of currents of telephonic frequencies. (26/3/27.)
287 561 British Thomson-Houston Co., Ltd. Electric switch mechanisms. (25/3/27.)
300 451 Concordia Elektrizitats Akt.-Ges., and W. Gosmann. Containers for electric accumulators. (19/3/28.)
295 370 H. A. Gill (Steatit Magnesia Akt.-Ges.) Electric resistances. (21/3/28.)
300 452 F. Quast. Magneto-electric machines. (21/3/28.)
300 457 F. Quast and A. F. V. Eichert (trading as Berko-Werke Quast and Co.) Alternating current magneto-electric machines. (24/12/27.)
293 825 Soc. des Accumulateurs Electriques (Anciens Etablissements A Dinin). Device for the control of the level of the electrolyte in accumulator batteries. (13/7/27.)
289 837 British Thomson-Houston Co., Ltd. Treating of filaments for vacuum tubes and the like. (3/5/27.)
290 210 M. Le Sidaner. Electric lighter. (9/5/27.)
292 980 A. B. Ruthsaccumulator. Electric power-generating plants. (28/6/27.)
300 490 J. Dieux. Apparatus for use in the electric reproduction of sound from disc or equivalent sound-records. (3/1/28.)
296 666 Siemens-Schuckertwerke Akt.-Ges. Alternating-current rectifiers of the metal-oxide type. (3/9/27.)
298 126 Siemens-Schuckertwerke Akt.-Ges. Lighting-installations, more particularly for mine workings. (3/10/27.)

## Applications for Patents.

### October 29th.

31 320 Automatic Telephone Manufacturing Co., Ltd., C. Gillings and T. G. Rice. Telephone systems.
31 339 British Thomson-Houston Co., Ltd., and W. J. Pool. Motor control.
31 404 British Thomson-Houston Co., Ltd. Electron discharge devices. (29/10/27 U.S.)
31 405 British Thomson-Houston Co., Ltd. Variable inductances. (28/10/27 U.S.)
31 331 C. W. Cosgrave and M. O. Valve Co., Ltd. Thermionic discharge devices.
31 257 N. F. Crane. Wireless receiving apparatus.
31 268 R. D. Delfosse. Electric signalling for railroad traffic. (29/10/27, France.
31 332 General Electric Co., Ltd. Nipples of screw lampholders.
31 314 W. R. Hume. Electric welding or deposition of metal.
31 353 I.G. Farbenindustrie A.G. Material for excluding Röntgen rays. (28/10/27, Germany.)
31 337, 31 338 International General Electric Co., Inc. Electric conductors. (29/10/27, Germany.)
31 289 K. Kaisser. Starting device for electromotors. (12/10/27.)
31 374 Metallges A.G. Obtaining smooth electrolytic metallic deposits. (27/10/27, Germany.)
31 355 L. M. Myers and Universal and General Radio Co., Ltd. Television transmitters.
31 356 L. M. Myers and Universal and General Radio Co., Ltd. Television receivers.
31 361 Rees Mace Manufacturing Co., Ltd., and K. S. S. Spencer. Radio receivig circuits.
31 400 Siemens-Reiniga-Veifa Ges. fur Medizinische Technik. Taking X-ray photographs.
31 333 Siemens-Schuckertwerke A.G. Electric switchgear. (5/11/27, Germany.)
31 344 Siemens-Schuckertwerke A.G. Electric furnaces. (12/12/27, Germany.)
31 316 Siemens and Halske A.G. Telephone systems. (5/11/27, Germany.)
31 268 A. Tasquin. System of electric signalling for railroad trafhc. (29/10/27, France.)
31 329 Vereinigte Eisenbahn-Signalwerke Ges. Switch device. (1/11/27, Germany.)
31 335 Westinghouse Lamp Co. Vacuum electric tube devices. (27/10/27, U.S.)

### October 30th.

31 521, 31 522 Almeida Accumulators, Ltd., and L. A. Levy. Secondary electric cells.
31 465 Benjamin Electric, Ltd., and H. T. Harrison. Shades for electric lamps, etc.
31 426 W. E. Box, A. E. Davies, and H. H. Thompson. Deflector devices for magnetic separators.

(*Continued on page* 640).

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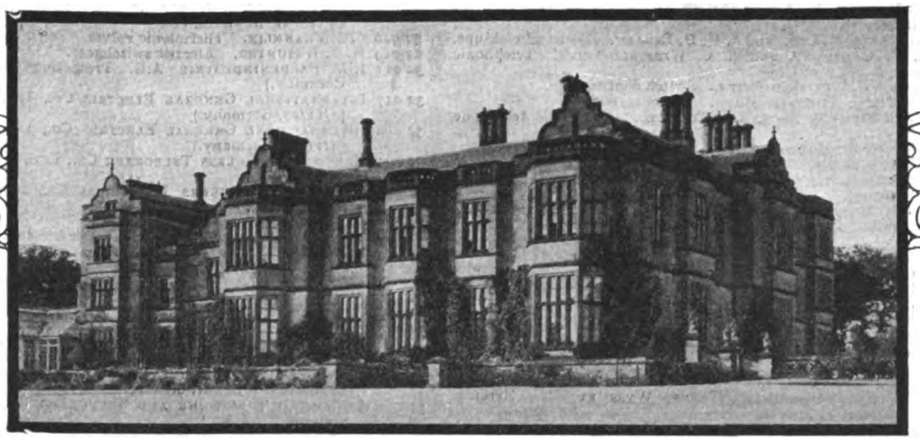

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**Amid the modern craving for novelty: things of a mere moment, it is a relief to turn to the beautifying of those things which age has mellowed and tradition endeared. The HELSBY TWIN WIRING SYSTEM brings the very latest self-contained Electric System into the home—no matter where it be nor what its size. In the modernizing of old surroundings it is a bright and cheerful way of perpetuating a very pleasant memory.**

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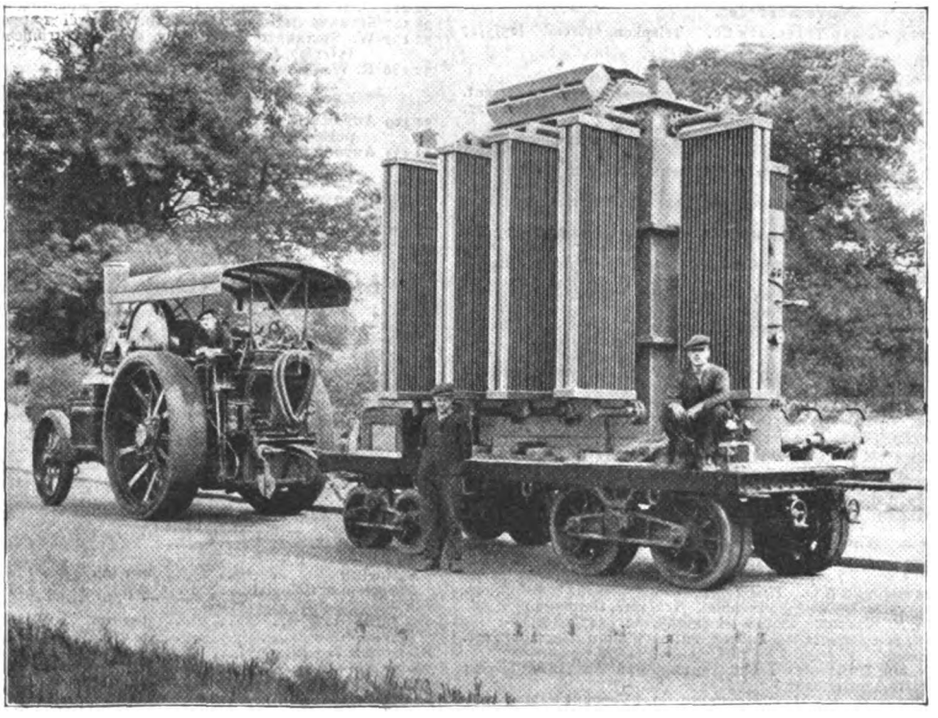

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**5,000 kVA BERRY TRANSFORMER starting from Hayes on a road journey of 200 miles**

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31 500 British Thomson-Houston Co., Ltd., and C. C. Devenny. Spark preventing devices for switches.
31 544 Burndept Wireless (1928), Ltd., and J. H. D. Ridley. Electrical pick-ups.
31 524 Burovox, Ltd., S. Cauthery, and S. C. Winfield-Smith. Telephonic microphones, etc.
31 525 Burovox Ltd., and S. C. Winfield-Smith. Switch controls, etc.
31 526 Burovox, Ltd., and S. C. Winfield-Smith. Switches, etc.
31 480 A. E. Caswell and Siemens Bros. and Co., Ltd. Automatic telephone systems, etc.
31 492 A. Heyland. Starting slip ring motors.
31 473 A. Huwyler. Electric cables. (4/7/28, Switzerland.)
31 441 F. A. Lindemann. Apparatus for producing photographic record of fluctuations in electric current.
31 531 Magnet-Werk Ges. Eisenach Spezialfabrik fur Elektromagnet Apparate. Automatic needle-catcher for textile materials. (12/3/28 Germany.)
31 537 G. W. Melland. Electric switches.
31 484 A. C. G. Menzies. Alterating current rectifiers.
31 490 C. J. Michel. Radio detector apparatus.
31 506 J. C. Savage. Electric lamps for optical projection.
31 498 Siemens and Halske A.G. Galvanic graphite and depolariser plates. (31/10/27, Germany.)
31 549 G. E. Tate. Device for automatically switching vehicle lamps.

### October 31st.

31 633 Akt. Ges. der Maschinenfabriken Escher, Wyss et Cie. Mercury switches. (6/12/27, Switzerland.)
31 619 Anglo-American Chemical Co., Ltd., and C. M. Gourvish. Electrical batteries.
31 573 W. E. Box, A. E. Davies and H. H. Thompson. Magnetic separators.
31 649 British Thomson-Houston Co., Ltd. Electrical regulators. (31/10/27, U.S.)
31 703 A. M. H. R. Brown and S. G. Brown, Ltd. Transformers, etc.
31 663 Ciné-Sound, Ltd. (E. Marcus). Apparatus for synchronous production, etc., of pictures and sound.
31 705 A. P. C. Collier. Means for making electrical connections.
31 597 J. A. Crabtree and B. G. Harrison. Electric switches, bell pushes, etc.
31 662 S. J. Eintracht and Universal and General Radio Co., Ltd. Power amplifiers.
31 647 Electrical Research Products, Inc. Signalling systems. (17/12/27, U.S.)
31 629 C. C. Gallop, G. H. Gardner, and A. Reyrolle and Co., Ltd. Electric protective systems. (29/8/27.)
31 570 F. H. Haskell. Television apparatus.
31 664 A. Huber. Electrical teaching device. (7/11/27, Austria.)
31 636 Inventum Electrical Appliances, Ltd., and A. Wright. Electric heating devices.
31 699 S. Joseph. Fuses for lighting systems, etc.
31 614 J. McLean. Galleries for electric lamps.
31 605 J. B. Meiklejohn and J. B. Meiklejohn, Ltd. Insulating switches.
31 606 J. B. Meiklejohn and J. B. Meiklejohn, Ltd. Supports for electric light pendants.
31 677 E. Morel. Magneto-electric machines. (9/11/27, France.)
31 686 J. H. Rumbaken. Magnetos.
31 684 S. M. Rutnagur. Electric traction for railways.
31 711 Standard Telephones and Cables, Ltd. (O. Bracke). Selecting switches for automatic telephone systems.
31 710 Standard Telephones and Cables, Ltd. (Western Electric Co.). Automatic telephone systems, etc.
31 673 Telefunken Ges. fur Drahtlose Telegraphie. Light control devices. (3/11/27, Germany.)
31 701 Telephon-Apparat-Fabrik E. Zwietusch and Co. Ges. Containers for electrical condensers. (12/11/27, Germany.)
31 575 T. F. Wall. Electromagnetic testing of steel wire ropes, etc.

### November 1st.

31 858 Associated Telephone and Telegraph Co. Telephone system. (25/5/27 U.S.)
31 803 A. O. Austin. Electric insulated controls.
31 780 Benjamin Electric, Ltd. Electric switches.
31 840 J. von Bosse. Extracting gas from and cleaning metal by electric current.
31 818 British Thomson-Houston Co., Ltd. Electric power systems. (1/11/27, U.S.)
31 819 British Thomson-Houston Co., Ltd. Electrical apparatus for power distribution systems. (1/11/27, U.S.)
31 807 Condit Electrical Manufacturing Corporation. Current limiting reactors. (31/12/27, U.S.)
31 808 Condit Electrical Manufacturing Corporation. Electrical switching and distribution system. (31/12/27, U.S.)
31 809 Condit Electrical Manufacturing Corporation. Self-contained rural sub-stations. (6/2/28, U.S.)
31 810 Connit Electrical Manufacturing Corporation. High tension distributing, etc. (6/2/28, U.S.)
31 811 Cotdit Electrical Manufacturing Corporation. Switch-houses, etc. (12/3/28, U.S.)
31 812 Condit Electrical Manufacturing Corporation. Electric switching systems, etc. (13/12/27 U.S.)
31 783 H. E. Cox. Wireless reception.
31 874 E H. Croft, General Electric Co., Ltd., and W. J. Paddock. Electric switches.
31 855, 31 856 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Electric discharge tubes.
31 825 F. W. V. Fitzgerald. Obtaining electric current directly from coal, etc.
31 830 E. G. Gage. Separating electric currents. (2/11/27, U.S.)
31 780 H. T. Harrison. Electric switches.
31 800, 31 801 C. Kyle. Electrostatic devices for sound reproduction.
31 745 F. W. Lanchester. Moving coil microphones.
31 857 N. V. Philips' Gloeilampenfabrieken. Arc discharge tubes. (30/11/27, Holland.)
31 772 Penrose Lifts, Ltd., and W. H. Sweet. Solenoids and electromagnets.
31 816 Siemens-Schuckertwerke A.G. Polyphase asynchronous motors. (4/11/27, Germany.)
31 852 Siemens-Schuckertwerke A.G. Plug contact connection for transformers.
31 853 Siemens and Halske A.G. Telephone cables. (26/5/28, Germany.)
31 867 S. B. Smith and G. M. Wright. Picture telegraphy, etc. (27/7/27.)
31 863 Telefunken Ges. fur Drahtlose Telegraphie. Picture telegraphy, etc. (1/11/27, Germany.)
31 864 Telefunken Ges fur Drahtlose Telegraphie. Apparatus for amplifying oscillations. (5/11/27, Germany.)
31 845 Westinghouse Electric and Manufacturing Co. Vacuum electric tube devices. (2/11/27, U.S.)
81 874 W. Wilson. Electric switches.

### November 2nd.

31 919 British Brass Fittings, Ltd., and A. Logan. Electric heating units.
32 019 British Thomson-Houston Co., Ltd. Electric switchgear.
31 935 A. Bubli. Burglar alarms, etc.
31 977 A. W. and S. and W. V. Butterfield and Mycromet Manufacturing Co. Electric lamp holders.
32 016 V. Cerri and L. Grechi. Remote control l.t. switch.
31 992 L. Dernier and Hamlyn, Ltd., and S. W. Hamlyn. Electric lamp fittings, etc.
31 979 F. Doggett, C. C. Mason and W. J. Stallan. Electromedical apparatus.
31 961 Electrical Research Products, Inc. Synchronous telegraph systems. (5/1/28, U.S.)
31 937 W. C. Fenwick, C. O. Jeffers, and J. R. Whincop. Apparatus for collection of electric impulses, etc.
32 006 C. S. Franklin. Thermionic valves.
32 019 M. C. I. Hunter. Electric switchgear.
32 011 I.G. Farbenindustrie A.G. Protecting carbon electrodes. (23/12/27, Germany.)
32 017 International General Electric Co., Inc. Electron discharge devices (2/11/27, Germany.)
32 018 International General Electric Co., Inc. Switches for transformers. (3/11/27, Germany.)
32 005 Marconi's Wireless Telegraph Co., Ltd. Signalling systems. (2/11/27, U.S.)
31 970 Metropolitan-Vickers Electrical Co., Ltd., and N. F. T. Saunders. Electric fans, etc.
31 901 T. P. Pratt. Electromagnets.
31 965 Siemens-Schuckertwerke A.G. Electric switches. (7/11/27, Germany.)
31 906 Telefunken Ges. fur Drahtlose Telegraphie. Telephone systems. (2/11/27, Germany.)

### November 3rd.

32 076 H. W. Adey. Radio receiving apparatus, etc.
32 038 J. E. Allan. Controlling electric motors.
32 122 Allgemeine Elektricitats Ges. Device for transmitting signals from railway track to moving train. (4/11/27, Germany.)
32 067 R. Anderson, F. Coates and A. Reyrolle and Co., Ltd. Controlling apparatus for circuit breakers.
32 131 Associated Telephone and Telegraph Co., and J. Wicks. Telephone systems. (9/8/27.)
32 126 F. Berg. Control switch. (6/8/27.)
32 046 R. Bosch Akt. Ges. Electrical ignition system. (26/5/28.)
32 094 British Talking Pictures, Ltd. Recording sound, etc.
32 098 Chemin de Fer Electrique Souterrain Nord-Sud de Paris. Automatic closing devices for car doors. (5/11/27, France.)
32 107, 32 108, 32 109 Eversher and Vignoles, Ltd. Mechanism for controlling motion.
32 125 Radiovisor Parent, Ltd. Sound reproduction.
32 102 Siemens-Schuckertwerke A.G. Long-distance cables. (19/11/27, Germany.)
32 106 Siemens-Schuckertwerke A.G. Means for protecting switchgear from dust, etc. (3/12/27, Germany.)
52 099 Siemens and Halske A.G. Depolarising plate for galvanic cells. (17/11/27, Germany.)
32 047 Telefunken Ges. fur Drahtlose Telegraphie. Electromagnetic wave signalling systems. (24/11/27, Germany.)

### November 5th.

32 226 Almeida Accumulators, Ltd., E. Almeida and R. K. Morcom. Electric cells.
32 227 Almeida Accumulators, Ltd., and E. Almeida. Electric cells.
32 228 Almeida Accumulators, Ltd., and L. A. Levy. Electrolytes for electric cells.
32 266 J. L. Baird and Television, Ltd. Television systems, etc.
32 257 British Thomson-Houston Co., Ltd., and H. Trencham. Electric draw-out switchgear.
32 232 Cambridge Instrument Co., Ltd. Measurement of forces.
32 249 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Means for increasing actinic effect of light rays.
32 250 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Circuit arrangements for amplifying electric oscillations.
32 221 J. Dieux. Transformation of electric currents. (7/1/28, France.)
32 230 Ferranti, Ltd., and S. Z. de Ferranti. Induction meters.
32 231 Ferranti, Ltd., and S. Z. de Ferranti. Electric fires.
32 255 D. B. Hoseason and Metropolitan-Vickers Electrical Co., Ltd. Electric motors.
32 279 J. Robinson. Electric vaporisers. (31/8/28, U.S.)
32 211 D. W. Sayers and S. J. Tyrrell. Mounting inductance coils.
32 197 Siemens Bros. and Co., Ltd. Recording apparatus.
32 177 W. Steinert. Electrically driven instrument for depilating skins, etc. (5/11/27, Germany.)
32 188 R. W. Thompson. Signalling apparatus.

### November 6th.

32 429 Automatic Telephone Manufacturing Co., Ltd., and S. R. Smith. Impulse sending arrangements for telephone systems, etc.
32 433 Automatic Telephone Manufacturing Co., Ltd., C. Gillings and W. H. Paulett. Telephone systems.
32 305 J. Bowie. Automatic voltage selecting relay.
32 368 British Thomson-Houston Co., Ltd. Electro-acoustic devices. (13/12/27, U.S.)
32 420 L. G. H. Cantle and N. E. Carvill. Electrical reproduction of sound.

## METAL AND CHEMICAL PRICES.

Tuesday, November 27th

| | Price. | Inc. | Dec. |
|---|---|---|---|
| *Copper*— | | | |
| Best Selected .. .. per ton | £72 10 0 | — | — |
| Electro Wirebars .. .. ,, | £75 5 0 | — | — |
| H.C. Wires, basis .. .. per lb. | 10 7/8 d. | — | — |
| Sheet .. .. .. ,, | 10¼d. | — | — |
| *Phosphor Bronze*— | | | |
| Wire (Telephone) basis .. per lb. | 1s. 1 1/8 d. | — | — |
| *Brass* 60/40— | | | |
| Rod, basis .. .. .. per lb. | 8¼d. | — | — |
| Sheet ,, .. .. .. ,, | 10¼d. | — | — |
| Wire ,, .. .. .. ,, | 10¼d. | — | — |
| *Pig Iron*— | | | |
| Cleveland Warrants .. .. per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. .. .. ,, | £14 15 0 | — | — |
| *Lead Pig*— | | | |
| English .. .. .. per ton | £22 10 0 | — | — |
| Foreign or Colonial .. .. ,, | £21 2 6 | — | — |
| *Tin*— | | | |
| Ingot .. .. .. .. per ton | £239 10 0 | £9 0 0 | — |
| Wire, basis .. .. .. per lb. | 3 1 | 1d. | — |
| *Aluminium Ingots* .. .. per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. .. ,, | £25 2 6 | 7s. 6d. | — |
| *Mercury* .. .. .. .. per bottle | £22 10 0 | — | 5s. 0d. |

*Sulphur*—Flowers, Ton £12 0 0 Roll, ,, £10 15 0
*Copper Sulphate*—Ton £25 to £25 10 0
*Boric Acid* (Crystals) ,, £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0
*Sodium Chlorate*—Per lb. 2½d.
*Sodium Bichromate*—Per lb. 3½d.
*Rubber*—Para fine, 10½d.; plantation, 1st latex. 8¼d.

∴ The metal prices are supplied by British Insulated Cables Ltd.

## LEAD MARKET REPORT.

James Forster and Co. announce that during last week the market displayed a firmer tone. The price for American lead is unchanged at 6·35 cents, though a better tone is in evidence.

Closing prices on November 24th were £21 3s. 9d. for November, £21 6s. 3d. for December, £21 8s. 9d. for January, and £21 10s. for February, 5s. to 6s. 3d. per ton higher on the week.

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

*Bouverie House, Fleet Street, London, E.C.4. Telegrams: "Benbrotric, Fleet, London." Telephone: City 0244 (Ten lines).*

No. 2636. [No. 23. Vol. CI.] Friday, December 7, 1928. Annual Subscription, 25s. Overseas, 30s.

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# Current Topics.

## In the Pillory.

ON the eve of going to press we have received a proof copy of the latest B.E.A.M.A. "Trade Survey." As usual, its keynote is one of almost unrelieved pessimism, though a touch of brightness is at times apparent in the observations on the newspaper criticism which greeted the last issue of the "Survey." While the credit policy of the Bank of England comes in for a good deal of criticism, the city editors of the daily papers in general are blamed for their modest part in shaping the programme of the Old Lady of Threadneedle Street. On reading this we fondly thought that we had on this occasion escaped, for it was only quite recently that the Statistical Department of the B.E.A.M.A. made it clear that while the daily Press left little to be desired the real villains of the piece were to be found in certain electrical journals. However, we were a little too hasty, for on page 26, both THE ELECTRICIAN and "The Electrical Review" share the honour of being pilloried on a charge suggesting that we have not made the "most cursory examination of the 'Trade Survey' in question," and that we have no knowledge of the unemployment situation. In support of this charge the "Survey" refers to THE ELECTRICIAN of October 19th, an issue which contains so far as we have been able to trace no reference to that publication, though in our issue of October 12th we did have something to say about it. After further consideration of our remarks, made nearly two months ago, we regretfully find that not only do we still adhere to them in regard to the publication which called forth those remarks, but we still find that many or them apply with equal force to the matter now under review. As we then said, "unbridled optimism is a dangerous thing, but there are occasions when it is preferable to gloomy forebodings which tend rather to accentuate temporary difficulties than to overcome them." The whole crux of the differences of opinion existing between us—and, we believe, our contemporary—and the writer of the B.E.A.M.A. "Trade Survey" is contained in the statement (on page 26 of the latest "Survey") that "If a trade survey is to be accurate at all, it must state the truth and avoid propaganda." Now while we would be the last to suggest that it did not at any time state what it did not believe to be true, it certainly does not "avoid propaganda," although we certainly agree that it should

## Purpose of the Survey.

ITS function, as we see it, is to record current tendencies—financial and industrial—in so far as they affect the electrical industry and, to a limited extent, to comment on them. But the attack on banking policy, even supposing it is justified up to the hilt, is real and well sustained propaganda. Again, the chapter on "Power Station Efficiency," a section which would make interesting reading in an electrical journal, can only be regarded in its present context as a piece of propaganda, however true. We entirely agree that the efficiency and low capital cost of present-day British power stations, equipped throughout with British plant, should command general admiration, and the more widely this is appreciated the better. As a chapter in a "Trade Survey" which eschews propaganda it savours somewhat of an attempt to paint the lily. In making these observations we are not unmindful of the complexity and difficulty of the task of reading the signs and portents with which the compilers of this B.E.A.M.A. publication are faced. We of the Fourth Estate are accustomed to such tasks, and our daily experience teaches us more of the dangers of dogmatism and of the need to take the "long-term view." These "down and out" lamentations unfortunately come to the eyes of people who have been, or might be, buyers of British electrical goods, and only confirm the stories, spread so sedulously by our competitors for the world's electrical trade, that the British electrical industry is in its death throes. Nothing, of course, could be further from the truth, but those who have been prepared to take that view will find all the confirmation they require in certain portions of this "Survey."

## Credit Policy.

TURNING now to the attack on the Bank of England's credit policy, we again find what looks remarkably like inconsistency. A decline in the purchasing power of the public generally, is "attributed to the credit policy pursued by the Bank of England since the spring of this year." Later on, however, it is stated that the policy complained of was initiated so long ago as the autumn of 1920. If, as we believe, there has been no marked change in the credit policy during the past eight years, it is strange that the "Survey" did not take this existing policy into consideration when making its exceptionally favourable and optimistic forecast for 1928. These continual cries of "Wolf," and the offering up as burnt

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offerings of the Bank of England and most of the Press of this country to make a prophet's holiday, must make amusing reading for our competitor rivals on the Continent and elsewhere, though we do not think they will appeal in quite the same way to the British manufacturers who are keeping a stiff upper lip and going all-out for all the business that is to be had, both in home and overseas markets.

## The Danger of Reparations.

ONE portion of the "B.E.A.M.A." Survey which appeals to us particularly is that devoted to a discussion of the Reparations problem. It has, of course, long been evident that there can be no real victor in an upheaval of the magnitude of the last European War, and events have strengthened the impression that the "vanquished" of 1914–1918 are well on the way to victory in the trade conflict which has raged during the past ten years. It seems a fine thing to the uninstructed member of the public that our late enemies are paying us and our war-time allies so many millions a year by way of reparations. In practice, however, reparations resemble the politicians' schemes for giving us all something for nothing—but not this year. Germany, being allowed each year to make part of her payments on Reparations account by deliveries in kind, is naturally using these deliveries to develop her export trade and secure the entrée into markets that were formerly closed to her. Cases are cited in the "Survey" to show that while a contract for only a portion of a complete electrical equipment may be supplied by Germany on Reparations account, the way is well paved for the completion of the contract for the same source in the ordinary course of trade. The danger of this policy does not need to be emphasised, particularly in its bearing on the British electrical industry. The question is, how can one guard against this comparatively new form of "peaceful penetration."

## The Electric Vehicle.

THOUGH we were pleased to see a number of electric vehicles among the exhibits at the Public Health Congress, at the Agricultural Hall, it gave us greater pleasure to learn the views of Mr. JAMES JACKSON, general manager of Birmingham Salvage Department, upon the uses of these vehicles. According to this authority the proportions of horse and electric cleansing vehicles in ninety-three towns are 63·27 against 16·37 respectively. The "disadvantages" associated with electric vehicles are, it is pointed out, more apparent than real, and wherever an authority is in possession of destructor plant of sufficient size to generate the current required at a point near to the garage where the vehicles are housed, no real difficulties need be anticipated. After the views expressed in these columns upon the same subject it is hardly necessary to say that we agree with Mr. JACKSON. Again, in the matter of carrying foodstuffs such as bread, milk, etc., the prevailing use of the petrol vehicle is one which we would gladly see dispensed with. Though some motor car owners will point out that no fumes come in contact with the contents of the van, or that, even assuming that they do, they cannot be detected in the case of bread, we venture to put forward the opinion that town bread carried by petrol driven vans tastes differently from country bread. We believe that if electric vehicles were used for carrying foodstuffs which take up odours, the difference between town and country foods would, at any rate, be less, in so far as their purities are concerned.

## The Lincoln Inquiry.

SOME interesting and novel features of the scheme promoted by Mr. R. BORLASE MATTHEWS, for the electrification of the County of Lincoln, were disclosed at the Electricity Commissioners' inquiry held at Lincoln last week. The outstanding feature of the scheme is, of course, the well thought out plan for electrifying such a large rural area. Some idea of the thorough manner in which the scheme was prepared can be obtained from a study of the estimates of anticipated revenue and expenditure. For instance, the 6 600 V lines are estimated to cost £308 per mile, as compared with £560 given by the Yorkshire Power Co., while the 33 000 V lines were estimated at £463, as compared with a figure of £1 100 given by the Yorkshire Power Co. Such figures in themselves would seem to be boastful, and of little interest, were it not for the fact that a detailed statement was incorporated showing every item of expenditure that would be entailed in erecting such lines. The anticipated revenue is also of interest, as the revenue per unit sold is estimated at as low a figure as 3·5d. the first year, 3·2d. the second year, 2·9d. the third year, and 2·5d. the fourth year. The promoter stated in his evidence that this low charge per unit is one of the most important features in a successful rural supply undertaking, for in conjunction with hire and hire-purchase facilities it would inevitably result in a high consumption per consumer. The sale of current per head of population in the area is estimated at 9·8 during the first year, rising to 74·8 in the fifth year. The amount of capital to be expended during the first three years is about £350 000, and it was shown that provided the scheme was carried out on the lines suggested, it would be possible to provide a satisfactory return on this capital during the first few years of operation. While the expert technical evidence seemed to be unassailable, the financial side appeared to be similarly safe. It therefore seems likely that, subject to the Order being approved by the Electricity Commissioners, one of the first comprehensive rural electrification schemes in this country will be commenced in the County of Lincoln in the course of the next few months.

## Common-sense in the Home.

FOLLOWING the two recent fatalities in which thoughtless people have been killed through using unearthed portable electrical apparatus in bathrooms, there has been a revival in electrical circles of the arguments for and against the tactful instruction of the public in the common-sense ways of using electrical equipment in the home. One school of thought maintains that as electricity is so safe it is unnecessary and even harmful to public confidence to warn people of the dangers attending its use in certain unauthorised ways. On the other hand it is contended, and rightly we think, that the very safety of electricity constitutes the chief danger in cases of this kind. After all, there is no need to frighten people, but there is no reason why they should not be told that it is at least unwise to hug a portable fire while indulging in a bath. The public is already well used to elaborate precautions when using gas, and every gas geyser is provided with a large card of printed rules and "don'ts" which are frequently added to by the representatives of a solicitous gas company. The precautions necessary when using electricity are very few indeed, and, if properly explained, quite reasonably necessary. By deliberately keeping this essential knowledge from the consumers of electricity we have invited the careless usage of portable appliances. The case for reasonable enlightenment seems to us to be overwhelming. The question is how shall it be done. The simplest and most practical method would be for manufacturers of potentially dangerous domestic appliances to draw up a few "hints for the user" and affix them to each article they sell. This, of course, would not affect all the existing consumers, but even they could be reached by means of notes printed on the backs of supply undertakings' quarterly accounts. When it is realised that women will use all-metal vacuum cleaners on concrete pavements outside their houses for cleaning mats and the like, and fill electric kettles under water taps without removing the flexible connection to the supply mains, it is obvious that we must either supply them with equipment which is more than fool-proof or else give them instructions for use.

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# MODERN TENDENCIES IN HEAVY POWER SWITCHGEAR.

## Control Gear of Large Rupturing Capacity—Characteristic of Large Units which Could be Improved—The Question of Flexibility—Disadvantages of Rigid Coupling.

By G. L. E. METZ.

THE modern tendency is toward the erection of so-called super-stations of large plant capacity and the interlinking of one system with another in an endeavour to meet the present demands for electricity for industrial and domestic services and the future demand expected from its application to rural activities.

The control of the large amounts of power that will have to be dealt with would not in itself be a difficult matter, provided the problem could be approached *ab initio*; but unfortunately the skeleton framework upon which the new developments have to be built is already in existence.

When it is remembered that this framework has grown up as a natural result of local economic requirements, and without any view to co-ordination of operation on a national scale at a future date, it will be appreciated that the problem of interconnection will bring with it many difficulties, not the least of which is the clearing and limitation of faults and disturbances.

The opportunities for providing a scientifically graded and sectionalised system of reactance to limit the concentration of energy and the effects of disturbance during fault periods, together with a comprehensive and co-ordinated system of protection rapidly to isolate the faulty section not being available, it follows that a greater number of breakers of large rupturing capacity will have to be used than might otherwise have been necessary.

This forces attention in the direction of control gear of large rupturing capacity. Heavy switchgear of this type has always been subject to the dictatorial, though mysterious, influence of fashion, and strong prejudice has at times given place to popularity in a manner that is inexplicable.

At the present time this heavy gear may for purposes of classification be dealt with under two headings :—(1) Cellular or open-type gear ; (2) Armourclad or closed-type gear. Both types have advantages and disadvantages peculiar to themselves, which are alternately magnified and minimised by conflicting and interesting parties.

Without presuming to dogmatise, it is safe to predict that finality is not reached by either type of gear, and that they will be ultimately replaced in very heavy service, such as in some cases modern exigencies will demand, by a new type of gear that will combine the advantages of the two and eliminate the disadvantages of both.

### The Gear of the Future.

The majority of troubles met with on these two classes of gear are due to the fact that the cellular or open-type of switchgear is too open, and the armourclad or closed-type is too closed ; and in the opinion of the writer the gear of the future for heavy power duties and large rupturing capacity will come in a class between these two extremes.

The increasing and deserved popularity of compound filled gear which has enabled it to make a place for itself in the sun has been obtained partly at the expense of exploiting the weaknesses of cellular type gear. It will, therefore, be assumed that interested parties have noted the disadvantages this type of gear possesses, and suitably multiplied or divided them by some factor their experience has suggested.

Armourclad gear, as a relatively new arrival and latest expression of modern thought, has so far enjoyed comparative immunity from serious criticism.

Without any desire to disparage a very useful and efficient piece of apparatus, there are certain characteristics of large units that could certainly be improved with advantage.

The outstanding points of interest are those of flexibility and ability to clear faults without damage to the busbars or adjacent units. Considering, for the moment, the question of flexibility, it could hardly be suggested that the method of changing over from one set of busbars to another by means of a removable plug was ideal, and yet this method is employed on some of the most modern designs. If the alternative method employing change-over selectors is used, which would immediately suggest itself as a much more convenient arrangement, there are certain difficulties to overcome. A considerable risk is incurred in having a single tank containing connections from both sets of busbars so close to the oil circuit breaker tank, which has been known to explode when clearing a fault, introducing the possibility of damaging the selector switch tank, and short circuiting both sets of busbars.

The practice of erecting large rupturing capacity units all rigidly connected on to a common set of busbars, to form a switchboard without barriers between units, leaves room for criticism, which experience has shown to be only too well founded.

The bursting of a tank of one unit can quite easily damage adjacent units so severely as to create faults and failures in them, and it would appear that for large units a barrier between tanks is a wise precaution.

The jump which a breaker nearly always gives when clearing a fault is communicated in the form of a direct blow to the busbar system, to which it is rigidly connected, and is very liable to cause serious damage.

### Cumulative Weaknesses.

All of these weaknesses are liable to operate in a cumulative fashion and hand on failure from one unit to another right down the switchboard, and, unless the writer is mistaken, there is a case on record of such a serious fault occurring which, starting with the failure of one unit, communicated itself somewhat in the manner indicated.

Now the weaknesses referred to above are all due to the fact that the busbars, selectors and breakers are not in separate compartments, as in cellular gear, but are rigidly coupled together.

It is not suggested for one moment that armour-clad gear is unreliable, even in the so-called larger units as known to-day, and any move to undermine the well-earned position it enjoys is to be deprecated. At the same time it has certain characteristic disadvantages—some of which have been mentioned—that will have to be got over before it is suitable for the still larger breakers that will be required ; moreover, their presence clearly indicates that finality has not yet been reached, and that the future will see a still further type of gear evolved in which these present difficulties are overcome.

For very large breakers in important positions it would appear that a compromise whereby the compactness of armour-clad gear would be retained with the added advantage of separate compartments would go far to provide a solution. This could be effected by providing a two-compartment cell with the selectors mounted in one compartment and the breaker in the other, the compound filled busbars being mechanically shielded and running over the top of the structure.

This would, of course, be a slightly more expensive arrangement than either of the existing types, but if a system is so designed or interconnected that the concentration of, say, 1 000 000 kVA of short circuit energy is possible, then it is not unreasonable to assume that the economies effected by this concentration of plant in some other direction are sufficient to warrant this extra expenditure upon suitable switchgear to control it.

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## E.T.B.I. SILHOUETTES.

WE are glad to announce that there has been a good response to our invitation to readers to purchase copies of the silhouette portraits, specially done for THE ELECTRICIAN at the recent annual festival dinner of the Electrical Trades Benevolent Institution by Baron Scotford and Peggy Newall.

There are, however, quite a number of portraits which have not so far found purchasers, and as the entire proceeds of the sale of those pictures will be handed to the Electrical Trades Benevolent Institution, it is hoped that those who have not yet sent in their orders will do so within the next few days. As previously explained we are not making a fixed charged for the silhouettes, but suggest that a sum of not less than 2s. 6d. should be tendered for each portrait ordered.

Any number of copies of a particular portrait can be supplied, and they can be mounted, if desired, in the form of calendars suitable for distribution to friends.

Orders, which should be sent to the Editor, THE ELECTRICIAN, Bouverie House, Fleet Street, London, E.C.4, will be dealt with in strict rotation.

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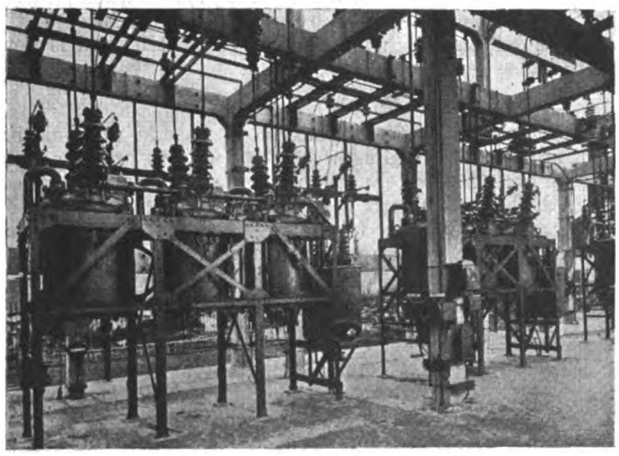
# NEW POWER STATIONS AND EXTENSIONS.

## The Brimsdown Station—New 40 000 kW Set at Barton—Extensions at Belfast—A New Automatic Motor Sub-Station.

ON account of the number of important power station developments—new stations and extensions—that have been inaugurated during the past few days, it is proposed here to deal with them together. The stations to be dealt with in this way are the new Brimsdown station of the North Metropolitan Electric Power Supply Co., the extensions at the Barton power station of the Manchester Electricity Department, the extensions at the Belfast Corporation's station, and the automatic motor-converter sub-station of the Charing Cross Electricity Supply Co., which was inaugurated at Aldwych House, London, on Tuesday.

The North Metropolitan Electric Power Supply Co. had originally two main power stations, one at Willesden and the other at Brimsdown. Normally these two stations, which are interconnected, are run in parallel with one another, and



Outdoor switchgear at Brimsdown. A close-up of one of the circuit breaker bays.

the County of London Electric Supply Co.'s station at Barking (connected by two 30 000 V underground mains, each capable of carrying 15 000 kVA) runs in parallel with them.

The load on the North Metroplitan system, which in 1922 was 27 700 kW, had by 1927 reached 65 800 kW.

The capacity of the plant installed at the two stations at the end of 1925 was at Willesden 24 500 kW, and at Brimsdown 23 600 kW, and the load on the system that winter was 49 000 kW. The maximum demand was therefore approximately equal to the capacity of the two stations, whilst the demand was growing at the rate of 8 000 to 10 000 kW a year.

Permission was obtained to proceed with the first section of the new Brimsdown station, consisting of two 25 000 kW turbo-alternators, together with a boiler house containing five units, arranged in such a manner that two boilers would normally deal with one turbine, the fifth boiler remaining as a spare for either of the two sets. The completed scheme is planned to consist of three such sections, i.e., of six 25 000 kW turbines and three separate boiler houses.

At the time the station was put in hand the position in regard to the cooling water was a difficult one, inasmuch as negotiations with the Metropolitan Water Board for the use of the water in the King George Reservoir for cooling purposes had not come to a head. In these circumstances the new station was designed in such a manner that the pumping plant could take care of the requisite cooling water from any one of the three possible sources, the River Lee Navigation, the King George Reservoir, or cooling towers.

It was contemplated that the first section of 50 000 kW capacity could readily be dealt with during the winter months from the existing flow of the river, while the old Brimsdown station would also be able to operate, if necessary, in the winter, and carry a considerable load if conditions were favourable. Broadly speaking, however, it is not proposed to run the old station at the same time as the new one, but the former will be treated as a reserve set; in other words, if one of the 25 000 kW sets failed, the old station could take its place. One of the sets in that station, however, would always be running for supplying the new station with auxiliary power, thus keeping the old station in running order and in a position readily to take up load in emergency.

The company's officials, Mr. J. M. Donaldson, chief engineer, Mr. W. N. C. Clinch, power station engineer, Mr. C. A. Smeed, chief architect, and Mr. A. H. Jenkins, chief electrical designer, were responsible for the major part of the general design of the steam raising, generating, and ancillary plant, as well as for the structural work.

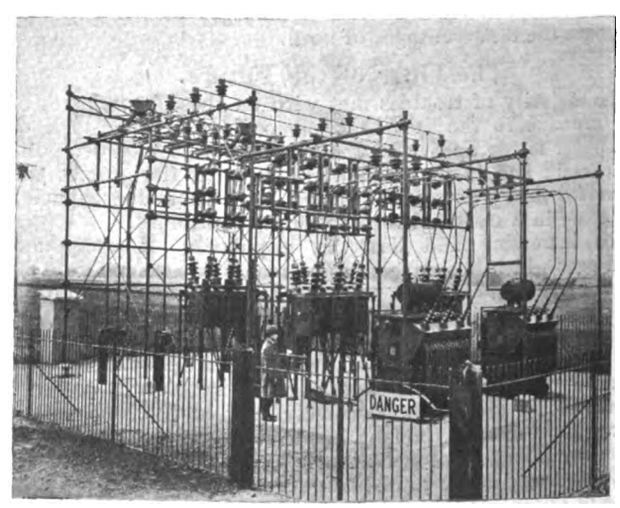
The area of the site occupied by the new station and its ancillaries is 43 acres, and it is level with a sound gravel foundation, which has been made use of for the larger part of the concrete required for the new buildings. The Lea Navigation is on one side and the London and North Eastern main line on the other.

Coal is delivered normally from the L. and N.E. Railway by means of a branch siding, but can also be obtained from the Lea Navigation, this involving the transfer of the coal from barge to truck and then passing the trucks along the siding. The coal as it enters comes over a weighbridge, and the trucks are tipped by an automatic side tippler into a hopper, from whence the coal is carried by a tray conveyor to a point where it may be discharged either on to the belt of an endless conveyor to go to stock, or to a magnetic separator and through crushing machine to one of two bucket conveyors, which carry the coal to raw coal bunkers at the top of the pulveriser house. The endless belt conveyor which takes the coal to stock can also be used in the reverse sense for taking it back to the raw coal bunkers, and the coal is placed on this conveyor by means of a crane with fixed jib, electrically driven and running along wide gauge tracks which are connected at the west end, so that one crane can run on either track.

The total capacity of this coal store is 20 000 tons, the coal being stored at a maximum depth of 10 ft. It is the intention, when the pulveriser house is completed by an extension northwards, to have an exactly similar arrangement on the other side, so that the coal handling arrangements will be in duplicate.

The pulveriser house is a lofty structure, the top being formed by the raw coal bin. The raw coal passes down from this through a weighing machine, either direct to the pulveriser or through a pair of driers, the drying being effected by means of live steam, which is obtained from the station by means of two pipes on the ash gantry.

There are at present three pulverising mills, having a capacity of about 15 tons per hour each, and the pulverised




The Buntingford sub-station of the North Metropolitan Electric Power Co.

coal is brought back into cyclones by exhausters, which, however, do not handle the powdered coal itself. This powdered coal then enters one of two screw conveyors, which carries the pulverised product to one of three "Fuller-Kinyon" pumps, which are really coal transport devices consisting of a screw working under air pressure. Each of these pumps has a capacity of 40 tons per hour, and the auxiliary air is supplied by two air compressors.

Two pipes serve to convey the powdered fuel from these pumps to the powdered fuel bunkers, which are immediately above the boilers in the boiler house. There are five bunkers corresponding with the boilers, and there is a special switchboard, which diagrammatically indicates the automatic

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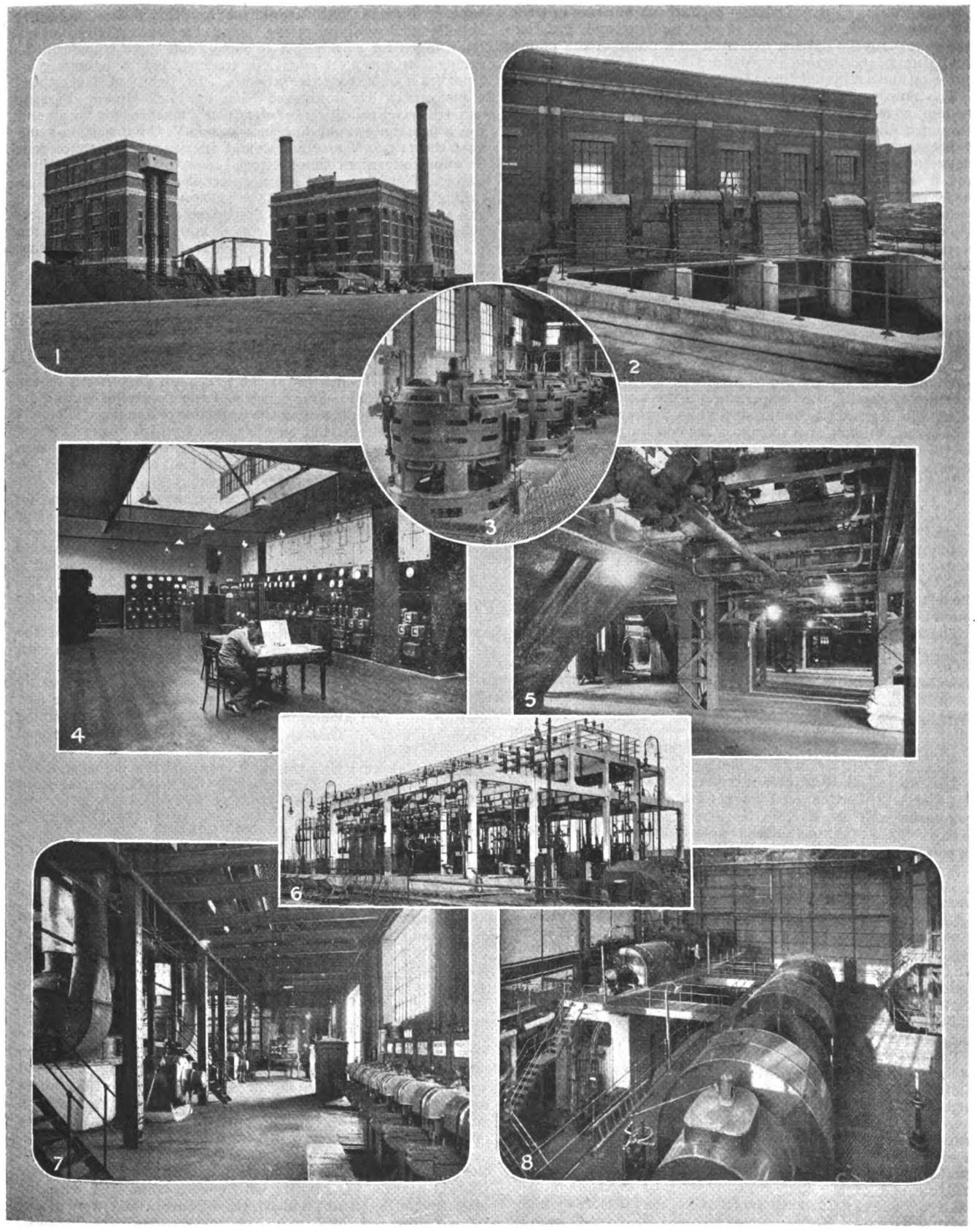


## BRIMSDOWN IN PICTURES.

*FURTHER views of the new Brimsdown station of the North Metropolitan Co. (described in the accompanying article) are reproduced on this page. The pictures show :—(1) A general view of the power station, pulveriser house, and coal handling plant as at present in operation ; (2) the screen pit and circulating water screens ; (3) inside the circulating water pump house ; (4) a view of the control room ; (5) part of the boiler house basement ; (6) a view of the outdoor switchgear ; (7) the floor of the pulveriser house, showing portions of the switchgear, mills, and (centre background) the "Fuller Kinyon" transport indicator panel ; and (8) a view (looking north) of the turbine room showing both of the new generating sets.*

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passage of the powdered coal to each of the bunkers in turn. The transmission pipes are at present underground, but they will eventually be carried overhead to a point in the middle boiler house, and then in either direction to the existing boiler house on the south and the third boiler house on the north.

The powdered fuel from the bunkers falls into a feeder system consisting of four duplicate feeders serving eight burners of the Lopulco type.

The combustion chamber is a very large one, extending right down to ground level, including, of course, the ash pit, and it is partly lined with water tubes on the sides with a water screen above this pit, while the back part consists of a radiant heat superheater.

The gases from the boiler pass first of all through an economiser and afterwards through an air heater, and so to the chimney stack. The chimney stack on the south side of the boiler house is considerably smaller than that on the north. The reason is that the southern stack deals with two boilers only, while the northern stack has to take care of the three boilers on the other side of the house, and, in addition, two more in the next house to be built.

These boilers have each a normal capacity of 100 000 lb. per hour actual at a blow-off pressure of 340 lb. and a normal pressure of 325 lb., the temperature of the superheated steam being 750 deg. at the boiler stop valve; they are, however, capable of running at a rating of 125 000 lb. per hour under overload conditions continuously, and no doubt would be capable of considerably more output if required.

## Ash Discharge.

The ash is discharged into a sluicing system in the boiler house basement, and goes to a settling tank where the water is pumped back, the same water being used more or less continuously. The ashes are extracted from this settling tank by means of an overhead runway and grab, which enables the ash to be taken away either by cart or by rail as may be found convenient.

The space which would normally be occupied by the sixth boiler is utilised as follows:—

On the ground floor is a fitters' shop directly served by a spur from the railway siding. The boiler house and turbine room staffs are also accommodated on other floors, and there is also an office for the boiler house engineers, a test laboratory, turbine test tanks, and the surge tanks working in conjunction with the condensate pumps and feed pumps. An automatic lift serves these floors.

The turbine house at present contains two turbo-alternators, together with certain feed pumps and auxiliary apparatus, switchgear and the like. It is served by means of a spur from the railway siding, which passes alongside the outdoor 33 000 V switchgear.

A crane capable of handling 80 tons and equipped with a subsidiary grab for loads up to 10 tons is arranged so that any material can be accepted from or delivered to the railway.

The plant is arranged longitudinally, and staggered in such a way that there is little waste floor space, and it is possible to withdraw the alternator rotors or condenser tubes without difficulty. Furthermore, the basement or lower part of the building is very light, as there is no chequer plate flooring above, but merely the passage-ways round about the two sets and between them a duplicate gangway with access also to the control room.

The turbines were made by Messrs. C. A. Parsons and Co., Ltd., and are of a rather special type with two cylinders—a high pressure and a double flow low pressure in one line. The high pressure cylinder is arranged so that but one-third of the steam supplied passes through the low pressure blading of that turbine. Steam is led off before this blading is reached to the low pressure cylinder, which deals with two-thirds of the low pressure steam. The exhaust steam from the low pressure end of the high pressure turbine is taken into a condenser where half the steam from the low pressure cylinder is also exhausted. The remaining steam is taken into a smaller condenser. These condensers, therefore, present the unusual feature of being of different sizes, the former, of course, being twice the size of the latter. The maximum continuous rating of these sets is 25 000 kW at a power factor of 80 per cent. and a speed of 3 000 r.p.m. It is believed that these are the largest single line machines in this country running at this speed.

The original machines were ordered for a pressure of 11 000 V, and one machine is connected direct to the 11 000 V system already centreing on the old station, it being obviously undesirable to step up to 33 000 V and then down again to supply this load. All future load from this station, however, is being dealt with at 33 000 V, and, therefore, the second set is arranged for working at 33 000 V, and three transformers, each of 10 400 kVA capacity, are installed for stepping up from 11 000 V to this pressure. In point of fact, these transformers have not yet been used as Messrs. Parsons constructed, in addition to the 11 000 V machine for the second set, a machine wound direct for 33 000 V, the intention being that the 11 000 V machine should first be put in service and, at some convenient time, changed over to the 33 000 V alternator. Time, however, did not permit of this double change taking place and, therefore, the station was started up with the 33 000 V machine in the first place and has been running since in this manner. As far as is known, direct generation at this pressure has never been carried out before—at least not on any such scale as this.

The first section of the station will rely on cooling water taken from the Lee Navigation alongside. The inlet is at the extreme north end of the site and there are stop posts to prevent river craft entering, and screens for dealing with the large debris which occasionally comes down the river. This inlet is connected by a 6 ft. underground tunnel, parallel with the river, which emerges at the screen pit just north of the pump house, where four screens of the revolving band type are installed, each handling the water for one pump. There is a spray device working on the screens which sweeps off the accumulated debris and returns it by an outfall channel into a movable hopper, which can be run along rails to an incinerator.

There are four pumps which are arranged for working on two different heads, the lower head for working on the river and the higher head for working on cooling towers or, as was originally contemplated, on the system required for extracting water from the King George Reservoir. The lower speed is 485 r.p.m. and the horse power at this speed is 260. The higher speed is 585 r.p.m. and is obtained by changing the poles of the motor, and the horse power is 430.

Each pump is arranged to deal with two-thirds of the capacity of one turbine, so that both turbines can be run with three pumps and there is one in reserve.

The water, having passed through the turbines, leaves by means of a discharge spill-way, at the south end of the new station site, and alongside this there is a well for obtaining make-up water. This water is stored in a large overhead concrete tank.

A building alongside this well contains the main 33 000 V earthing resistance, which is connected to the neutral point of the three transformers.

## 33 000 V Switchgear.

The main 33 000 V switchgear was erected some time before the new station was put in hand because it was necessary to develop a 33 000 V system from the old station, and this system will be continued for further extensions.

Switchgear of this kind is expensive and occupies much space and it was obviously impossible to instal it in the old buildings, while, as the new station had not even been begun, the question of a separate building for the switchgear was somewhat difficult. After consideration, it was decided to proceed with switchgear of the outdoor type and to put it in such a position that it could be controlled (as it was in the first place) from the old station, but, by changing over the operating cables, it would be worked from the new station when erected. This changeover has been almost completed and the whole of the switchgear is controlled from the control room on the third storey of the office building. This switchgear has been in service now for over two years and has operated with complete satisfaction.

One of the transformer bays is not at present occupied, these transformers having been in a temporary position near the old station for reasons which were connected with the operation of the plant; indeed, these transformers were placed there before the outdoor switchgear was actually installed, and the transformers and the feeder connected therewith were treated as one unit but with 11 000 V switchgear.

The office building includes the large control room to which reference has been made, together with certain offices and, on the floor below, a small secondary battery for emergency use and, on the ground floor, the main 11 000 V switchgear which is of the ironclad pattern. In addition, of course, there are various offices for the staff and the works stores.

The following were the principal contractors and sub-contractors for the station:—Civil engineering and building work: The Foundation Co., Ltd.; steelwork: Braithwaite

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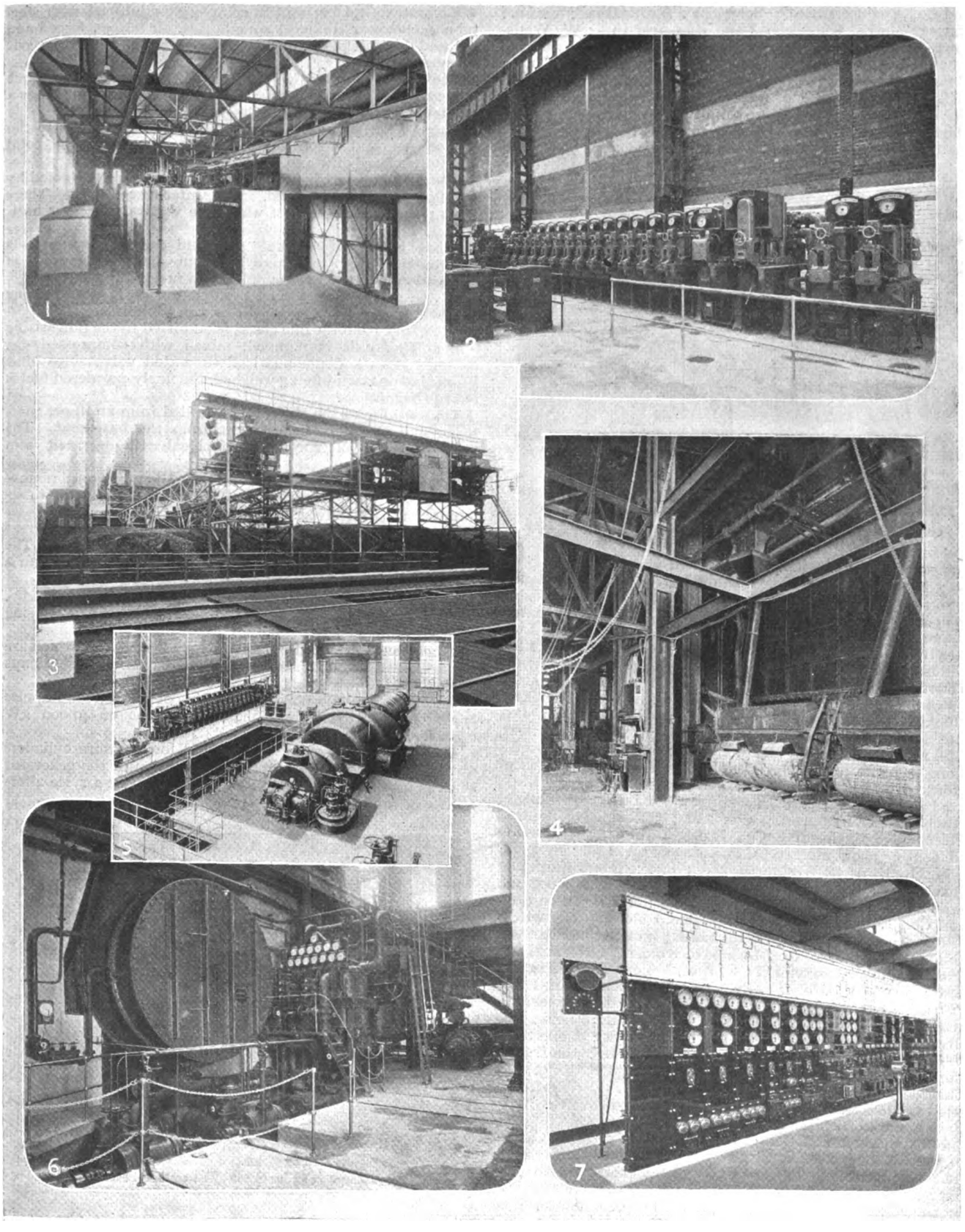

## THE BARTON EXTENSIONS.

*THESE pictures of the extensions at the Barton station of Manchester Corporation show :—(1) Some of the oil circuit breakers and reactor cells ; (2) the 420 V metal-clad auxiliary switchgear for No. 4 turbo-alternator set, with field breaking pillars for the main and house service alternators in the foreground ; (3) the coal handling equipment at the railway sidings end ; (4) front of one of the new boilers, showing chain grates and traversing coal chutes ; (5) the new 40 000 kW turbo-alternator set with 420 V auxiliary switchgear and stand-by motor-driven exciter on left of picture ; (6) condensing plant for the new set with motor-driven boiler feed pump in the background ; and (7) the control board for the extension switchgear. A description of the plant is given in the accompanying article.*

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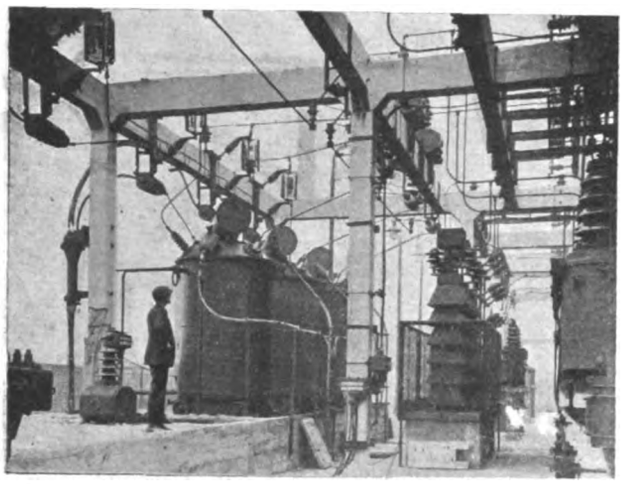
and Co., Engineers, Ltd.; floorwork: Estler Bros.; cranes: Herbert Morris, Ltd.; goods and passenger lifts: W. Wadsworth and Sons, Ltd.; circulating water piping: Stanton Ironworks Co., Ltd., Staveley Coal and Iron Co., Ltd.; circulating water valves: Alley and MacLellan, Ltd., J. Blakeborough and Sons, Ltd.; circulating water screens: F. W. Brackett and Co., Ltd.; pulverising and steam raising plant: International Combustion, Ltd.; boilers, powdered fuel transport system: Babcock and Wilcox, Ltd.; air



Outdoor sub-station at Brimsdown showing a 9 000 kVA transformer bank.

compressors: Fullerton, Hodgart and Barclay, Ltd.; Coal weighers and turbine test weighbridge: W. and T. Avery, Ltd.; radiant heat superheater and economisers: Foster, Wheeler, Ltd.; air heaters: Howden-Ljungström Preheaters (Land), Ltd.; boiler instruments: George Kent, Ltd., Electroflo Meters Co., Ltd., Foster Instrument Co., Ltd., Industrial Combustion Engineers, Ltd.; chimneys: John Thompson (Dudley), Ltd.; steam feed and drain piping: Stewarts and Lloyds, Ltd.; valves and boiler mountings: Hopkinsons, Ltd.; pipe lagging: Newalls Insulation Co., Ltd.; feed pumps: Drysdale and Co., Ltd.; G. and J. Weir, Ltd.; fans: Davidson and Co., Ltd.; motors: the Lancashire Dynamo and Motor Co., Ltd., the British Thomson-Houston Co., Ltd.; starters: Brookhirst Switchgear, Ltd.; ash handling plant: Underfeed Stoker Co., Ltd.; ash telpher: Ritchie Atlas Engineering Co., Ltd.; ash sluicing pumps: Pulsometer Engineering Co., Ltd.; turbo-alternators and condensing plant, etc.: C. A. Parsons and Co., Ltd.; evaporators: Richardsons Westgarth, Ltd.; fans: James Keith and Blackman Co., Ltd.; raw coal handling plant: Babcock and Wilcox, Ltd.; circulating water pumps: W. H. Allen Sons and Co., Ltd.; circulating water pump motors and switchgear: the English Electric Co., Ltd.; pumps (auxiliaries): Holden and Brooke, Ltd.; turbine instruments: Negretti and Zambra, Foster Instrument Co., Ltd., Venner Time Switches, Ltd.; 33 000 V outdoor switchgear: Ferguson Pailin, Ltd.; 11 000 V switchgear: A. Reyrolle and Co., Ltd.; d.c. switchgear: the Power Equipment Co., Ltd.; transformers: the British Electric Transformer Co., Ltd.; rotary converters: the English Electric Co., Ltd.; motor generator: the Lancashire Dynamo and Motor Co., Ltd.; storage battery: the Chloride Electrical Storage Co., Ltd.; cables: British Insulated Cables, Ltd.; works power distribution pillars: Artic Fuse and Electrical Manufacturing Co., Ltd.

For the accommodation of the new plant for the extension of the Barton power station of the Manchester Corporation (officially opened by the Lord Mayor of Manchester on November 29th) it was necessary to extend the existing boiler house by the addition of a second bay, and to erect a new turbine house and switch house. The buildings are of similar design and construction to those originally erected, and the new turbine-house occupies a position corresponding to that of the old turbine-house, but on the opposite side of the extended boiler-house, which thus now occopies a central position.

In the boiler house three marine type water-tube units have been installed, two of which are stoker-fired, while the third is equipped for burning pulverised fuel. The last-mentioned has been erected in the original section of the boiler-house.

The stoker-fired boiler units are of somewhat different design from those first installed, and have a slightly higher steaming capacity.

Each steam-raising unit is completely equipped with steel tube economiser, integral superheater, air heater, forced and induced draught plant, and a steel chimney fitted with a grit arrester.

The normal evaporative capacity of the powdered-fuel unit is the same as that of the two stoker-fired boilers, but it has a greater overload capacity.

There are 810 water tubes in this boiler, 462 tubes in the economiser, and 2 220 tubes in the air-heater; the total heating surface being 42 139 sq. ft.

The furnace is equipped with water-tube walls protected by slabs of refractory material, and a water screen floor. There are 14 fuel burners, ten of which are vertical and four horizontal.

What is known as the "bin and feeder" system—as differentiated from the "unit" system—has been adopted in connection with the Barton pulverised fuel boiler.

In the case of the former system, the coal, after passing through the driers, in which the contained moisture is evaporated by heat from the flue gases, is admitted to the pulverising mills. Thence it is pumped, mixed with compressed air, through pipes and pneumatically-operated valves into bins. From the bins, after being weighed, the finely-powdered fuel is fed to the burners.

The working of the boiler is controlled from an upper platform, and the pulverising plant from the basement. The pneumatic control gear for the fuel valves is operated from the firing floor.

A magnetic separator is provided for the purpose of removing any "tramp" iron fragments from the fuel prior to its admission to the pulverising mills.

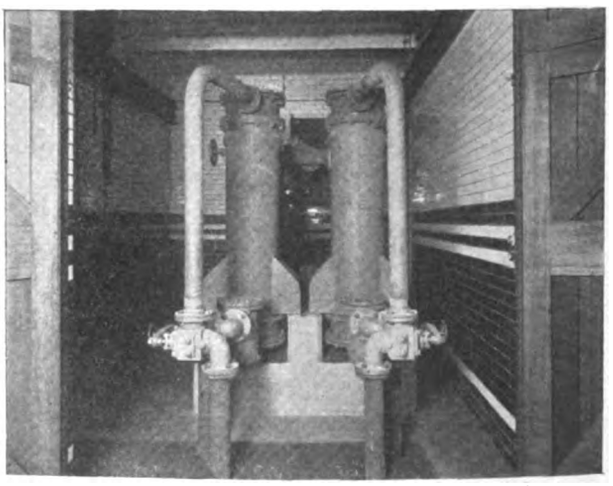
Noteworthy features of this steam-raising unit are, the great size of the furnace chamber and the height of the boiler. The distance from the firing floor to the centre of the boiler drum is no less than 40 ft.

For the driving of the various fans, pumps, coal feeders, etc., in connection with this boiler, 33 electric motors of varying sizes are employed.

Three new boiler-feed pumps are installed, two of which are motor-driven and one is steam turbine-driven. These pumps are located in the basement of the turbine-room.

In the turbine-house a steam turbine of the Rateau impulse type, coupled to a three-phase alternator of 40 000 kW capacity, has been installed.

The turbine has separate high and low-pressure cylinders arranged in tandem, and upon an extension of the generator shaft is mounted the rotor of a 1 000 kW house-service alterator. Beyond that again are the exciters.



The cooling plant for the 31 250 kVA transformer bank at the Brimsdown station.

This arrangement involves a very long machine, the overall length of the complete set being 83 ft. 6 in.

The turbine runs at 1 500 r.p.m., and has 23 stages of expansion in the high pressure, and 16 stages in the low-pressure cylinder, plus multi-exhaust.

The velocity of the blade tips on the last wheel, when it is running at full speed, is 808 ft. per sec., or 551 miles per hour.

Steam is bled from four expansion stages for feed-water heating.

The main alternator—the largest so far constructed in this country—which generates three-phase current at 6 600 V, is of similar design to those previously installed, and, like them,

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is ventilated on the closed-air circuit principle. The air is cooled by water from the main circulating water system.

It is of interest to note that the total weight of the complete rotor of this set is over 100 tons.

A separate motor-driven exciter is provided as standby.

The circulating water for the condenser is provided by two motor-driven pumps.

Two three-stage steam ejectors maintain the vacuum in the condenser, and the condensate is withdrawn by two motor-driven extraction pumps.

One extraction pump is capable of dealing with the whole of the condensate when the set is on full load. Each of the three-stage ejectors will deal with 60% of the air; so that both of the latter are required under full load conditions.

All auxiliary motors are alternating current.

It was not necessary to enlarge the circulating water outlet culvert on account of the additional plant, but the inlet culvert has been extended in length.

For handling the heavy plant in the new turbine-house, a 100-ton crane has been installed.

The whole of the current at the generated pressure of 6 600 V is stepped-up to 33 000 V by two transformers, each of 25 000 kVA capacity—the largest so far manufactured in this country. The weight of each one is 69 tons, and they were transported, complete and filled with oil, from the manufacturer's works to site.

As in Barton No. 1, the switchgear in Barton No. 2 station was manufactured by the British Thomson-Houston Co., Ltd., and comprises equipments for the main 31 250 kVA turbo-alternator, 1 500 kVA house service transformer, three 300 A feeders, and one blank feeder. In addition there are 500 A main and tie business reactors, 1 000 A main and auxiliary business connectors, and 500 A tie bus connectors to Barton No. 1 station. The total number of feeders in this section will be eight, and a further section of equal capacity is contemplated.

The switchgear, which is of cellular construction, is built on two floors, the lower accommodating the main and auxiliary busbars, busbar selector switches, current transformers, feeder isolating switches and cable sealing ends, while the upper floor accommodates the oil circuit breakers, reactors, tie busbars and potential transformers. This arrangement is generally similar to that at Barton No. 1 but by the provision of busbar selector switches only instead of busbar isolators and selectors a very considerable saving in space is obtained.

An interesting feature of the operating mechanism for the busbar selector and feeder isolating switches in the 33 000 V equipments is the provision of vermin-proof shutters where the operating rod passes through a cell door, the switches in question being remote mechanically operated in gangs of three from outside the cells. Indicating lamps show when the circuit is correct for opening or closing the isolating switches.

## "Series Safety Switch."

An interesting feature embodied in connection with the operation of the oil circuit breakers is the provision of a switch termed a "series safety switch," which is normally open, and is in series with the closing circuit of the oil circuit breaker; thus, in order to close the breaker it is necessary first to close the "series safety switch" and then operate the breaker by means of the control switch, the "series safety switch" then being returned to the normal "open" position. This rule is strictly adhered to by the operating engineers.

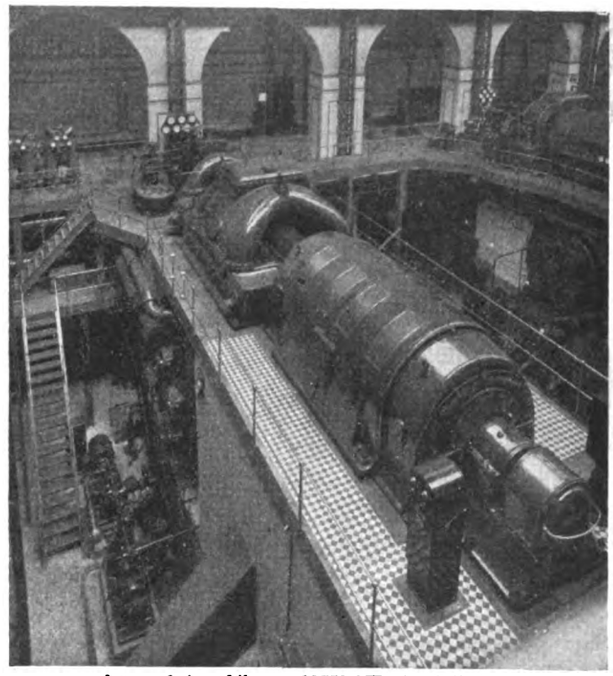
No. 2 Station is provided with summation metering equipment, which will ultimately indicate the total power generated by the two 31 250 kVA turbo-generators when the installation is complete. No provision is made at present for summating the output of the smaller machine. The equipment consists of one recording wattmeter located in the control room, an indicating wattmeter for the boiler house, and an indicating wattmeter for the resident engineer's office.

The extensions just put into commission have increased the main generator plant capacity of the Barton station to a total of 122 500 kW, representing approximately three-quarters of the whole capacity of the site. The foreshadowed development of the Central Electricity Board's scheme for this area, however, is of such a nature that plans for further extensions are, of necessity, already in course of preparation.

The extensions were designed, the plans and specifications prepared, and the construction work supervised by Mr. H. C. Lamb and the engineering staff of the Manchester Electricity Department. Messrs. C. S. Allott and Son, Manchester, were responsible for the civil engineering work.

The principal contractors were as follows:—

Building work: C. H. Normanton and Son, Ltd.; steelwork: E. Wood and Co., Ltd.; boiler plant; Babcock and Wilcox, Ltd.; turbo-alternator: the Metropolitan-Vickers Electrical Co., Ltd.; main transformers: the Metropolitan Vickers Electrical Co., Ltd.; 420 V switchgear: the Metropolitan Vickers Electrical Co., Ltd.; condensing plant: Richardsons, Westgarth and Co., Ltd.; 33 000 V switchgear: the British Thomson-Houston Co., Ltd.; electrically-driven pumps: Mather and Platt, Ltd.; and high and low pressure pipework: Aiton and Co., Ltd.



A general view of the new 18 750 kW set at Belfast.

The new 18 750 kW turbo-generator set started up at the Belfast Corporation's station on November 22nd is of the Metro-Vick impulse two-cylinder type, incorporating two-stage feed heating. Generating at 6 600 V, it runs at 3 000 r.p.m.

The condenser is of the Metro-Vick "Central flow" type, handling 19 000 gallons of cooling water per minute, and with a cooling surface of 18 500 sq. ft. Air extraction is by two sets of two-stage ejectors, and the condensate extraction pumps are in duplicate, each being capable of full duty. One of the condensate pumps is driven by an a.c., and the other by a d.c. motor. The turbine alternator, condenser and auxiliaries were manufactured by the Metropolitan-Vickers Electrical Co., Ltd.

The Charing Cross Electricity Supply Co.'s new automatic motor-converter sub-station at Aldwych House, Aldwych, London, was officially opened on Tuesday by Mr. W. F. Fladgate in the presence of Sir Andrew Duncan, Mr. Archibald Page, Mr. T. P. Wilmshurst, Dr. S. L. Pearce and a number of other well-known engineers.

The Charing Cross Co., which is at present handling a load of about 35 000 kW, has embarked on a programme of additional sub-stations, the Aldwych House plant being the first of its type.

The sub-station has a total capacity of 3 000 kW, and is normally controlled either completely automatically, or by remote control from the company's generating station at Short's Gardens.

Although so compact (the dimensions of the basement housing the plant are only 52 ft. by 48 ft.) it is the largest automatic motor-converter sub-station in the country.

The plant installed includes four 750 kW motor-converters together with the necessary switch and control gear for the automatic operation of the converters.

The control gear consists of metal-clad oil circuit breakers for controlling the incoming h.t. side; starting and synchronising panels; d.c. control board and relay panels; outgoing d.c. feeder panels.

The whole of this equipment was manufactured and supplied by The General Electric Co., Ltd., with the exception of the switchboard controlling the outgoing d.c. feeders, which was made and erected by the engineers of the Charing Cross Electricity Supply Co., Ltd. In addition to the above gear,

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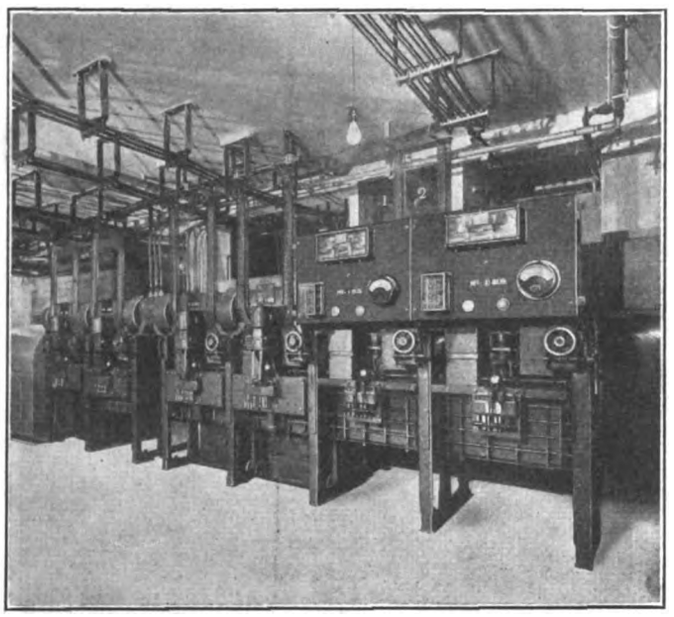
an air filter system has been supplied by the Premier Cooler and Engineering Co., Ltd., while a large exhaust fan, supplied by Davidson and Co., Ltd., ensures adequate ventilation.

The four G.E.C. motor-converters supply power to a 200-220 V d.c. 3-wire network. Power is supplied from the London Power Co., via Short's Gardens, at 11 000 V 50 cycles, three-phase.

Normally the station is controlled either automatically by



G.E.C. h.t. metal-clad switchgear, at Aldwych House sub-station.

relays governed by network conditions, or by remote pilot wire control from Short's Gardens. Under remote control conditions, the automatic relays for starting and stopping are put out of action, while in cases of emergency means are provided for manual operation.

When under fully automatic control the functions of the equipment may be summarised as follows :—

(*a*) One machine will start up when the busbar voltage falls to a certain value below the normal voltage and remains at this value for a predetermined period. The machine will automatically synchronise and parallel on to the d.c. network.

(*b*) Should the first machine become loaded to approximately 90% of its full load and remain at this load for a predetermined period, or should the first machine fail to take the load, then a second machine will start up. The third and fourth machines will also come automatically into operation if the load conditions call for their assistance. Each machine, as it parallels on to the busbars, will possess a suitable voltage to share the load.

(*c*) As the load falls the machines will shut down in the same sequence as that in which they started up ; that is, the first machine to start up will be the first to shut down. In this manner all the machines are called upon to give equal periods of duty.

(*d*) As the machines shut down the switchgear is automatically reset ready for starting up again.

(*e*) All the gear is protected against any fault which may develop, either in the machines and their controlling switchgear, or in the system to which the machines are connected.

Remote control from the company's power station at Short's Gardens is accomplished by means of pilot wires, and under this system the automatic relays for initiating starting and stopping of the machines are put out of action.

The remote control covers the following functions :—(*a*) Starting and shutting down one or more machines ; (*b*) indicating the position of the switchgear controlling each machine and the synchronising contractors ; (*c*) determining the load on each machine ; (*d*) indicating the busbar voltage between outers and mid-wire ; (*e*) means for varying the setting of the automatic voltage regulating relay ; (*f*) means for volleying—that is, delaying the closing of the d.c. circuit breakers until the desired number of machines are running and then closing all their breakers together ; (*g*) determining whether the automatic fan is running ; (*h*) means for indicating the lockout of any machine and giving an audible alarm.

By the operation of a controller associated with each machine, all automatic and remote starting and stopping is made inoperative and the machines may be started and stopped as required by push buttons mounted on the relay panels.

This method of control is intended for use during routine inspections of the plant, and also when it is desired to connect a machine to the testing d.c. busbars. These busbars are supplied so that any weak feeders may be isolated and fed from a separate source during tests, etc.

When on local control the synchronising and paralleling of any machine are still automatic, and all protective features are operative.

In addition to the above, provision is made to operate any or all machines manually should an emergency condition make this necessary.

Very complete automatic protection is provided for the machines. The various classes of fault against which protection is afforded include the following :—(*a*) Low a.c. voltage (e.h.t.), broken or reversed phase ; (*b*) a.c. overload (e.h.t.) ; (*c*) earth leakage (e.h.t.) ; (*d*) excessive d.c. overload ; (*e*) overspeed of the machine ; (*f*) l.t. earth leakage ; (*g*) faulty start ; (*h*) reversed polarity ; (*j*) failure to parallel ; (*k*) d.c. reverse current ; (*l*) overheating by continual overloads.

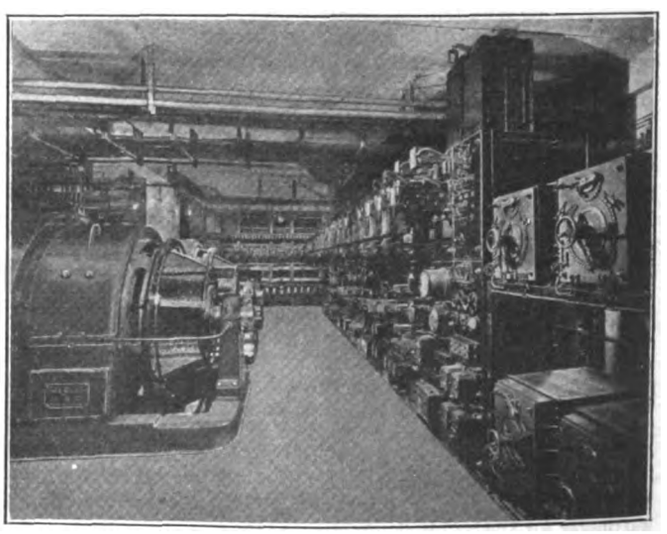
The incoming supply is from two 11 000 V feeders, each of which is brought to high-tension switchgear of the G.E.C. metal-clad type, which incorporates many interesting features, not the least of which is the extremely neat appearance of the units.

By adopting the principle of vertical draw-out isolation, the ugliness inherent in the horizontal draw-out type of gear has been avoided, as has also the waste of floor space due to the use of two pedestals between adjacent circuit breakers, and to the forward projection necessary for withdrawing the breaker.

The breaking capacity of the oil circuit breakers is 250 000 kVA, the two incoming 11 000 V feeders being brought each to a manually operated breaker fitted with Merz-Price protective gear. The h.t. supply to each of the four motor-converters is also controlled by metal-clad switchgear, the oil circuit breakers in these instances being motor operated.

A special feature of the design of this type of switchgear is the method by which the breaker is raised or lowered by four chains attached to the tank, and operated by a capstan handle. The breaker is held in the raised position by a bar under the tank, thus eliminating the danger of the tank being lowered leaving the breaker plugged in, as may be the case when the oil circuit breaker itself is held in the raised position by stops or bolts.

The trip gear mechanism is interlocked in such a manner



General view of d.c. side of G.E.C. motor-converters and l.t. switchboard at Aldwych House sub-station.

that should an attempt be made to lower the breaker while the contacts are closed, it will be tripped automatically immediately the lowering operation is started. This interlock also prevents the circuit breaker from being raised while the contacts are closed.

Another important feature of this metal-clad switchgear is the method of busbar selection. This selection is accomplished by an ingenious plug contact assembly, which is referred to as the "revolving turret." With this system the entire

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process of changing over from one set of busbars to the other occupies only a few minutes.

Briefly, the operation of changing over is accomplished in the following manner:—The circuit breaker is lowered to the isolated position, and each turret is rotated through an angle of 180 deg., after first lifting its locking bolt. The breaker is then raised again into contact. A shutter protects the busbar contacts and is common to all six plugs, three on each set of busbars. It is impossible to expose the contacts of both sets of busbars simultaneously.

The shutter operating bars is fixed to the centre turret, the position of which automatically ensures that the proper busbar plugs are disclosed on raising the breaker. Furthermore, the fact that the shutter covers the entrace to all six socket sheaths precludes the possibility of raising the breaker into position with one or two of the turrets incorrectly located.

Both the busbar chambers and the current transformer chambers may be filled with solid compound or heavy oil, whichever is preferred. The busbar chambers are filled with compound, and the current transformer chambers with heavy oil.

Bakelised manilla paper plates, fixed into the ends of each section of the busbar chamber, support the busbars, which are further insulated, where they pass through these plates, with bushings of similar insulating material. Porcelain is used for the main switch insulators and plug shields.

The circuit breakers themselves follow usual G.E.C. practice, their design and construction being of a robust character. The tanks are of welded steel plate reinforced by rolled steel bars, while the contacts are so designed as to give perfect contact at all loads.

The 200-240 V low tension switchboard was also manufactured and supplied by the General Electric Co., Ltd., and consists of 13 panels, the centre panel being a master control panel. There are three panels for each machine. On two of these, which control the d.c. output, are mounted the circuit breakers and metering equipment, while the third is concerned with relay controls, etc.

The outgoing d.c. feeders are controlled by a switchboard manufactured and erected by the Charing Cross Electricity Supply Co.'s engineers. Each feeder panel, of which there are 16 altogether, is fitted with circuit breakers with overload trips and metering equipment.

In order to keep the temperature of the air in the sub-station down to a definite level, a large Davidson fan has been installed, which automatically starts up with the first machine, and continues running until the last machine is shut down.

In addition to the fan an air filter, supplied by the Premier Cooler and Engineering Co., Ltd., has been installed, and ensures that all the air entering the sub-station is washed free of the dust which otherwise would be drawn into the ventilating ducts of the machines.

## CANADIAN ELECTRICITY.

### Calgary Power Co. Orders Generators for New Plant.

THE Calgary Power Co. has just ordered from the Canadian Westinghouse Co., Ltd., three generating units, costing approximately $400 000, which are to be installed at the new Ghost River power plant, delivery of the first unit to be made within 13 months.

Of the three generating units, two are of giant size, weighing 182½ tons each. They will be of 15 000 kW capacity and will operate at a voltage of 13 200. The third generator, 1 000 kW, will be considerably smaller, weighing 27 550 lb. but will operate on the same voltage as the larger ones.

Great progress on the construction work at the Ghost River site is reported, the number of men working on the project being 315. Work on the coffer dams is completed and large scale excavation work is being carried out on the south bank of the River, where eventually the southern end of the big dam will rest.

The East Kootenay Power Co. has prepared plans for the erection of a new 15 000 H.P. power plant at Phillip's Canyon on the Elk River, and construction will be begun as soon as the necessary water lease has been obtained. Power to be developed in Phillip's Canyon will be utilised not only for the supply of the requirements of the Consolidated Mining and Smelting Co. at the Sullivan Mine and elsewhere, but will be distributed all over the Kootenay district where the demand for electricity has increased rapidly in recent years.

## INDUCTION REGULATORS.

### Large Equipment for the New Zealand Government Power Scheme.

THERE has just been shipped to New Zealand a large induction regulator which has several interesting features of design. The regulator has been designed and manufactured

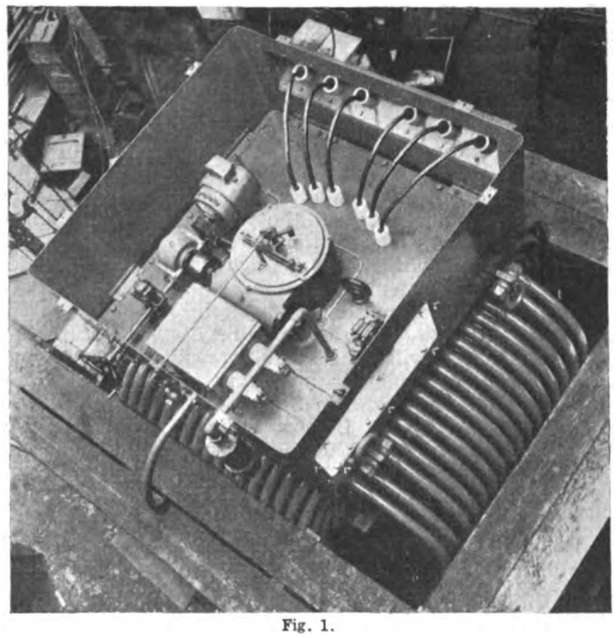

Fig. 1.

by Switchgear and Cowans, Ltd., Old Trafford, Manchester, and supplied to the order of the New Zealand Government for the Gisborne sub-station of the Waikaremoana power scheme.

The voltage of the incoming supply circuit controlled by the regulator varies from 10 000 to 13 000 V (three-phase, 50 cycles, 3 500 kVa), the outgoing circuit being regulated to maintain a constant voltage of 11 000 V, with plus or minus 12½ per cent. variation.

The regulator functions in 45 seconds from maximum to minimum boost, the rotor being driven by a 12½ H.P. motor running at 1 420 r.p.m., and driving the rotor through pinions and worm gears, the latter being immersed in oil baths. The top-plate of the regulator, showing the motor and gearing and arrangement of terminals, is illustrated in Fig. 1.

The wound rotor and stator are designed with oil cooling ducts. The rotor flexible leads to the terminals are supported on a stout steel spiral spring encircling the shaft which removes all stresses from terminals and joints at the ends of the leads. The end windings of the stator are permanently retained in position by insulated bracing rings to which each coil is individually secured, thus preventing distortion due to stresses in the event of short circuit.

The control panel is mounted on the side of the tank.

It will be seen that the regulator is of the outdoor type, and it is thought to be probably the largest two-pole regulator that has yet been made. It is, at any rate, believed to be the largest induction regulator of any type yet installed in New Zealand. The approximate dimensions of the apparatus complete are: 11 ft. high, 9 ft. long and 7 ft. 6 in. wide. The weight complete with oil is approximately 12½ tons, the weight of oil required to fill the tank being 3 tons.

### A USEFUL FUSE CARRIER.

The Ray Manufacturing Co. has sent us a sample "Andy" fuse wire carrier. This consists of a small leatherette holder of the same size and shape as holders intended for booklet matches. The holder is fitted with a snap-clasp and contains two sizes of fuse wire neatly wound round specially prepared card strips. The holder also contains a small folder giving instructions as to how to renew a fuse, and containing suitable letterpress for advertising cookers, radiators, and toasters or other devices as may be thought fit. These folders are, of course, obtainable with a variety of electrical suggestions printed thereon and, in addition, a number of slogan stamps such as "Cook Electrically," "Illuminate Electrically," etc., are offered.

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# GENERATING PROGRESS.*

## Trend of Development in Power Station Practice—Transformation of the Boiler House—"Two-Cylinder Machines Overdone"—The Largest Single Alternator.

By J. HARCOURT WILLIAMS, M.I.E.E.

THE boiler house is going through greater changes at the moment than any other part of the generating station, due to increased pressures and temperatures, pulverised fuel firing, compartment type stokers and the use of air heating. We also have the low-temperature carbonisation plants which are now publishing their results.

The introduction of high pressures and temperatures into generating stations has undoubtedly increased the complications, particularly the boiler house, as it means additional apparatus in order to make full use of these; and if some stations have not obtained the results that were expected from theoretical considerations, one is inclined to put it down to these complications which have to be introduced, and one must remember that each link means a possible inefficiency and increases the necessity of adequate supervision in order to ensure the best results. One expects that complete success will come when more experience has enabled the plant to be simplified; and, in passing, it is worth noting that we have the Padiham Station in Lancashire obtaining results on a par with Barton, although operating at very moderate pressures and temperatures, but laid out on extremely simple lines.

### Bigger Boiler Units.

Boiler units are still increasing in size, notable ones being: Barton, 100 000 lb. per hour; Barking, 135-187 000 lb.; Liverpool, 125 000 lb.; Hams Hall, 200 000 lb.; Leeds Corporation, 160 000 lb.; Synthetic Ammonia and Nitrates, Ltd., Billingham, 240 000 lb.

Pulverised fuel installations continue to make headway in this country, especially for large plants, although the trouble with grit is a serious one, and not always easy to overcome.

Reheating has been tried in America and in this country, and for the moment it appears to be resting; but we may see it revived later if increased steam temperatures do not render its use in the future of no advantage.

Boilers fired by means of pulverised fuel have necessitated large combustion chambers, and the furnace temperatures have been raised considerably, which brought trouble with the furnace linings. This is now being successfully got over by using water-cooled furnace walls.

These water tubes, primarily introduced to cool the brickwork in the combustion chamber, are now likely to lead to radical alterations in the design of boilers, in the direction of employing these tubes as a means of extending the heating surface of the boiler.

High pressures have necessitated alterations in methods of manufacture, such as solid drawn mild steel steam and water drums in place of rivet drums, for safety valve loads of 530 lb. per sq. in. They are more expensive to manufacture, but eliminate troubles inherent in the rivet drums, such as seam leakage.

The drums for the new 240 000 lb. per hour boilers for the International Combustion Co. are 51 ft. overall in length, 4 ft. 6 in. internal diameter, have a wall thickness of 4½ in., and weigh 55 tons each (the largest in the world). The working pressure of these boilers is 800 lb. per sq. in.

So far no boilers are running in this country at pressures above 600 lb., but English boiler makers have had experience of higher pressures for boilers built for installation outside Great Britain, and the Bradford Corporation 1 100 lb. boilers will shortly be at work in this country.

Experience on 1 200 lb. boilers in America is that water levels are more stable and moisture in the steam is desirably low; but freedom from oxygen of the feed water is particularly essential, in order to prevent the scaling of tubes, as the scale thickness must be kept less than $\frac{1}{32}$ in., or tube failure occurs.

The demand for higher steam temperatures will provide boiler makers with the difficulty of finding a suitable material for the superheater tubes.

Alloy steels appear to show promise, but are at present very expensive.

Like all other sections of the generating and distributing system, there is need to reduce the capital cost of boilers, and boiler makers have this very much in mind.

The tendency has been for the size of steam turbines to increase, and the Central Electricity Board has standardised 50 000 kW (C.M.R.) sets for extensions in England and Scotland. In America very large units are going in, especially where the load is dense and ground is expensive. Instances of these are the following: 208 000 kW for the State Line Generating Co.; 165 000 kW, Ohio Power Co., Phila; 160 000 kW, New York Edison Co.

The capacity of 50 cycle turbo-alternators running at 3 000 r.p.m. continues to increase as more and more experience is gained in manufacturing and running. The limit of such sets is no longer the ventilation of the electrical rotor, but rather a mechanical one. Makers are now building sets to run at 3 000 r.p.m. of 35 000 kVA to 40 000 kVA, and it is probable that even these will soon be exceeded.

Many engineers still have, however, a very soft spot for the 1 500 r.p.m. sets, and 70 000 kW sets and over are likely to be built shortly in this country.

All large modern turbo-alternators are multi-cylinder, either in tandem on one shaft, or on separate shafts driving separate alternators.

It is as well to mention that the two-cylinder machine has been rather overdone, apparently due to fashion or a desire to offer something out of the ordinary, and this applies to the smaller capacity machines down to 5 000 kW running at 3 000 r.p.m.

It should be remembered that increasing the number of stages in order to show a slight gain in efficiency is offset in turbines of such small ratings of the multi-cylinder design by the cross-over pipe losses, extra gland leakage loss, and bearing losses.

There is an undoubted tendency in America for engineers who previously were advocates of two- or three-cylinder types to show a distinct preference for still larger turbines of the single-cylinder design.

Two recent examples of this are the 75 000 kW, 1 500 r.p.m. set for Buffalo, and the 75 000 kW, 1 800 r.p.m. set for the Cahokia Station of the Union Electric Light and Power Co., St. Louis.

### High Pressure Turbines.

With regard to turbines for high pressures, turbine manufacturers in this country are prepared to build turbines to any pressure the boiler makers will build boilers for. Turbine designers are now looking to much higher steam temperatures to effect increased economies, and my company is now building to an order a 10 000 kW turbo-alternator to which steam will be supplied at 365 lb. per sq. in. at 1 000 deg. F., supplied from a boiler at 400 lb. and 700 deg. F., from which it will pass through an independent oil-fired superheater. The machine is designed to work on 29 in. vacuum.

The high-temperature portion of the machine is in one cylinder and made of special alloy steel. The machine is a two-cylinder set. The superheater will also be made of alloy steel.

Materials are now available for steam turbines to meet the requirements of high pressures and temperatures, but they are at present very expensive, and include alloys of iron, nickel, chromium and tungsten.

The increase of steam temperature is not likely, with the present knowledge of suitable metals, to be accompanied by the employment of higher steam pressures.

When high boiler pressures, such as 1 200 lb., were first thought of, it was in conjunction with existing low-pressure turbine plants, and a high-pressure boiler and turbine at 1 200 lb. was installed, exhausting into the low-pressure range, which supplied the low-pressure turbines, which were fitted with condensers.

Now new stations are being designed with a 1 200 lb. boiler-house only, and the turbine designed as a cross compound unit with the high and low tension units tied together and with all the governing done in the high-pressure unit. The cross-over pressure, which is also the reheating pressure, fluctuates up and down with the load.

* Extracts from the Inaugural Address to the North-Western Centre of the Institution of Electrical Engineers.

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The low-pressure unit may be operated on low pressure steam in emergencies, an example of an all-high-pressure station is the Deepwater Station in America, with two 53 000 kW cross compound units, the high-pressure sets running at 1 800 r.p.m., and the low pressure at 3 600 r.p.m. It is of interest that a third high-pressure set is going in, a duplicate of the other two, except that it will provide exhaust steam for a near-by factory.

There are other machines, such as a 53 000 kW cross compound, going in at New Jersey, and a 12 500 kW, the third set, into the Edison Electric Illuminating Co.'s Edgar station.

The earlier experience with 1 200 lb. pressure turbines in service in America, indicates more erosion than with lower pressure steam, but it is expected that the use of high chromium blading will get over this. Steam velocities are lower in high pressure than in low-pressure turbines.

### Turbo-Alternators.

The increase in the size of generating units has meant the increase in the size of turbo-alternators, and, here again, some very large machines have been built in America, and English designers would be prepared to produce similar machines as soon as there is a demand in this country.

The voltage for which stators for these large machines should be wound needs particular consideration in each case. It is not many years since it was considered that 11 000 V was too high a voltage for which to wind a 5 000 kW turbo-alternator, but many improvements have since been made in the design and manufacture of both conductors and insulation, so that at the present time, machines of as low a rating as 1 500 kW can now be wound for 11 000 V.

The problem of designing for high voltages is easier for larger ratings, and manufacturers are prepared to build, and are building, machines of 20 000 kW and above for 33 000 V.

Where transformers are used between the machine and the station busbars, there is no reason why the designer should not choose a voltage which will be most suitable in the design and manufacture of the stator windings of the turbo-alternator, having regard to the arrangement and number of slots, and the volume of current which has to be carried away from the machine. This voltage need not conform to any standard distribution voltages in such cases.

Modern machines call for a wide range of excitation, and a separate source from which the exciter main field can be excited is desirable, and can best be provided by using a double d.c. generator, one the exciter proper, the other a small auxiliary machine which is designed to run at constant voltage with the magnetic field saturated, and to excite the main exciter under all load conditions. It is also available for operating the synchronising motor alarms in air cooler equipment, or voltage regulator coils.

Difficulties in connection with cable connections to stator windings are to some extent overcome by an arrangement of coils whereby half the current is brought out from the windings by connections at either end of the stator. Where this is done the machine can be protected against breakdown of the stator windings on the split conductor principle, and only a comparatively small neutral connection need be brought out.

The 160 000 kW, 25-cycle set for the New York Edison Co.'s East River station is the largest single alternator built. This is a two-pole machine, and the design of the rotor has presented several mechanical problems and has been the limiting feature in the design of the machine . The problem set the makers was to get a machine that would give the largest possible output in the available space.

There is an unusual feature about the stator winding of this machine, which is composed of two separate identical windings of 80 000 kW each, but electrically separated. These two windings are connected through two oil circuit breakers to adjacent sections of the busbars.

The advantages of this arrangement are: (1) possibility of obtaining half the output of the machine with one-half of the winding; (2) reduction in the current rating of the oil-switch by the use of two oil-switches.

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# ELECTRICITY ON MODERN VESSELS.*

## Points in Favour of A.C. for Ship Work—Claims for the Constant Current System—Insulating Materials—The Lighting Installation.

By P. S. GLOVER, A.M.I.E.E.

THE latest classification regulations for ship work permit the use of 500 V d.c. for power and 250 V for lighting and heating, and 250 V a.c. for power and 150 V for lighting. The a.c. system does not appear to have been developed to any considerable extent in this country for ship work, with the exception of a few cases where electric propulsion has been adopted, but it has a number of points in its favour for ship work and may possibly receive greater attention in the near future. Quite recently a large electrically propelled self-discharging collier, using alternating current for main propulsion, has also utilised alternating current for the large motors for operating the discharging gear.

The d.c. three-wire system appears to find more favour abroad than in this country. The constant-current system which is also allowed by the classification regulations up to a voltage of 650 (d.c.) is really an old system which was commonly used when arc lamps were in vogue. This system has recently been developed by Mr. Gilbert Austin for use on board ship.

Great claims are made for this system, both in economy and reliability. It offers considerable advantages for deck machinery, owing to the fact that when an overload occurs the motor is automatically and harmlessly stalled and can be kept stalled for an indefinite period, sustaining the load without any damage to the motor. This is a factor not to be lost sight of in view of the rough handling this type of gear receives from unskilled labour at the ports. As it is, however, necessary to instal special generators with increased first cost for each individual installation, this system would have to be considered on its merits.

The position of the generating units in a vessel varies according to the lay-out of the engine-room, the general practice being to place these sets in the wings. A much better arrangement, however, if space is available, is to place the sets in a row at the forward end of the engine-room in close proximity to the main switchboard, thus making as short as possible the length of main feeder and equalising cables.

The classification rules require all semi-insulating material such as marble or slate, to have all conducting parts insulated with mica or other non-hydroscopic material. The tendency now is to do away with this class of material and use "Sindanyo" or similar non-hydroscopic material for the panels of the boards. Manufacturers are also turning their attention to the dead-front type of board.

With the advance made in the design of the control gear it has been possible to obtain electric windlasses which will function in exactly the same manner as steam windlasses—i.e., they are capable of being stalled for indefinite periods with full-load torque excited by the motor. Owing to the fact that the anchor sometimes locks in the hawse pipe when working the windlass, it is very important that provision for stalling should be made and that all resistance units should be continuously rated for each step.

Distribution boxes are a very important feature of the lighting installation of a passenger ship. Owing to the enormous number of points controlled, which may be anything from 1 500 to over 10 000, provision should be made for the detection of faulty circuits with the utmost speed, mathematical precision and complete isolation.

Almost without exception all parts of the ship outside of the accommodation should be wired with lead-covered and armoured cable served with a closely braided serving fully impregnated with water-proof compound to protect the armour, which consists of galvanised-steel wires. It is preferable that feeder cables should be insulated with varnished cambric, which has been approved by Lloyd's in recent years, in lieu of rubber in order to provide better service under high-temperature conditions, it being realised that there are very few ships which do not at some time or another experience conditions of intense heat.

* Extracts from the Inaugural Address to the Tees-side Sub-Centre of the Institution of Electrical Engineers.

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Paper cables have been tried, but are generally not so satisfactory, because much more time and space are required for sealing the ends, and, due to bends and vertical runs, difficulties are experienced in maintaining an even distribution of oil in the cable.

Vulcanised-rubber cable is the most suitable for accommodation which is panelled, and the cables are best supported by being let into grooves in the panelling and covered over with removable strips which harmonise and, if possible, form a feature of the panelling. Tubing should be avoided, because of condensation troubles, and where the vulcanised rubber cables require to be drawn in, this can be done by providing wood channels behind the panelling. In places such as dining saloons, where the lights are sometimes a long way from the removable cornice containing the main run, the vulcanised-rubber wires for each light should be accommodated in a separate wood draw-in channel. With this arrangement it is quite easy to renew wiring for any particular light without disturbing the panelling of the roof. Accommodation which is not panelled is best wired with lead-covered cable served over-all, which can be run on the surface on wood grounds, secured by brass clips, and easily painted.

Owing to the complete isolation of ships when at sea from all facilities for repairs and renewals, it is of the utmost importance that nothing but the best and most robust and reliable type of apparatus and equipment, specially designed for ship work, should be installed. In addition to isolation by long distances, ship installations are subject to very rough usage, and stresses and strains due to violent storms.

There is no doubt that, due to natural conservatism, which conditions at sea induce, and also to the unsuitable material and design which was at times put forward, the progress of electrical work on board ship has been considerably hindered in years gone by, but I feel confident that this has now been largely overcome, and the enlightened ship-owners are steadily acquiring confidence in the reliability of modern first-class electrical equipment.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Hot Spot Temperatures.

[To the Editor.]

Sir,—I have read the letters on this subject with much interest, although they try to explain too much. In the first place, Mr. Norris objected to an advertisement which stated that the Hackbridge Co. avoided hot spots in making their transformers, and so did not need hot spot indicators. Surely that is a commendable ideal, and the term "hot spot" is well known in the industry. Personally, I should purchase transformers without hot spots, just as I should purchase a car with a sound chassis rather than one with "weak spots" and dashboard gadgets indicating how far it could safely be used.

Although the advertisement is perfectly clear, Mr. Norris goes on to say "it is better to talk of hottest spots" and also talks of "safe load indicators." This substitution of terms is no argument. I consider the Hackbridge Co. have made a mistake in endeavouring to resist all Mr. Norris's statements. He has made an attack on an advertisement of theirs with plain terms and meaning, but he does not appear as yet to have substantiated his objection.

I am, etc.,
Northerner.

November 23rd.

[To the Editor.]

Sir,—In respect of this correspondence, my experience as a large user of transformers may be of interest. The circumstances of our supply make it inevitable to instal tranformers of the "fit and forget" type, the idea of spending my staff's time inspecting indicators being absurd. We use transformers of a design we can rely on, and occasionally thoroughly ill-treat them under the unavoidable conditions which occur, but we get no trouble.

The letter in your last issue caused me to be sufficiently interested to look up some fairly recent quotations for large transformers from four makers.

The weights of the core plus windings were in the proportion: 100, 96·5, 70·7 and 70·7 respectively.

The first two certainly appear to be much more liberally designed, and the second was chosen, although I have no reason to suppose that the latter two would not be satisfactory.

These are the bare facts, and I have no comment to make.—I am, etc.

"Utilitas."

December 3rd.

### "A Lesson for Contractors."

[To the Editor.]

Sir,—With reference to the article, "A Lesson for Contractors," which appeared in your issue of November 16th, in Current Topics, we were rather amused at the obvious reference to our firm in the sentence which reads "It appears that a firm of ironmongers in Colchester, wishing to obtain electrical business," etc. It is surely remarkable that these comments should have been made about a firm whose name appears on the National Register and who are also members of the Electrical Contractors' Association, bearing in mind the thorough inquiry as to qualification made by each.

This firm was established in 1817 by the late Mr. George Joslin, who was the founder of Joslins, Ltd., and for considerably upwards of 30 years we have been very actively engaged in the installation of plants and also town wiring, and can claim to be the pioneers in electric lighting in this district, as well as the installation of telephones and electric bells.

We do "wish to obtain electrical business," and if possible we intend to obtain a still greater volume than has been our good fortune in the past; hence the reason for our advertising scheme, which we are glad to say has met with great success.

We quite agree with you in your comments on Mr. Penwil.'s letter in your issue of November 23rd, wherein you rather stress the point that the ironmonger seems to be the man to whom people go for almost any ordinary domestic requirement, and you regret that they do not so readily call at the electrical shop for their electrical requirements. Quite so; ironmongers as a body are not only older and more firmly established than even the oldest of what might be called electrical engineers only, but they do come more in contact every day with the public than any other similar business undertaking.

At all events, we find that our ironmongery department and our electrical department both work exceedingly well together in the interests of the public, which, after all, is our first consideration.—I am, etc.

For Joslins, Ltd.
C. J. P. Softley,
Managing Director.

Colchester,
December 3rd.

[As we have stated before, we are full of admiration for Messrs. Joslin's enterprise. Their letter only emphasises our point that electrical traders must anticipate very keen competition from ironmongers.—Ed.]

## BOOKS RECEIVED.

"Daily Bread." By Evelyn Sharp. (London: Ernest Benn, Ltd.). Pp. 34. 6d. net.

"The Faith of a Democrat." By Philip Snowden, M.P. (London: Ernest Benn, Ltd.) Pp. 32. 6d. net.

"Die Gleichstrom-Querfeldmaschine. By Dr. E. Rosenberg. (Berlin: Julius Springer.) Pp. 97. 11 marks.

"The Discovery of the Consumer." By Mrs. Sidney Webb. (London: Ernest Benn, Ltd.). Pp. 32. 6d. net.

"Practical Aids to Retail Selling." By A. E. Hammond. (London: Sir Isaac Pitman and Sons.) Pp. xiii+164. 7s. 6d. net.

Prover med Modellturbiner for Morkfoss—Solbergfossanlegget By Prof. G. Sundby. (Trondhjem: F. Bruns Bokhandel.) Pp. 80. 3.80 kr.

"Transformer Construction and Operation." By Emerson G. Reed. (London: McGraw-Hill Publishing Co.) Pp. xii+227. 15s. net.

"Die asynchronen Drehstrommaschinen mit und ohne Stromwender." By F. Sallinger. (Berlin: Julius Springer.) P. vi+197. 8 marks; bound, 9.20 marks.

"Die elektrische Ausrüstung des Kraftfahrzeuges." Part 1, Zündung. By Erich Klaiber and Dr. Walter Lipparta. (Berlin M. Krayn.) Pp. 237+xiv. 17 marks; bound, 19 marks.

"Electric Circuits: Theory and Applications." Vol. I: "Short Calculations and Steady-State Theory." by O. G. C. Dahl. (London: McGraw-Hill Publishing Co., Ltd.) Pp. x+390. 25s. net.

"Rating Relief Simply Explained." By J. Scott Henderson. With a Foreword by the Right Honourable Sir Kingsley Wood, M.P. (London: "Rating and Income Tax," and Argus Press. Pp. 46. 3s. 6d. net; cloth 4s. 6d.

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# I.E.E. MIDLAND CENTRE.

## The Central Electricity Board—The Engineering Mind—The National Point of View.

OVER three hundred members and friends attended the annual dinner of the South Midland Centre of the Institution of Electrical Engineers, at the Grand Hotel, Birmingham, on November 30th. Mr. S. Holden, chairman of the centre, presided, and among those present were Sir J. R. Brooke, Dr. A. H. Railing, Major F. C. Cooke, Col. F. A. C. Leigh, Dr. W. Cramp, Messrs. J. Harcourt Williams, R. T. Smith, M. Railing, R. A. Chattock, S. T. Allen, G. R. J. Parkinson, G. N. Guest, W. Wilson, F. S. G. Hinings and Coun. H. K. Beale.

Mr. FRANK HODGES, of the Central Electricity Board, proposed the toast of the "Institution of Electrical Engineers," and after referring to its growth, said that the future of the electrical industry could not yet be estimated, even by the most prophetic. There were among our industries some which had assumed national importance and proportions because of political reasons, but in the case of the electrical industry its progress had been dependent upon engineering genius. There was further evidence of this in the Central Electricity Board which had emerged, not from the political mind, but from the engineering and technical mind. There was in some quarters a slight feeling of grievance with respect to certain aspects of the Board, but he wished to assure members that it was the best technical men in the country who deemed it to be of national necessity that the Central Electricity Board was established; it was their minds which first conceived the idea of electrical inter-connection for the whole of the country. Further, when the history of the national grid was written, the Institution of Electrical Engineers would figure largely in such work. As a member of the Board, he found it gratifying to know that the chief engineer of the Board was, during office, elected President of the Institution, further, it had been possible to find among the ranks of the Institution men suitable to fill every position from the chief engineer downwards. He desired to express his praise of those men who deemed it to be in the interests of the nation that electricity should be regarded from the national rather than the parochial point of view.

### Britain as One Unit.

They all knew that the industry could not be limited by territorial frontiers, or by areas expressed in terms of Parliamentary Orders. They were going to regard Britain as one great unit, and he felt sure that engineers were already beginning to think of electricity undertakings as national units instead of local enterprises. The Board, said Mr. Hodges, looked to the electrical engineering mind and industry for advice and then formed its own opinion as to how such advice could best be applied. He wanted all engineers to feel that in Britain we had the natural genius for keeping abreast of the world. In the matter of construction and design there was no reason why the Central Electricity Board should have to look beyond the boundaries of this country in order to be in the forefront with respect to electrical development.

Mr. P. V. HUNTER, vice-President of the Institution, in reply, stated that it was a matter of considerable satisfaction to the industry to know that of the contracts so far placed by the Board, not one had been lodged outside the country. The Board would not only generate nationally but their activities would affect manufacturers generally for their betterment. Speaking of the growth of the Institution, Mr. Hunter expressed the belief that its increasing membership was due to the activities of its powerful local centres and the fact that the Council could not hold office for more than three years.

Mr. P. VERITY, proposed the toast of "Kindred Societies and Guests" and, after some humorous observations, paid tribute to the Institutions of Civil and Mechanical Engineers.

Dr. E. W. BARNES, The Right Rev. the Lord Bishop of Birmingham, in reply, pointed out that some of the deepest thinking at the present time was being given to the science of which they represented the practical application. Progress in the past had been so fast that they could not in any degree foretell the future. Never before in the history of mankind had there been so marked an advance in knowledge. Their teaching was the newest of the spheres of knowledge which claimed the attention of the world, and he believed that as that knowledge advanced they would begin to understand more fully the meaning of their being here.

It was announced during the dinner that Mr. H. Hooper, hon. sec. to the Centre, had been appointed by the Central Electricity Board as assistant to Mr. S. T. Allen, the Central England engineer.

# SOUTHERN CONTRACTORS.

## Members of South Coast Branches of the E.C.A. Pay Visit to Southampton.

BETWEEN 70 and 80 members of the Southampton, Bournemouth and Portsmouth Branches of the Electrical Contractors' Association were the guests of the Pirelli-General Cable Co., Ltd., on November 21st. The morning was spent in visiting the works on the Western Shore, Southampton, and, after lunch at the South-Western Hotel, the party proceeded to Eastleigh to inspect the factory there. This visit of contractors is the second of a series, the first having been some three weeks ago, when West Country branches of the Electrical Contractors' Association were entertained.

Mr. G. Martinez (manager of the Pirelli-General Cable Co.) presided at the lunch, and supporting him were Mr. H. Roberts (sales manager, General Electric Co., Ltd.), Mr. L. C. Penwell (secretary of the Electrical Contractors' Association), Councillor F. W. Cook (chairman, Southampton branch, E.C.A.), Mr. Knight Bowerman (chairman, Portsmouth branch), Mr. W. Wilson (chairman, Bournemouth branch), and Mr. Lyster Holt (Southampton branch manager of the General Electric Co., Ltd.).

In welcoming the guests, Mr. Martinez spoke of the work being done at the Southampton and Eastleigh factories. More work was coming, and they were thinking of extending the Eastleigh factory, which for present requirements were already too small.

On behalf of the General Electric Co., Mr. Roberts extended a welcome to the visitors.

Speaking for the contractors of Hampshire, Councillor Cook thanked the Pirelli Co. for their hospitality, and for the opportunities afforded of visiting the works. He said he was glad to hear of the progress and development previous speakers had referred to, for the future of Southampton was bound up with the industries which were carried on in and around the town.

Mr. Penwell, who also added the thanks of the members of the Association, said that co-operation between the manufacturers and contractors was not only desirable but also very necessary.

# THE SCOTTISH CENTRE I.E.E.

## Successful Gathering at Annual Dinner—The Growth of the Institution.

THE Scottish Centre of the Institution of Electrical Engineers held their annual dinner and "at home" on November 27th, in the Grosvenor Restaurant, Glasgow. A large attendance was presided over by Mr. Donald Smeaton Munro, chairman of the centre.

In proposing the "Corporation of Glasgow," Mr. James Morton, president of Glasgow Chamber of Commerce, said he would venture to congratulate the members of the Institution on belonging to one of the prosperous industries of the country. Lord Provost Sir David Mason responded.

Mr. J. R. Richmond submitted the "Institution of Electrical Engineers." No one could read the history of the Institution, he said, without being struck by the rapidity and the extent of its growth. The Institution had grown almost with the expansion of electrical science itself, and that expansion bordered almost on the romantic. In 1871 the members numbered 110, in 1900 there were 3 660, and in 1928 there were 13 012. They were fortunate in belonging to an industry and a profession which was still in its early manhood. It was hard to realise that within one's own memory the industry had grown to its present high estate. One point which struck him in reading the history of the Institution was the wide field of developments which had taken place in electrical science—developments which were segregating themselves and forming secondary industries by themselves, many of them of great and growing importance. The electrical industry, like all others, was at the beginning of great changes both as regards its technical development and industrial structure. Rationalisation was a matter deeply affecting their industry, and there were the economic sides of hydro-electric schemes, and also that more recent development marine electric propulsion, in both of which they in Glasgow were specially interested.

Captain G. M. Donaldson, vice-president of the British Institution, acknowledged.

The health of the Chairman was pledged on the call of Mr. D. Macfarlane Macleod.

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# NEWS IN BRIEF.

## Electrical Exhibition at Clacton—Situations Vacant—A New Telephone Exchange Wanted—Domestic Appliances Danger—Proposed Showroom at Beckenham—Dundee and Foreign Cable Tenders—Selling Electric Lamps.

A SECTIONAL mains engineer is required for Manchester electricity department.

Hammersmith (London) B.C. requires a junior engineer in charge for the electricity department.

Clacton-on-Sea U.D.C. last week opened an exhibition of electrical appliances at the Band Pavilion.

Applications are invited for the position of assistant to the consumers' engineer in the Salford electricity department.

Tenders are invited by H.M. Office of Works for the erection of a telephone exchange at Ingrebourne, Harold Wood, Romford.

At a meeting of the British Institute of Radiology on December 13th, Mr. G. E. Bell will deliver a lecture entitled "Constant Voltage High Tension Generators."

The tenth annual ball of the Electrical Trades Benevolent Institution was held in aid of the Institution at Newcastle on November 30th, when about 300 members and friends were present.

Eastbourne Electricity Committee is arranging to open the new showrooms on February 13th, and a sum of £300 has been voted for equipment. The Corporation is to invite applications for the position of manager at the showrooms at a salary of £300 a year.

The London telephone administration is endeavouring to induce telephone subscribers whose names and numbers have not hitherto appeared in the telephone directory to consent to their inclusion in future, as this will effect a saving of work and expense.

The first radio-electric clock ordered by a railway company will be put into operation in the new passenger station of the Baltimore and Ohio Railroad in the Chanin Building, New York, which is to be opened shortly. The clock will control dials in other parts of the station.

New automatic telephone exchanges equipped with Swedish apparatus and material have recently been installed in Naples and Smyrna. The Naples exchange at present serves 8 500 subscribers, and will have an ultimate capacity of 80 000 lines. The Smyrna automatic exchange will have ultimate capacity of 2 000 lines.

The flooding of the river Shannon has caused considerable damage in the Banagher area. Flooding has been exceptionally severe, with the result that all work on the hydro-electric development scheme at Meelick has been abandoned for the moment, and it is unlikely that work can be started again until after Christmas.

At a recent meeting of shareholders of the Duffield Iron Corporation, Ltd., and Duffield Coal Products, Ltd., Mr. Duffield said the Coal Products Co. intended to provide improved and cheaper means of producing gas for steel works and industrial undertakings, and to make cheaper electricity from a system of steam generation.

The Scottish Office has informed Edinburgh Corporation that expenditure on automatic traffic control apparatus cannot rank for police grant, although it is estimated that its use will result in a saving of £3 000 per annum. The Lord Provost's Committee recommends that the automatic signals be installed at 16 additional points.

Mr. R. W. Kennedy lectured at the club room of the Electrical Association for Women on November 28th, on "The Commonsense Handling of Domestic Electrical Equipment." Mr. Kennedy frankly said electricity could be dangerous, just as every other form of power was dangerous, if not installed properly and if not used with intelligence. He referred to the need for earthing appliances in the bathroom and kitchen, and the desirability of having fittings made of bakelite. He displayed a number of accessories to illustrate his lecture.

A deputation from the Union of Post Office Workers last week placed before the Postmaster-General particulars of the workers' grievances and suggestions with respect to the development of the telegraph service. Telegraphic delays were attributed to under-staffing and the requirement of an excessive output by a depleted staff. Mr. T. J. Hodgson, assistant secretary of the Union, asked the Postmaster-General to consider the provision of avenues of advancement for the staff into other Civil Service Departments. The Postmaster-General promised to reply in writing.

Hull municipal telephone department made a net profit of over £7 000 in the last six months.

Beckenham Electricity Committee is considering the provision of showroom accommodation.

Manchester Corporation invites tenders for the construction of a sub-station building at Denton (South).

New workshops and stores are to be erected and equipped for the Burnley electricity department at a cost of £7 860.

It is reported that damage to the extent of about £2 500 was done by the recent storm to the cooling towers at the Roath power station. These towers have been up for 22 years.

A Faraday lecture, entitled "How Electricity Does Things," will be given by Mr. Ll. B. Atkinson, on December 14th, at the Manchester Municipal College of Technology, before the North-Western Centre of the I.E.E.

The progress made by electricity in the industrial field was reviewed in an address last week by Mr. L. C. Marsden, the new President, to the Walsall Engineering Society. An address on Westinghouse brakes was given by Mr. F. Thomas.

At a meeting of the Royal Scottish Society of Arts on November 26th, Mr. J. P. H. Bewsher described "An Improved Method of Artificial Illumination"—a method designed to eliminate the glare of powerful lighting by correction and diffusion.

The city electrical engineer of Bradford (Mr. Thos. Roles) and the chairman of the Electricity Committee are to investigate with regard to an offer by a firm to erect, at its own expense, a gas mask for abolishing or reducing the emission of smoke from the chimneys of the Valley Road power station.

Fire at the premises of Jessop and Boydell, Ltd., electrical contractors, Bradford, last week, caused considerable damage to stock through heat, smoke and water. The offices were saved, but much structural damage was done to floors and ceilings. It is thought the fire was due to spontaneous combustion of damp straw and packing.

A complete electric lighting and pumping plant has been installed in the model ranch owned by the Prince of Wales at Calgary, Alberta. Two Delco-Light plants have been installed, and energy is supplied to the numerous buildings while two shallow-well Delco-Light pumps supply drinking water through a system of pipes and taps.

Having had a report from the Town Clerk in regard to burgled meters, Tynemouth Electricity Committee has instructed the Electrical Engineer to circularise tenants where such prepayment meters are installed requesting them to notify the department when they remove from such premises as otherwise they will be held responsible if the meters are burgled.

An address to the Birmingham Young Men's Christian Association on the progress which is being made by electricity in the promotion of public health was delivered by Mr. G. S. Francis last week. He said progress was threefold—in electrotherapy, in clearing the air of industrial areas of the smoke pall which was the legacy of the steam age, and in the decentralisation of industry, with the revival of rural industries.

Dundee Electricity Committee discussed, on November 26th, the acceptance of offers for the supply of cable. The lowest foreign offer was £1 945, against the lowest British offer of £2 286, a difference of about 18%. Mr. D. T. Patterson pointed out that the wages paid in Antwerp to men in the electricity trades amounted to 35s. per week, whereas the British figure was about £4. The Committee decided to recommend acceptance of the foreign offer, but before the meeting of the Council an effort is to be made to secure a reduction in the British offer.

Miss N. E. Miller, publicity manager to the Edison Swan Electric Co., gave an interesting lecture at a meeting of the Electrical Association for Women last week on "Planning a National Lamp Sales Campaign." Miss Miller said the main points which must be considered included (*a*) the attitude of the public and the trade toward the product; (*b*) the selling points of the product itself; and (*c*) a consideration of new points of appeal. Some idea of the progress made in lamp advertising was demonstrated by the large number of interesting posters which Miss Miller had displayed. A discussion followed, opened by Mr. Crinks of Metro-Vick Supplies, Ltd.

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# PERSONAL.

LEYTON Town Council has promoted Mr. J. W. Speight to the position of deputy borough electrical engineer, with an increase in salary of £81 18s. 8d. per annum.

Mr. A. P. Young, general manager at Coventry for the British Thomson-Houston Co., Ltd., has been appointed associate manager of the company's works at Rugby, and he is succeeded at Coventry by Mr. W. Vincent.

Mr. Richard Hoggard, general manager Lincoln tramways, has been appointed transport manager at Chesterfield, in succession to Mr. W. G. Markes, who, as already announced, has secured a similar appointment at Nottingham.

Mr. R. Borlase Matthews has been elected as a member of council of the Royal Agricultural Society of England. It is believed that this is the first occasion upon which this honour has fallen to the lot of an electrical engineer.

Estate of the gross value of £7 369 was left by the late Mr. Henry Mattinson, manager and chief engineer of Manchester City tramways, who died on September 1st, aged 52 years.

Mr. Fred Britter, of the staff of the Maidstone Corporation electricity works, where he has been for over 11 years, is leaving to take up an appointment with the Mawchi Mines, 800 miles north of Rangoon, Burma. On November 22nd he was presented by the borough electrical engineer of Maidstone, Mr. E. E. Hoadley, on behalf of the staff and employees, with a fitted leather attaché case and a travelling clock.

A short list of four for the position of general manager of the tramways undertaking, to be vacated shortly by Mr. R. L. Horsfield, who has been appointed manager at Leeds, was made at a special meeting of Cardiff Tramways Committee on November 30th. Twenty-eight applications were received, and the list finally selected was:—Mr. G. Jackson, general manager and engineer, Oldham tramways; Mr. W. Forbes, general manager and engineer, Aberdeen tramways; Mr. W. T. Young, general manager and engineer, Halifax tramways; and Mr. C. G. Jackson, assistant-manager of the Liverpool tramways. It was decided to appoint a sub-committee to visit Oldham, Aberdeen, Halifax, and Liverpool.

Manchester Tramways Committee on November 29th decided to recommend to the City Council that Mr. R. Stuart Pilcher, manager Edinburgh tramways and formerly of Aberdeen Tramways, be appointed manager and chief engineer of Manchester tramways at £2 000 a year, with a maximum, it is understood, of £2 500. Mr. Pilcher's salary as manager in Edinburgh is £1 500, with a maximum of £1 700. Originally there were 19 candidates for the post, later reduced to a short leet of three:—Mr. H. P. Stokes (Plymouth); Mr. H. R. Kiernan (Manchester); and Mr. R. S. Pilcher (Edinburgh). At a previous meeting some of the members took exception to what they regarded as the too drastic curtailment of the short leet. As a result the meeting was adjourned, and on November 29th, after considerable discussion, it was decided to add the names of two other candidates—namely, Mr. J. S. D. Moffat, general manager of Salford Tramways, and Mr. A. R. Fearnley, general manager of Sheffield Tramways, to the list. Mr. R. Stuart Pilcher was appointed manager of Edinburgh Corporation Tramways in July, 1918. Previous to that date he had been manager of the tramways at Aberdeen, traffic manager of Buxton (Derbyshire) Corporation, and assistant electrical engineer to Birkenhead Corporation Tramways.

## Obituary.

MR. SAMUEL WHITE, chairman of the Bristol Tramways and Carriage Co., Ltd., on November 29th, aged 67 years. He was formerly also a director of the Imperial Tramways Co., and he assisted his brother, the late Sir George White, in organising both the Bristol tramways, which were the first electric tramways in the country, and the London United Tramways system, on which electrical operation was begun in 1901.

MR. REGINALD ALEXANDER DALZELL, formerly Director of British Telegraphs and Telephones, on November 27th, aged 62 years. Mr. Dalzell was born at Poona in 1865. He was educated at Dulwich College, and in 1881 entered on his long connection with the telephone service, first with the Globe Co., then with the United Co., and afterwards with the National Telephone Co. When the National Co. was taken over by the State in 1911 Mr. Dalzell, then Provincial Superintendent for the West of England, was transferred to the Post Office, and in 1916 became head of the Traffic Section. In 1922 he was promoted to the position of Director of Telegraphs and Telephones. He retired in July of last year.

# IN PARLIAMENT.

## Nottinghamshire Electricity Order Considered by House of Lords Committee.

A SELECT Committee of the House of Lords last week considered the Derbyshire and Nottinghamshire Electric Power Supply Co.'s Electricity Supply Special Order in respect of a large area in East Nottinghamshire.

Mr. R. Harker, K.C., for the applicants, said the company had already authority to supply in the area in bulk or for power purposes. The opposition was principally from the Butterley Co. and the Bolsover Colliery Co., who supplied electricity in parts of the area without statutory authority. He would concede that they were entitled to give the supplies they were now giving. He asked that they should not be given the protection they asked for without the restrictions to which statutory undertakings were subjected.

Mr. Alex. Phillips, engineer and manager of the promoting company, said consent to the Order had been obtained from all the eight local authorities concerned in the Order.

The case for the mining companies, represented by Mr. Wrottesley, K.C., and Mr. H. F. Bidder, was that they had had to lay mains across roads and underground to supply electricity to mining communities which they had established, and they asked protection for that.

After an adjournment, the Chairman, the Earl of Wemyss, said the Committee was agreed that the colliery companies deserved the protection they sought and that the promoters ought to have a reciprocal advantage. The Committee subsequently approved the insertion of a clause, agreed between the parties, that the colliery companies should keep an up-to-date map of their cables and that the promoters should give them notice of intention to break up streets and lay cables alongside or across colliery cables, so that damage could be avoided.

### Replies to Questions.

The following are points from answers to questions in the House of Commons:—

Twenty-two telephones have been installed in rural stations in Essex, and 15 more are in hand.

The number of wireless receiving licences in force on October 31st was, in round figures, 2 543 000.

A flat rate telephone charge would necessarily be higher than the total sum at present paid by the bulk of subscribers.

The daily average number of messages sent by the telephone transmitter at Rugby from May 1st to November 7th, 1928, was 28·9.

The question whether any modification is desirable in the terms of the British Broadcasting Corporation's licence, so as to include television, is at present under consideration.

The number of automatic telephone exchanges already working is 129, comprising about 150,000 subscribers' lines. It is hoped to open about 50 additional exchanges by the end of 1929.

During the last two years there have been about 300 cases of Post Office telephone cables being damaged by stray currents from public traction undertakings. The onus of preventing the leakage of injurious currents rests on the undertakers, but attempts are made by the Post Office to limit the harmful effects of currents picked up by the cable sheaths by ensuring that they leave for earth by metallic conduction.

In reply to a question regarding the placing of two bronze wire contracts with French and German firms, the Assistant Postmaster-General states that the quotations of the associated British manufacturers for the conversion of the raw material (which is of foreign origin) into the finished article exceeded the foreign quotations by between £9 000 and £10 000, or over 37 per cent. As for future orders, the Postmaster-General would continue to apply the policy of an effective preference for British manufacture where reasonable quotations were obtainable.

Replying to an inquiry regarding external beam wireless telegraph services operated from this country in addition to the four Imperial services worked by the Post Office, the Postmaster-General states that beam services are operated from this country by the Marconi Co. to the Argentine, Brazil, the United States and Egypt. The first two of these came into operation on August 5th, 1927; the United States service on October 28th, 1927, and the Egyptian service on January 15th, 1928. The transmitting station in this country for all four services is at Dorchester and the receiving station at Somerton (Somerset).

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# ELECTRICITY IN LINCS.

## Inquiry into Six Applications for Provisional Orders.

COL. T. C. Ekin, chief inspector to the Electricity Commissioners, commenced at Lincoln last week an inquiry into projects for electricity supply in Lincolnshire, including schemes by (1) the Yorkshire Electric Power Co. to supply the main streets only of two towns in Axholme; (2) the Yorkshire Electric Power Co. to supply the main streets only of two towns and one village in the Gainsborough area; (3) the Boston and District Electric Supply Co. to supply the central portion of Skegness and the main street of one village; (4) the Bourne U.D.C. (who have agreed to transfer their interests to Mr. R. Borlase Matthews); and (5) Mr. R. Borlase Matthews to supply all the streets of 140 towns and villages within three years, thereafter proceeding to supply the whole of the remaining 236 towns and villages of Lincs; and (6) the Mablethorpe Gas Co., for the Mablethorpe and Sutton Order.

It was stated that the Wainfleet and District branch of the National Farmers Union, and Friskney Parish Council had passed resolutions supporting the Boston Electricity Supply Co.'s scheme, but the Central organisation of the National Farmers' Union stated that the Wainfleet branch had not consulted them or considered the interests of the whole county.

Mr. H. E. Ringrose, for the Mablethorpe Gas Co., said the Gas Co. was willing and able to provide electricity for the urban district.

Mr. Craig Henderson, K.C., on behalf of Mr. Borlase Matthews, said his scheme affected the whole area, whereas the Yorkshire Electric Power Co.'s proposals left a large part of the county stark, as far as electric mains were concerned. The area proposed to be covered by Mr. Matthews's scheme was 1 932 square miles, with a population of 219 000, and it included 12 urban and 14 rural districts. There were altogether in the area 376 villages, hamlets and townships. The supply would be obtained from Peterborough, and from the Central Electricity Board when it was in charge. They proposed to supply at a flat rate maximum of 9d. per kWh, with an alternative system of charging for farms.

### The Average Price per Unit.

Dr. A. Ekström, a Swedish engineer who has assisted Mr. Matthews in the preparation of the scheme, said it was estimated that the average price charged would be 3·5d. gradually coming down to 2·5d.

Mr. S. G. Turner, K.C., for the Boston and District Co., said a large part of the rural population belonged to the labouring class. Under Mr. Matthews's scheme each would be called upon to pay 30s. per year towards the cost of the installation, 6s. meter rent and 15s. per room, in addition to the cost of consumption, and he asked how many labourers would be likely to agree to receive electricity on those terms?

It was pointed out that these were maximums.

The Inspector made some inquiries as to wages paid in Lincolnshire. These were satisfactory, and Dr. Ekström said obviously the farm labourers could afford to pay the usual average for paraffin oil or for electricity.

Dr. Ekström estimated that 60% would take a supply. If they did not get powers for Skegness and the north-western part of the area the whole scheme would be dropped.

Mr. John M. Kennedy, consulting engineer, did not agree that the Yorkshire Electric Power Co. were in a position to give a cheaper and more efficient supply in a shorter time than their competitors. He had never seen a scheme prepared in such thorough detail as that put forward by Mr. Matthews.

Mr. Arthur Collins, financial expert, said Mr. Matthews's scheme was practicable. There would be no difficulty in raising from £300 000 to £500 000 to finance it.

Mr. R. Borlase Matthews said he had been interested in rural electrification schemes for many years, and had experimented extensively in the use of electricity on his 600-acre farm, where it was used for 67 purposes, and it was exceedingly economical on simple farm work.

If the north and eastern areas were taken away it would rob his scheme of two big areas which would help the more difficult areas. He must have an area large enough to stand overhead charges. Where farmers used the current a charge of 3s. 6d. per acre plus 1d. per kWh would be made, and the farmer would not be limited as to its uses. He had made private arrangements for £200 000 capital.

Mr. Turner, on behalf of the Boston and District Electric Supply Co., which wished to extend its supply to Skegness, said there had been no opposition to his scheme based on any suggestion that it was intrinsically unsound.

Mr. W. P. Donald, for the Yorkshire Power Co., said if it obtained the Order it would be willing to include Caistor and that neighbourhood, leaving Mr. Matthews to provide for other parts of the country. What the company had done in Yorkshire it proposed to do in Lincolnshire. The whole of the local authorities who were concerned in the scheme were supporting his application.

Mr. W. B. Woodhouse gave evidence in support of the Power Co's scheme.

The inquiry lasted four days.

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# ELECTRICITY SUPPLY RIFLE LEAGUE.

## Prize Distribution and Dinner.

THE first to be held since before the War, the dinner of the Electricity Supply Rifle League, held on December 1st at the Talbot Restaurant, London Wall, promises to be the forerunner of an annual function. There was an attendance of nearly 80 members and their friends, Mr. R. S. Downe, the president, in the chair.

The shield in Division I was presented to the Central "A" team, who had won the premier position after a tie with the City Co.'s "A" team. The City Co.'s "B" team, however, was awarded the shield for Division II. The S.M.R.C. Silver Medal for the best average in the League was won by Mr. F. O. Andrews, of St. James's, who made an average for the year of 97·09. It was also pointed out that "possibles" were registered during the season by Mr. A. Ridd, of Shoreditch, and Mr. J. McNeil, of the City Co.

When the League was formed in 1912 it consisted of six clubs—Central, Hackney, Ilford, Shoreditch, Stepney and Westminster. Since then 18 undertakings have been represented in its tournaments, but many of these clubs are at present dormant, only Hackney and Shoreditch having unbroken membership. Difficulties in obtaining suitable range accommodation have been largely responsible for the falling off, but it is anticipated that other undertakings will form clubs to compete in the League's events.

The toast list at the dinner was short. Mr. A. H. Allen proposed "The League," and Mr. E. Mathews (the hon. secretary and treasurer) replied. "The Chairman" was proposed by Mr. G. C. Weston, and briefly acknowledged by Mr. R. S. Downe. Mr. C. P. Fox proposed "The Visitors," to which Mr. Bernard C. Holding (editor of THE ELECTRICIAN) replied.

A musical programme was given during the evening by the "Golden Pippins" Concert Party.

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# COMMERCIAL TRAVELLERS.

## Special Railway Facilities for Commercial Travellers.

AS a result of a deputation by the National Union of Commercial Travellers to the Railway Managers on June 20th last, the Union has now been informed that the railway companies have agreed:—(1) That commercial travellers be issued tickets to their "home" stations for distances not exceeding 80 miles, on Mondays, Tuesdays, Wednesdays and Thursdays, at a single fare for the double journey on surrender of voucher, the tickets to be available on the outward journey by any train at or after 4.30 p.m., and for return by any train starting at or before 10.30 a.m. the following day. (2) That cheap day tickets be issued to commercial travellers on Mondays to Saturdays inclusive, at a single fare for the double journey for distances not exceeding 80 miles on surrender of voucher.

The railway companies have further agreed that a commercial traveller may be issued a week-end ticket to any point from which an ordinary or trader's season ticket is valid to his "home" station; the commercial traveller in such cases, in addition to surrendering the usual voucher, will be required to produce his season ticket when applying for a week-end ticket to a station short of his "home" station. These arrangements will come into operation on January 1st.

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Mr. W. C. C. Hawtayne has prepared alternative schemes and estimates for the proposed extensions of the Eastbourne electricity undertaking. In regard to overhead lines he calls attention to the fact that these obviate street openings and limit capital outlay and costs of house services.

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# LEGAL INTELLIGENCE.

## Claim Against the Admiralty—War Time Electrical Development.

LORD FLEMING began the hearing of evidence in the Court of Session, Edinburgh, on November 27th, in an action raised by the Corporation of Greenock against the Admiralty, claiming £250 000, with interest since August, 1923.

The Corporation stated that a very large development of their electrical undertaking took place during the War owing to the greatly increased demand stimulated by war conditions among industrial undertakings, and in particular those engaged in production of munitions. It was clear to them that after the War their undertaking would be saddled with a large amount of unremunerative expenditure incurred in building or purchasing plant at war prices. Negotiations took place with the Government with a view to the Corporation being relieved of a portion of that additional expenditure, and the Corporation maintain that an agreement was arrived at in terms of which they were to be relieved of the sum sued for.

The Admiralty case was that no concluded agreement such as that alleged by the Corporation was entered into. They admitted that the plaintiff entered into negotiations with various Government Departments and that a meeting took place at the Admiralty, but the proposals never obtained the approval of the Board of Admiralty, nor of the Treasury, and, accordingly, if any agreement purporting to bind the Admiralty was arrived at it was not binding against the defendants. The defendants further stated that the present proceedings were excluded by the Indemnity Act, 1920.

A settlement of this case was intimated on Tuesday, when it was understood that the terms were that the defendants were absolved from liability, no costs being awarded on either side, but the Admiralty to make an ex gratia payment of £50 200.

## British Insulated Cables and Income Tax.

Judgment was on November 30th delivered in the House of Lords, by Lords Buckmaster, Sumner, Wrenbury, Carson and Warrington, in the appeal of the Commissioners of Inland Revenue on British Insulated Cables, Ltd., involving a question of accessibility to Corporation Profits Tax, the point being whether the company was exempt in consequence of their having a statutory electricity supply undertaking in addition to their main business of cable manufacturers. The Special Income Tax Commissioners, Mr. Justice Rowlatt and the Court of Appeal having each agreed that the company was so exempt, the Crown appealed to the House of Lords, where judgment was reserved on November 9th. The House dismissed the Commissioners' appeal.

Lord Buckmaster said the company, by virtue of certain Provisional Orders, was enabled to supply electrical energy within the urban district of Prescott for all public and private purposes, but was precluded from charging any higher price than that authorised by the Order. The company had, in fact, worked under the powers of the Orders and was still so working, though only to an extent trivial in relation to the general business they carried on. The argument on behalf of the Crown was that the tax was laid upon the "undertaking" of the subject, and that that undertaking in the present case was really the general business of the company, while equally the exemption was an exemption of a company whose general undertaking was that of the excepted industries mentioned in the Act. Such a provision in the Act of Parliament would have been manifestly fair.

Lord Buckmaster found in the present case the exemption was not an exemption of a company in respect of that part of its business which consisted of the privileged undertakings, nor was it the exemption of a company whose undertaking was that of the special named industries. It followed, therefore, that the appeal must be dismissed, with costs.

### LIVERPOOL HARMONIC SOCIETY.

Liverpool and District Electro Harmonic Society held a hot-pot supper and smoking concert, on November 23rd, at the St. George's Restaurant. The entertainment provided by the Duds Concert Party was thoroughly enjoyed. It was announced that the members of the Liverpool Society would be entertained by the Manchester Electro Harmonic Society on December 14th at Manchester.

# BUSINESS ITEMS.

RADIO, Ltd., inform us that their telephone number has been changed to Museum 0767/9.

**The stand of the General Electric Co., Ltd., at the Ironmongery, Hardware and Domestic Appliances Exhibition, which was recently held at the Agricultural Hall, London.**

Blackstone and Co., Ltd., announce that at the Smithfield Show, to be held from December 10th to 14th, new lighting and power plant units will be featured on Stand No. 28. The exhibit will include a 1½ kW petrol electric generator plant, consisting of a 3½ B.H.P. "Blackstone" 4-stroke petrol engine, direct coupled to a dynamo and mounted on a baseplate common to both. The switchboard to be used in connection with the set is mounted on the dynamo. Sets similar to that which will be exhibited are designed to produce 1, 1½, 2½ and 3½ kW.

The Detrick Arch Co., Ltd., announces that it has taken over from the Underfeed Stoker Co., Ltd., all the rights for the design, manufacture and sale of all flat suspended arches and roofs and furnace walls constructed under the patent rights of the M. H. Detrick Co. in Great Britain and the British Colonies (excluding Canada). It has also acquired the rights of design, manufacture and sale of Beco boiler baffles for the same countries. The operations of the Detrick Arch Co. will be under the management of Mr. J. K. Mann, formerly with the M. H. Detrick Co. of Chicago.

A firm in South-west India is desirous of information concerning equipment for the generation of a.c. with heavy type vertical cold starting crude oil engines, directly coupled to three-phase alternators delivering 3 300 V at 50 cycles. Information is also desired concerning overhead lines and underground cables, three-phase oil-immersed core type transformers ranging from 2-50 kVA (sizes below 10 kVA may be pole-mounting type), and three-phase squirrel cage and slip ring motors of 440 V 50 cycles, in sizes ranging from fractional H.P. to 50 B.H.P. Delivery of plant will require to be f.o.b. Cochin, South India, and probable date of delivery at that place from receipt of order should be given. Catalogues, etc., should be addressed to THE ELECTRICIAN, 154, Fleet Street, E.C.4, quoting reference S.M.W., when all replies will be forwarded.

One of the outstanding features of the British Thomson-Houston Co., Ltd., at the Blackpool Electrical Exhibition, which opened on December 1st, is a display of electric lighting equipment including the latest domestic, industrial and commercial types. For the home there is shown a variety of pendants, brackets and hall lanterns, etc., together with a good selection of glassware and silk and parchment shades to meet practically every conceivable requirement. For commercial purposes is a range of pendant fittings with "Ace," "Keldon" and "Trojan" glassware for the lighting of shop interiors, offices, etc. Shop window lighting by means of X-ray reflectors and floodlight and spotlight projectors is demonstrated in a model shop window. For industrial lighting, Glass-steel diffusers and Mazdalux reflectors are shown. Another display is of "Hotpoint" electrical appliances. Apart from the main exhibit on Stand No. 10, the British Thomson-Houston Co. has, in addition, a very attractive "Mazda" lamp display exhibited in one of the miniature shop windows facing the approach.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

BRECONSHIRE STANDING JOINT COMMITTEE.—Electric light installation at the County House, Brecon. Specification, etc., from Mr. H. C. W. Strickland, County Offices, Brecon.

COUNTY MENTAL HOSPITAL, PRESTWICH.—Supply and fixing of electric cooking apparatus and other equipment at the annexe kitchen. Particulars from Mr. A. R. Dowling, Clerk and Steward, at the Hospital.

HAMILTON CORPORATION.—Repair of cooling tower, at the electricity works. Further particulars from the Burgh Electrical Engineer.

F. J. HAWKES AND CO., LTD.—Manufacture under patent of an electrical device, consisting of elements and switchboards, and requiring electric welding. Specifications, etc., can be seen at the offices of Messrs. F. J. Hawkes and Co., Ltd., Finsbury Court, Finsbury Pavement, London, E.C., from December 12th to 14th.

HALIFAX CORPORATION, December 7th.—Supply and erection of 6 500 kW M.C.R. turbo-generator and auxiliaries, at Foundry Street generating station, Halifax. Specification, etc., from the Engineer and Manager, Electricity Offices, Town Hall Street East, Halifax; deposit £2.

SALFORD CORPORATION, December 8th.—Fire alarm installation in Public Health Department of Salford House. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

GLASGOW CORPORATION, December 10th.—Electric light installations on Scotstoun area No. 2 site (tenement section), and Gairbraid Avenue rehousing site. Specifications, etc., from the General Manager, 75, Waterloo Street, Glasgow, C.2.

STOCKTON-ON-TEES CORPORATION, December 10th.—Supply of paper-insulated cables. Specification, etc., from Mr. S. G. Marston, Electricity Works, Thompson Street, Stockton-on-Tees.

SURREY COUNTY COUNCIL, December 10th.—Electric wiring and fitting for Brookwood Mental Hospital, Woking. Particulars from the engineer, Mr. E. L. Burne, 28, Victoria Street, Westminster, S.W.1; deposit £3 3s.

SWINDON CORPORATION, December 10th.—(*a*) Installation of new street fire alarm call bell system (19 pillar type fire alarm call boxes), switchboard and wiring; (*b*) supply and fixing of the equipment, but exclusive of wiring. Street plan may be inspected at the office of the Borough Surveyor, 34, Regent Circus, Swindon.

AYR CORPORATION, December 11th.—Twelve months' supply of general stores for the tramways department. Specification, etc., from Mr. W. Grant, tramways manager, Town Buildings, Ayr.

EDINBURGH EDUCATION AUTHORITY, December 11th.—Electrical installation work in connection with erection of Leith Academy New Secondary School. Specification, etc., from Messrs. Reid and Forbes, 7, Ainslie Place, Edinburgh.

LIVERPOOL CORPORATION, December 11th.—Electric light installation at Old Swan Washhouse, and alterations to ighting fittings in the plunges at Queen's Drive (Walton), Lister Drive, Picton Road and Garston Baths. Specification, etc., from the Baths Manager, 75, Dale Street, Liverpool.

MANCHESTER CORPORATION, December 11th.—Supply of steel girder tramway rails. Specifications, etc., from the Secretary, Corporation Tramways Department, 55, Piccadilly, Manchester.

STOKE AND WOLSTANTON GUARDIANS, December 11th.—Installation of electric fire alarm system and wiring at the Turnhurst Road Institution, Chell, near Tunstall. Specification, etc., from Mr. T. Wood, Clerk, Union Offices, Stoke-on-Trent, deposit, £1.

STRETFORD URBAN DISTRICT COUNCIL, December 11th.—Supply and erection of 3 three-phase transformers of 10 000 kVA capacity each, with equipment for voltage regulation. Specification, etc., from Mr. J. A. Robertson, 20, Brazennose Street, Manchester; deposit £2 2s.

BROMLEY (KENT) CORPORATION, December 12th.—Electric wiring of 91 houses at Southborough. Particulars from the borough engineer, Mr. Harold Cliffe; deposit, £1 1s.

GRIMSBY CORPORATION, December 13th.—Electric light wiring of Armstrong Street Schools. Specification, etc., from Mr. S. R. Windle, borough electrical engineer.

BARNOLDSWICK URBAN DISTRICT COUNCIL, December 15th.—Complete electricity distribution scheme. Specifications, etc., from Mr. R. W. Fenton, Clerk of the Council, Town Hall, Barnoldswick, via Colne; deposit £1 1s.

BRADFORD CORPORATION, December 15th.—Supply of single-deck and double-deck electric trolley vehicles, trolley wire and tramway poles. Specification, etc., from Mr. R. H. Wilkinson, Tramways Department, Hall Ings, Bradford.

PLYMOUTH CORPORATION, December 15th.—Supply of motor-driven rotary boiler feed pump. Specification, etc., from the City Electrical Engineer, Electricity Works, Prince Rock, Plymouth, before December 10th.

CENTRAL ELECTRICITY BOARD, December 17th.—Oil filtering and storage equipment for 13 outdoor transforming stations, in connection with the Central Scotland Electricity Scheme. Specification (No. C.S.-P.S. 1A) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

LEICESTER CORPORATION, December 17th.—Electric light installation in connection with erection of a public abattoir at Aylestone Road, Leicester. Specifications, etc., from Mr. R. Stephen Ayling, 53, Victoria Street, London, S.W.1; deposit £1 1s.

WEST RIDING EDUCATION COMMITTEE, December 19th.—Electric light installation at Wath Secondary School. Specification, etc., from Education Dept., County Hall, Wakefield.

STAFFORDSHIRE EDUCATION COMMITTEE, December 28th.—Electric light and power installation in the County Mining College, Stafford Road, Cannock, by registered electrical installation contractors. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit, £3 3s.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc., from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

SOUTHEND CORPORATION, December 31st.—Supply of 3 000 joint boxes, for the light railways and electricity department. Full particulars from Mr. R. Birkett, Electricity Works, London Road, Southend-on-Sea

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300 V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52) 35, Old Queen Street, Westminster, London, S.W.1.
*Note.—An asterisk denotes that local representation is, in practice, essential.*

DURBAN MUNICIPALITY, December 8th.—Supply of four pairs of equal-wheel bogie trucks, four 4-motor tramcar equipments, and tramcar saloon and top-deck seats. Specification from Messrs. Webster, Steel and Co., 36, Leadenhall Street, London, E.C.

RATHMINES AND PEMBROKE JOINT HOSPITAL BOARD, December 8th.—Installation of electric bells at the Isolation Hospital, Clonskeagh. Specification from the Matron.

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DUBLIN CORPORATION, December 10th.—Supply, erection, etc., of e.h.t. switchgear and accessories. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 10th.—Supply of two-conductor cords (P. and T. 151/1157). (Reference B.X. 4 929.)

VICTORIAN ELECTRICITY COMMISSION, December 10th.—Supply, etc., of one 65-ton electric overhead travelling crane (specification 28/103). (Reference A.X. 7 116.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of instrument cords (schedule C. 374). (Reference B.X. 4 811.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 11th.—Supply of telephone generators (schedule C. 375). (Reference B.X. 4 812.)

VICTORIAN RAILWAY COMMISSION, December 12th.—Supply of d.c. polarised relays (contract 42 137). (Reference B.X. 4 886.)

SOCIETE NATIONALE DES CHEMINS DE FER BELGES, December 13th.—Supply of armoured and unarmoured electric cables. (Reference B.X. 4 930).

SOUTH AFRICAN POSTS AND TELEGRAPHS, December 13th.—Supply of solder, copper wire and cable. (Reference B.X. 4 799.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of seven-ton electrical overhead travelling crane (tender No. 1 347.) (Reference A.X. 6 989.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 13th.—Supply of one electrically-driven, geared, maximum service, double housing planing machine (tender No. 1 356.) (Reference A.X. 7 064.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/69.)

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically-operated deep dredger for Yallourn Brown Coal Works (specification 28/94). Specification, etc., from the Agent-General, Victoria House, Strand, London, W.C.

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, December 18th.—Supply of 50 000 metres of rubber covered field telephone wire. (Reference A.X. 4 849.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of lamps, lamp caps and lamp sockets. schedule C. 378.) (Reference B.X. 4 819.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, December 18th.—Supply of motor generating sets (schedule C. 377). (Reference B.X. 4 810.)

EGYPTIAN MINISTRY OF THE INTERIOR, December 20th.—Supply of pumps, electric motors, air compressors, etc., and sinking an artesian well. (Reference A.X. 7190.)

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of telegraph materials (C. 2 900).

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of metal filament traction lamps (contract 91). (Reference B.X. 4 891.)

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of tram trucks and electrical equipment for tramcars (contract No. 80). (Reference A.X. 7 113.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 20th.—Sub-station equipment, including switchgear, transformers and cables, for Frankton Junction power and signalling supply (specification No. 101). (Reference B.X. 4 771.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 20th.—Supply of telegraph material, poles, cross-arms, spindles, insulators, wire, etc. (tender No. 1363). (Reference A.X. 7 223.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of two hydraulic pumps and electric motors. (Reference A.X. 7 150.)

TURKISH DIRECTION-GENERAL OF POSTS, TELEPHONES AND TELEGRAPHS, January 5th.—Supply of 60 000 porcelain insulators and 15 000 swan neck fittings. (Reference B.X. 4 904.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of switching equipment and relays, for use in automatic telephone exchanges (schedule C. 381). (Reference B.X. 4 880.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of protective apparatus for telephone equipment, including fuses, heat coils and arresters (schedule C. 380). (Reference B.X. 4 881.)

GRAHAMSTOWN MUNICIPALITY, January 22nd.—Supply of cable, transmission lines and transformers (contract C. 1928). (Reference B.X. 4 913).

EGYPTIAN MINISTRY OF THE INTERIOR, January 24th.—Supply and installation of electric system for Beba. (Reference B.X. 4 916).

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, January 24th.—Supply of telephone switchboards (tender No. 143). (Reference B.X. 4 912).

NEW SOUTH WALES DEPARTMENT OF PUBLIC WORKS, January 28th.—Supply and erection of hydro-electric generating plant. (Reference B.X. 4 892).

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of pillar insulators, with metal parts, for use on 132 000 V outdoor circuits. (Reference B.X. 4 921.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

INDIA STORE DEPARTMENT, February 15th.—Supply of hydro-electric plant, comprising four 12 000 kW water-wheel driven alternator sets, auxiliaries and spares (schedule 4). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.—Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Reference B.X. 4 873)

## Tenders Accepted.

DOVER CORPORATION.—Pirelli-General Cable Works, Ltd., feeder cable, £1 798.

GRAVESEND CORPORATION.—Sidney and Freed, electric wiring of sanatorium, £65.

GRIMSBY CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply of e.h.t. switchgear, £3 550. (Recommended.)

STOKE-ON-TRENT CORPORATION.—J. H. Broadhurst and Son, erection of 8 all-electric houses at Avenue Road, Hanley, £3 940.

EASTBOURNE CORPORATION.—General Electric Co., Ltd. carrying out lighting scheme at new showrooms and offices £363 14s. 8d.

ERITH URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., cables for Woolwich Road extensions, £2 192 11s. 6d.

MANCHESTER CORPORATION.—General Electric Co., Ltd., 30 500 V tramcar motors, each of 50 H.P. on one-hour rating, with 60 tramcar controllers for controlling two 50 H.P. motors.

WANDSWORTH (LONDON) GUARDIANS.—India rubber, Gutta Percha and Telegraph Works Co., Ltd., supply of cable in connection with installation of new hot water boilers at St. James's Hospital, £163 7s. 9d.

GLASGOW CORPORATION.—J. Baker and Co. (Rotherham), Ltd., axles, wheels and tyres for reconditioned tramcars; W. C. Yuille and Co., Ltd., gearing for destination screens; Edison Swan Electric Co., Ltd., switchboard, for new 'bus garage; Ferranti, Ltd., transformer, for new 'bus garage.

LEEDS CORPORATION.—W. H. Allen, Sons and Co., Ltd., supply of circulating water pipes and valves, £3 258. Supply of cables: W. T. Henley's Telegraph Works Co., Ltd., £1 595; Enfield Cable Works, Ltd., £1 704; Macintosh Cable Co., Ltd., £1 890; Greenwich Cable Works, Ltd., £1 586 11s. 3d.; and Hackbridge Cable Co., Ltd., £1 680.

CAPE TOWN CORPORATION.—Metropolitan-Vickers Electrical Export Co., Ltd., reblading rotor and supplying spares for turbo-generators at Dock Road power station, £900. Supply of copper wire; British Insulated Cables, Ltd., £4 336 10s.; Dowson, Dobson and Behr, Ltd., £3 011; and General Engineering Co., £1 801 5s.; Associated Engineering Co., Ltd., supply of meters, manufactured by Measurement, Ltd., £980 16s. 8d.

METROPOLITAN WATER BOARD.—W. T. Glover and Co., Ltd., supply of four 250-yard lengths 0.3 sq. in. paper insulated twin shaped conductor, two joint boxes for same cable, four cable end sealing boxes, two 218-yard lengths special cable, two cable and sealing boxes, one special joint box with connecting links, 120 yards twin 19/044 paper-insulated shaped conductor, two cable end sealing boxes, with lead sleeves, compound and insulating materials, £812 (recommended). Also tendered: Standard Telephones and Cables, Ltd., £810; Macintosh Cable Co., Ltd., £813; W. T. Henley's Telegraph Works Co., Ltd., £816; British Insulated Cables Ltd., £820; General Electric Co., Ltd., £823.

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# ELECTRICITY SUPPLY.

## Mains Extensions at Morecambe, Cheltenham and Poplar—Witham and Largs Supplies Inaugurated—York Extension Order—Exeter Plant Extension Proposal—Electric Street Lamps Supersede Gas at Otley.

MORECAMBE Electricity Committee has obtained sanction for a loan of £11 000 for mains.

Douglas (Isle of Man) Electricity Committee has obtained a site at Summer Hill for a sub-station.

Sanction to loans of £12 041 and £1 230 for electricity purposes has been received by Tamworth T.C.

Cheltenham Electricity Committee has obtained sanction to borrow £39 562 for mains, transformers and switchgear.

A supply of electricity to Witham was inaugurated by the East Anglian Electric Supply Co., Ltd., on November 26th.

The County of London Electric Supply Co. has intimated that electricity will be available on Canvey Island by next autumn.

Bedford Electricity Committee is to undertake a scheme for the supply of electricity to the hamlet of Cotton End, at a cost of £1 160.

York Electricity Committee is seeking an Order to include in the electricity supply area the districts of Warthill and part of Boroughbridge.

The supply of electricity to Largs by the Ayrshire Electricity Board has been commenced. The charges are 5½d. per kWh for lighting and ½d. for power.

Exeter City Council is applying to the Electricity Commissioners for sanction to a loan of £37 500 for an extension of plant at the electricity generating station.

London County Council Highways Committee states that it proposes to report fully when the standard prices of all the London electricity supply companies have been determined by the Commissioners.

The Whitchurch and Pangbourne Electric Supply Co., Ltd., has informed Bradfield R.D.C. that the charge for electricity for lighting will be reduced from 1s. to 10d. per kWh from the beginning of next year.

Otley U.D.C. has decided to adopt electric street-lamps, in place of gas. The energy is to be supplied by the Yorkshire Electric Power Co. The company will lay five miles of cable in the town, and the initial outlay will be £20 000.

Lancaster T.C. proposes to embark on improvements at the power station, to cost over £32 000. Two new boilers will cost £25 000 and a station battery £7 500. The Central Electricity Board has granted permission for the work.

Poplar (London) Electricity Committee is to extend mains, etc., at a cost of £2 750, to provide a further supply for the Port of London Authority at West India Docks.—The Committee has obtained sanction to borrow £191 530 for mains and plant.

The Lighting Committee of Littlehampton U.D.C. has entered into a new street lighting agreement with the Sussex Electricity Co., as from November 30th. The old contract was on the basis of approximately 3¾d. per kWh. The new contract provides for a charge of 5½d. per kWh, including maintenance.

Heston and Isleworth Electricity Committee is to seek sanction to a loan of £12 700 for new showrooms and offices in Bath and Staines Roads. New distributor mains are to be laid along several roads from Woodlands Road for the supply of 204 houses, to be erected on the Woodlands Estate, at a cost of £2 110.

At a meeting of the Dublin City Commissioners last Saturday a letter was submitted from the Irish Free State Electricity Supply Board, giving approval to the expenditure of £100 100 in connection with the Corporation's electricity undertaking.—A transformer station, with a frontage of 82 ft. to Fleet Street and 83 ft. to Bedford Row is to be erected.

In connection with the Central Scotland Electricity Scheme, plans for the erection of 20 steel latticed towers were submitted to the Dean of Guild Court, Edinburgh, last Friday. The petition, which was submitted by the General Electricity Board, was approved. The towers, 65 ft. in height, are to be erected on Mortonhall Estate.

Dunoon T.C. has received an offer by a London firm to supply electric light and power to the burgh. It is understood that the present offer is the most favourable yet received. The T.C. was recently in negotiation with Greenock Corporation for a supply by means of an under-water cable across the Firth, but the ratepayers decided against proceeding with the matter.

Birmingham Electric Supply Committee has completed a scheme which will enable householders to instal electricity on easy payment terms. The continued progress of the undertaking is indicated by the fact that during October, 1 585 additional premises were connected. During the past few weeks there has been an average daily increase of over 10% in the total demand, compared with the same period last year.

The work in connection with the erection of the first section of Leed's Corporation's new Kirkstall generating station is making good progress. The new dock, at which coal will be unloaded from barges, is finished, and the skeleton of the building which will contain the coal pulverising plant is being erected. The concrete bed for the boiler house has been laid, and a similar bed for the turbine room is in course of formation. It is expected that the erection of the main building will be commenced early in the new year.

Sir Andrew Duncan, chairman of the Central Electricity Board, accompanied by Mr. M'Coll and Mr. Archibald Page, held a conference with Dundee representatives at Dundee last week in regard to the question of linking up the new electricity system with the Carolina Port station. Amongst the proposals made at the conference was one by which a sub-station might be erected in the neighbourhood of the Kingsway. From that station an overhead wire would carry the current to Carolina Port, where the necessary transformers might be installed.

Alderley Edge and Wilmslow Councils have elected the electricity board for the district. The board will take over the Alderley and Wilmslow Electric Supply Co.'s works at the end of the year. A loan of £113 000 has been raised for purchase of the works, and the area of supply, as fixed by the Electricity Commissioners, includes the urban districts of Alderley Edge, Wilmslow, and Handforth, and portions of the Macclesfield and Bucklow rural districts. The charge for current, at the outset, will be 10d. per kWh, but when arrangements can be made to obtain a supply in bulk from Stockport or Manchester the generation of electricity at Alderley Edge will cease, and the charge to consumers will be reduced.

Col. T. C. Ekin, on behalf of the Electricity Commissioners, opened an inquiry at the Town Hall, Highgate, on Tuesday, into an application by Hornsey Corporation for sanction to borrow £33 000 for an extension of its generating plant. It was suggested by the Commissioners that this expenditure might be avoided by obtaining a supplementary supply of electrical energy in bulk from the Central Electricity Board. Mr. Richard Cripps, K.C., for the Hornsey Council, argued that under the Electricity Act of 1926 the Central Board had no legal power to give a bulk supply until the South-East England scheme was completed. Mr. Craig Henderson, K.C., for the Central Electricity Board, said that they were able to give a supply of current in bulk to Hornsey through the North Metropolitan Power Company at an advantageous cost, and they could do this with the consent of the Joint Electricity Authority. The Board had Parliamentary powers which would have the ultimate effect of closing down those electricity stations which were uneconomical.

At a meeting of Glasgow Corporation last week, Coun. Pilkington asked whether the Convener of the Electricity Committee was aware that Glasgow householders who lived in the area supplied by the Clyde Valley Electric Co. had received notices of increased charges for electricity; if he would state the comparative costs as between the Clyde Valley Co. and the Electricity Department for three, four, five and six-apartment houses, and whether he would take steps to obtain unification of charges for all persons within the city boundaries? Bailie Holmes, Sub-Convener of the Committee, said it was not possible to produce a statement of the comparative costs which would be of any value, because the methods of computation in the two cases were different. It could only be said generally that the Corporation tariff to domestic consumers was cheaper than that of the company. The question of negotiating for taking over the electrical supply in the city now controlled by the company did not come within his province. If any member of the Committee brought up the matter no doubt it would be considered.

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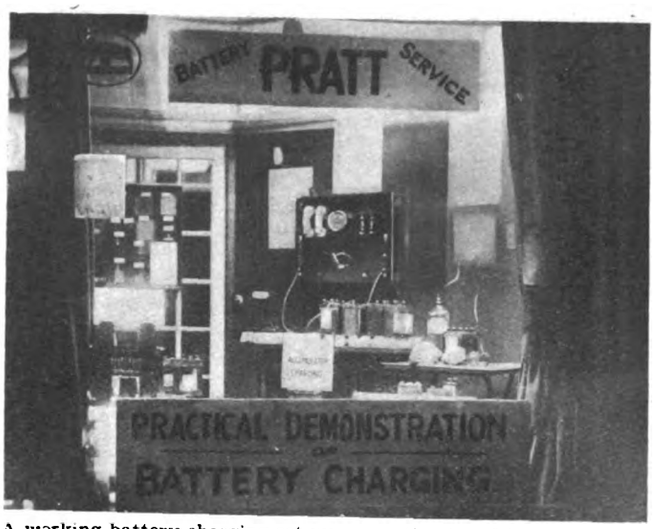
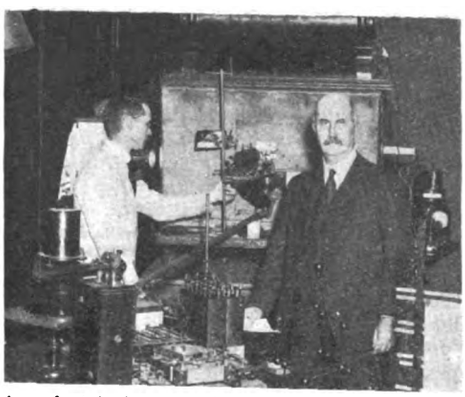
# ELECTRICAL NEWS IN PICTURES.

The new "Volta Memorial," erected on the bank of the lake at Como, Italy, to commemorate the great physicist, Alessandro Volta. In the building are housed, in exhibition cases, experimental forms and models of the machines used in conjunction with his discoveries.

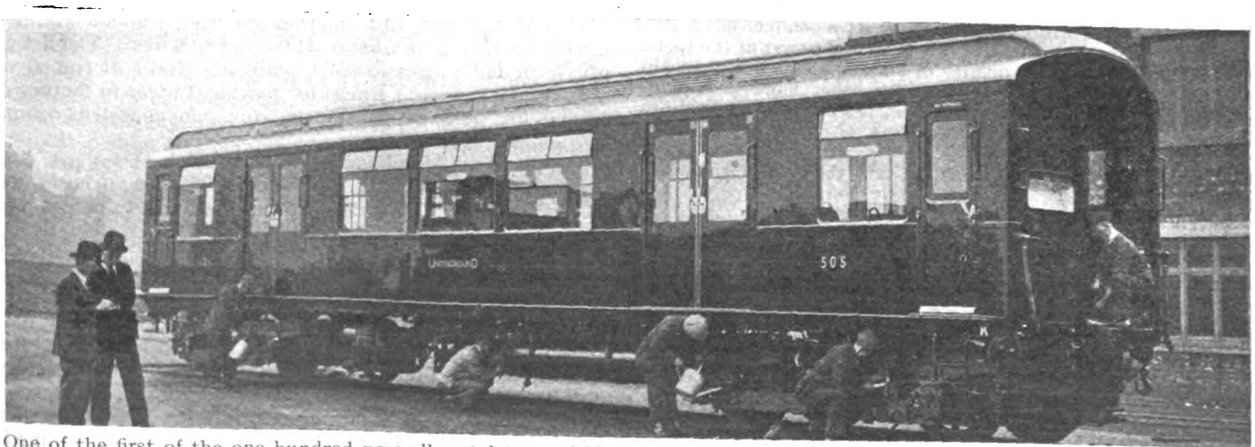



A working battery-charging set was recently staged in the window of Christopher Pratt and Sons, Ltd., of North Parade, Bradford. High and low tension batteries for wireless purposes were to be seen being recharged, with the accessories for testing and refilling with acid in position.

Some of the members of the Bristol University Engineering Society on the occasion of their recent visit to Portishead power station. A thorough inspection of the station was made, the party being split up into groups of ten, each having its own guide.



An electrical apparatus which it is claimed proves the genuineness or otherwise of a diamond. The device was developed by Sir William Bragg, F.R.S.




One of the first of the one hundred new all-metal type of Underground trains which are being built for the District Railway, London. They embody a new method of seating, are decorated in a novel way, and are said to be lighter than those made of wood which are now in use. By placing the switchgear and resistances under the carriage, the driver's cabin is reduced to small dimensions, and the passengers' accommodation is accordingly increased.



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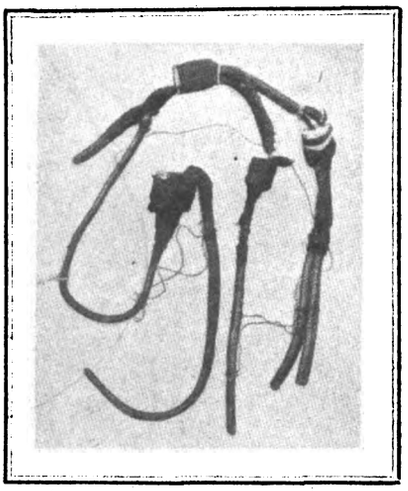
# "HIDDEN RISKS."

## New Leaflet Issued by National Register of Electrical Installation Contractors.

TO meet the requirements of registered contractors and supply authorities who wish to instruct the general public on the advantages of having installation work done by contractors whose names appear on its roll, the National Register



HIDDEN RISKS.

**The front page of the new leaflet published by the National Register of Electrical Installation Contractors.**

of Electrical Installation Contractors has issued a four page leaflet measuring 6 in. by 4¼ in. This attractive publication, the front page of which is reproduced above, explains in simple, non-technical language the risks which are inseparable from installations put in by unqualified contractors, the way to avoid these risks, and how to tell who is a registered contractor.

The text of the leaflet is given below :—

" Hidden away in walls and under floorings in house, shop, and factory, is a maze of wires whose purpose is to conduct electricity to the points where you convert it into light and power at the touch of a switch. Generally the quality of materials and workmanship employed are beyond reproach. On the other hand it is still, unfortunately, possible to find untidy bunches of wire amateurishly tied up with odd bits of tape and string after the style of the illustration overleaf.

" Such work is definitely dangerous, and the risk is enhanced by reason of the fact that it is hidden away, so that you may never have seen it or even given it a thought.

" How to insure yourself against the risk of breakdown—and even fire ? Consult a qualified electrical installation contractor, and remember that as so much depends on the way this work is done, the cheapest offer is not always the most satisfactory in the long run.

" ' But how can I tell who is a qualified electrical installation contractor ? ' The National Register of Electrical Installation Contractors has been brought into being to provide a ready reply to your question. It is an independent organisation existing solely in the public interest, and it maintains a Register containing the names of some twelve hundred persons and firms who have given to its Registration Board satisfactory evidence of their competence in matters of this kind.

' Such persons are furnished with a certificate—which is withdrawn if they fail to maintain a sufficiently high standard of workmanship—and they are authorised to display the badge shown on this page, and to call themselves Registered Electrical Installation Contractors.

" By employing only such Registered Contractors for electrical wiring work you relieve yourself of all anxiety over the hidden wires that are so important to your comfort and safety. In fact you may place the same sort of confidence in the work of the Registered Electrical Contractor that you do, in another sphere, in the work of the registered medical practitioner.

" Although the National Register of Electrical Installation Contractors has been in existence for less than five years, a number of Corporations, County Councils, Hospitals and other public bodies and institutions have definitely decided to restrict their orders for electrical wiring work to Registered Electrical Installation Contractors. Why not follow their lead, and so secure the safe and trouble-free service that only the qualified electrical contractor can be relied upon to give ? The badge of the National Register is the hall-mark of good electrical wiring."

Copies of this leaflet may be had by registered contractors and supply authorities, at cost, in minimum lots of 500 at 12s. 6d., and £1 3s. per 1 000 copies.

# ELECTRICAL ENGINEERS' BALL, 1929.

## Members of the General and Executive Committees.

IT has been arranged to hold the 20th Electrical Engineers' Ball, on February 8th, 1929, at the Hotel Cecil, London. The names of the General and Executive Committees are as follow : Sir T. O. Callender, Sir Hugo Hirst, Sir Arnold Gridley, Sir Philip A. M. Nash, Sir John Snell, Sir George Sutton, Dr. S. Z. de Ferranti, Dr. S. L. Pearce, Col. T. F. Purves, Sir William Noble, Dr. Alexander Russell, Lt.-Col. C. Hardie, Lt.-Col. F. A. Cortez Leigh, and Messrs. H. Alabaster, G. H. Alabaster, H. Allcock, L. Andrews, Ll. B. Atkinson, O. H. Baldwin, George Balfour, M.P., J. H. Bowden, R. A. Chattock. A. C. Cramb, F. W. Crawter, A. J. Cridge, H. W. Couzens, T. C. Elder, E. J. Fox, E. Gatehouse, Frank Gill, M. M. Gillespie, James Gray, J. P. Gregory, A. E. Hadley, J. S. Highfield, C. W. Hill, P. V. Hunter, R. W. Hughman, M. J. D. Kerr, J. E. Kingsbury, H. W. Kolle, W. W. Lackie, H. M. Leaf, W. Stanley Lonsdale, J. J. Macgregor, A. E. McKinstry, H. J. S. Mackay, Wm. McClelland, P. V. McMahon, A. V. Mason, W. Lee Matthews, H. E. Midgley, W. M. Mordey, E. W. Moss, F. H. Nalder, E. S. New, A. Page, G. W. Partridge F. Pooley, M. J. Railing, G. E. Riley, A. S. Rinder, F. M., Rogers, P. F. Rowell, C. E. Sayer, H. Scholey, H. C. Siddeley, A. M. Sillar, D. J. Sinclair, C. D. Taite, G. M. C. Taylor, J. M. G. Trezise, A. H. Walton, David Wilson, W. B. Woodhouse, and F. E. Worsdell. *Executive Committee* :—Messrs. O. H. Baldwin, H. W. Couzins, A. C. Cramb, C. W. Hill, J. E. Kingsbury, W. S. Lonsdale, P. V. McMahon, A. M. Sillar, and A. H. Walton. *Hon. Secretaries* :—Messrs. A. M. Sillar and C. W. Hill. *Hon. Treasurer* :—Mr. J. E. Kingsbury.

# TRADE PUBLICATIONS.

A MAILING card describing thermo-electric pyrometers with ranges up to 4 000 deg. C. has been received from the Cambridge Instrument Co., Ltd., of 45, Grosvenor Place, London, S.W.1.

A special catalogue dealing with accessories suitable for motor yachts, bungalows, cottages, etc., for use with low voltage circuits, has been issued by D. H. Bonnella and Son, Ltd., of 46-48, Osnaburgh Street, Euston Road, London, N.W.1.

E. and E. Kaye, Ltd., of Ponders End, Enfield, Middlesex, have published a new list of H.C. copper wires. The list gives prices for H.C. wires in coils, plain soft and soft tinned wires are also dealt with. Prices for sectional wires in factory coils over 56 lbs., H.C. copper strand, are given, as well as comparative gauges tables.

The Mullard Wireless Service Co., Ltd., Denmark Street, London, W.C.2, has issued a poster for display purposes, which gives details of the most suitable Mullard valves to use in the various popular receivers described in recent technical publications. The poster will be revised from time to time, and copies will be sent to all traders, so that it may be understood at a glance which valves to use in certain circuits.

We have received from Batteries, Ltd., Hunt End Works, Redditch, a copy of a new list No. 1 which has recently been published. This booklet contains a semi-technical description of the construction and characteristics of the latest type of " Nife " nickel-steel alkaline accumulator. Particular attention is drawn therein to the steady voltage maintained on discharge and curves are given on pages 14 and 16. Another feature in this publication is the numerous and varied applications for which the booklet claims that " Nife " steel plate batteries are employed.

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# MINING ENGINEERS.

## Presidential Address to Mining Electrical Engineers—London Branch.

IN his presidential address to the London Branch of the Association of Mining Electrical Engineers, on November 21st, Mr. J. W. Robinson reviewed the question of scientific progress, and in the course of his remarks stressed the importance of the maintenance of individual effort supplementary to the work of the research organisations. Referring to the Safety in Mines Research Board, he said that during the year ended March 31st, 1928, £52 718 was expended by the Board on research work (apart from the building of research stations). In 1927, the Board published eleven papers containing the results of research work, whilst other results were contributed by the investigators to various scientific and technical journals. The scheme of co-operative research with the United States Bureau of Mines had matured on satisfactory lines, and he looked forward to co-operation in research being extended to Belgium, Germany, and France. Mr. Robinson appealed for a freer exchange of ideas among firms.

He contended that the scientific use and treatment of coal was one of the predominant needs in industry, and the World Fuel Conference, which had recently concluded its deliberations in London, had convinced the civilised world that the burning of raw coal was wanton waste. As to the scientific control of boiler plant, some of the most modern super-power stations had reached the stage, which some of our fuel experts had been advocating for years past, at which they were regarding the operation of steam boilers as a job for the highly trained chemical engineer. Extraordinary interest was centred also upon the development of low-temperature carbonisation, and so far as the treatment of fuel problem was concerned, the situation could be regarded as satisfactorily progressive, and must lead to important results in the near future. With the development of low-temperature carbonisation we could look forward to a new era in the mining industry; not only the coal owners, but other industrialists, were waking up to the possibilities, and would not shelve their responsibility in this direction.

# GARCKE'S MANUAL.

## New and Enlarged Edition Just Published—A Brief List of Contents.

THE 1927-28 edition (Vol. XXXI) of Garcke's "Manual of Electrical Undertakings" has just been issued. It has been revised and corrected to September, 1928, and the number of undertakings dealt with has increased to about 5 000, while the directory section, which contains the names of directors, engineers, managers, secretaries, etc., comprises about 20 000 names and addresses. The undertakings dealt with are classified in four sections, viz.: (1) electric supply and traction; (2) telegraph and telephone; (3) manufacturing and miscellaneous; and (4) Colonial electrical undertakings. In each case the information includes the subscribed capital, or, in the case of municipalities, the loans authorised and raised, the dividends paid by companies; and in the electric supply section, the generating plant installed, the load connected, the maximum load, output, revenue, and cost per kWh, and analysis of accounts, with comparison for four years; in the traction section (tramways, light railways, and trackless trolley lines) the information includes lengths of routes, passengers carried, miles run, etc.; in the telegraph and telephone section there are summaries of the industry, statistics of Post Office and municipal capital expenditure, companies' subscribed capital, and a table of nominal capital of companies registered from 1856 to 1927. The summaries of statistics show that the total issued capital of 490 electric supply companies in Great Britain was £153 800 424, compared with 486 companies and £142 470 125 a year previously; the loans authorised to be raised by 373 municipalities amounted to £160 474 581, compared with 330 and £140 568 491. The plant installed in the generating stations of 732 undertakings owned by local authorities and companies was 5 577 125 kW, against 745 undertakings and 5 127 491 kW, and the electricity sold by 583 undertakings was 6 903 115 917 kWh, against 558 undertakings and 6 444 116 244 kWh. The book also contains, as usual, a section on the progress of the year, and there are numerous maps of electricity supply areas and much other information of value to those engaged or interested in electrical work. The book, which has grown to over 2 000 pages and is still sold at 35s. net, is published by the Electrical Press, Ltd., Fisher Street, Southampton Row, London, W.C.1.

# WIRELESS NOTES.

## Broadcasting Over the Supply Mains—Development in the U.S.A.

AN interesting transaction, foreshadowing the lines on which broadcasting in the United States is expected to develop, is reported from New York.

By a deal involving the largest single transfer of patents in the history of the wireless industry, the North American Company, the largest supplier of electric light and power in the United States, has granted the Kolster Radio Corporation title to no less than 600 of its patents, in return for exclusive licenses in the field of wired radio to one of its subsidiaries, Wired Radio, Inc. The patents concerned include the fundamental patent for chain broadcasting, as well as patents for television and talking motion pictures.

The significance of this transaction, which has been completed only after many months of secret negotiations, lies in the fact that within the coming decade or two most of the broadcasting in the United States will, it is predicted, be carried on over household electric light and power wires, the air being left clear for commercial and safety communications. In this way, according to wireless experts, the worst of the broadcasting difficulties with respect to interference will be overcome.

### The Manufacture of Sets.

The Kolster Radio Corporation has also received from the North American Company the contract to manufacture for Wired Radio, Inc., not less than one-third of its apparatus requirements, the value of the business which it will receive in this way being estimated at approximately £7 200 000 per annum. Owing to the vast extent of its operations, the North American Company is already fully equipped to enter the wired radio field, and, in view of the future predicted for this type of broadcasting in the United States, the new agreement is expected to open up for the company an entirely new and important field of business.

The Post Office authorities are taking steps to establish a wireless telegraph station at Fleetwood to operate when communication by cable either with the Isle of Man or Ireland is interrupted. A representative of the G.P.O. engineering department has visited the coast and has come to the conclusion that Fleetwood presents the most suitable opportunities for such a station.

### New Beacon Station at Start Point.

A wireless beacon installation built at Start Point by Marconi's Wireless Telegraph Co., Ltd., for the Corporation of Trinity House has just been completed. This type of station transmits a special signal, on an exclusive wavelength of 1 000 metres, for the benefit of ships equipped with wireless direction finders, and the Start Point installation is the seventh of its kind now established round the British coasts. The transmitter has a power of 500 W, and the whole equipment is automatically controlled by a master clock for transmitting groups of interrupted continuous wave (I.C.W.) signals at prearranged intervals. The call sign of the Start Point station is GSM and accurate direction-finding bearings may be expected up to about 100 nautical miles under normal atmospheric conditions.

# FACTORY LIGHTING.

## Good Progress in the Midlands and the North.

THE Factory Lighting Campaign is already bearing good fruit in the Birmingham area, a number of orders for complete factory lighting installations having been placed with local firms during the past few days. This, at a time when little money is being spent by private firms upon development of this kind, is attributed to the vigour with which the campaign has been conducted, and in particular to the factory lighting demonstration at Dale End.

Mr. R. C. Hawkins, divisional officer, North Western Area of the E.D.A., gave a lecture on "Factory and Workshop Lighting" at the Chester electricity showrooms last week. Representatives of most of the important engineering workshops in the district attended. Mr. Hawkins gave experiments on the effect of glare and inefficient lighting, and demonstrated the advantages of good lighting, emphasising the saving which could be brought about in industry through the application of electricity. Mr. S. E. Britton, city electrical engineer, moved a vote of thanks to the lecturer for his enlightening discourse.

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# COMPANY NEWS.

## Big Rise of Marconi International Marine Shares—Electrical Distribution of Yorkshire Increase of Capital—Marconi's Wireless Telegraph Co. and the Merger—Burndept Wireless Statutory Meeting—New Companies Registered.

MARCONI'S International Marine shares have continued to be bought, and changed hands on Monday at over £5 apiece, the price of 82s. 6d. at time of writing showing a rise of 13s. 9d. compared with the quotation a week ago. Eastern stock has lost last week's small advance. With the exception of Ever-Readies, which are 1s. 9d. to the good, leading equipment shares have shown weakness. Henley's are 3s. 3d. down; British Insulated, Callender's and Siemens, 1s. 3d., and General Electric, 6d. Lighting descriptions have been irregular.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1928 to 1927. Highest. | Lowest |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 91½ | 91½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 26/6 | 27/- | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/- | 27/6 | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/6 | 43/- | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6 | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 43/1½ | 42/6 | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | N'castle-upon-Tyne Elec. Sup. Ord. | 25/- | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James. & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops.Worcs.&Staffs Power B.Or | 34/4½ | 34/4½ | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/- | 34/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/ | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124 | 124 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 127½ | 127½ | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) .. | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb. .. .. | 80 | 79 | 103 | 50½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 77½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 74½ | 74½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb. .. | 80½ | 79½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. .. | 62 | 62 | 82 | 30 |
| 4½ | Met. Elec. Trans, 4½% Deb. .. | 72 | 72 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 64½ | 66 | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. .. | 71 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 80½ | 80 | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 81½ | 81½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 110½ | 110½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. .. | 26/6 | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 81/3 | 82/6 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/6 | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 104½ | 10/0½ | 109½ | 92/- |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 81/3 | 82/6 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 10/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf. | 18/3 | 19/- | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord (£/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 26/10½ | 26/10½ | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 27/3 | 25/6 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 41/- | 41/6 | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 112/6 | 115/9 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 38/9* | 38/9 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 28/9 | 18/9 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 55/- | 55/- | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 26/3 | 27/6 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 56/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 254½ | 259½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 68½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 25½ | 26 | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 28½ | 29 | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 50½ | 25 |
| 5 | Marconi's Wireless T. Ord. .. | 70/3 | 78/1½ | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. .. | 82/6 | 68/9 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 25½ | 26 | 23 | 11/3/6 |

(*a*) 1s. 7⅞d. per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus. * Ex dividend.

ERNEST BENN, LTD.—Intm. div. of 2½% less tax, has been declared.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Intm. div. of 5% actual, tax free (same rate as last year) on ord. shs. is announced.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly, div. of 1½% on cum. pref. shs. will be payable on Jan. 1.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—Div. on common shs. of $1¼ p. sh., for qrtr. ending Dec. 30, will be payable on Jan. 1.

GENERAL ELECTRIC CO., LTD.—Transfer books and register of members of the 6½% A and 7½% B cum. pref. shs. are closed until Dec. 14, inclusive, for the purpose of preparing div. warrts. for six mos. ended Sept. 30, payable on Dec. 31.

COMPANIES TO BE STRUCK OFF THE REGISTER.—The following cos. will be struck off the Register of Joint Stock Companies, unless cause to the contrary is shown before Feb. 13, 1929: Acme Radio Valve Co.; Burke Electrical Mfg. Co.; Johnson Radio Co.; Lang Squire Wireless Mfg. Co.

WARD AND GOLDSTONE, LTD.—The directors have formulated a scheme (for approval by the shhldrs.) to alter the rights of participating pref. shs. The directors consider it advisable to separate the pref. shs. from their participating rights. It is proposed to divide each £1 ord. sh. into four shs. of 5s. each, and hldrs. of ten pref. shs. would receive in addition to their pref. shhldg., four ord. 5s. shs, and *pro rata*, for relinquishing their participating rights on the pref. shs.

BENN BROTHERS, LTD.—Sir Ernest Benn, chn. of Benn Brothers, Ltd., announces the purchase of the business of William Agnew, Ltd., 24, Mark Lane, London, E.C., proprietors of "The British Trade Journal," "The Leather Trades' Review," and "The Miller." Thus will be added to the Bouverie House group three outstandg. trade journals, long established, and with admirable records of service and enterprise. It is noteworthy that each of these journals originated actually in the industries they serve, and this keynote of contact will be preserved and extended under the world-wide organisatn. that the Benn journals command. The staff of William Agnew, Ltd., will be transferred to Bouverie House, and the Mark Lane lease disposed of. The acquisitn. of these three great technical organs marks another step in their progress, and offers a further instance of the enterprise which has made Benn Brothers and Bouverie House the centre of modern trade journalism.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The co. has sent to the various Stock Exchange Committees a letter stating that, after taking into acct. applications already accepted for the conversion of registered shs. into sh. warrts. to bearer, the maximum precentage of shs. authorised by the articles of association to be entered in its foreign register has been reached. The articles of association provide that all shs. comprised in any sh. warrts. to bearer for the time being outstanding shall be entered in the co's foreign register, and that the total number of shs. for the time being entered in the foreign register shall not exceed 25% of the issued sh. cap. —It has been decided to pay a further div. of 10%, which will bring the distributn. for 1927 up to 20% on the ord., and will mean a total paymt. of 17% on the pref., which, in additn. to a fixed cum. paymt. of 7%, rank *pari passu* with the ord. after the latter receive 10%. The directors announce that until the Bill authorisg. the merger of the Marconi Co. with the Eastern and Associated Telegraph Co.'s passes into law the merger cannot be made effective. Therefore it will not be possible for the merger co. to make an offer for the exchange of shs. in the merger co. for shs. in the Marconi Co. until early in next year. The directors have decided to postpone the ann. gen. mtg., at which the accts. for 1927 will be presented, until after the offer of the merger co. has been made.

## Company Meetings.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—At an extraordinary general meeting last week a resolution to increase the capital to £1 500 000 by the creation of 500 000 £1 shares, ranking *pari passu* with the shares of the original capital, was confirmed.

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BURNDEPT WIRELESS (1928), LTD.—At the statutory meeting last week, Mr. Chas. W. Rooke, chairman, said the agreement between the liquidator of the old company and the present company had been carried through in accordance with the scheme of reconstruction approved by all parties. It was significant of the confidence in the Burndept products and in the new management that a large majority of the old shareholders had come into the scheme, and many of them had put in applications for excess shares to such an extent that the issue had been oversubscribed. The wireless trade generally was experiencing a good autumn season, and the company was securing a larger proportion of the total radio orders than it had done for some years. The sales for August, 1928, showed a considerable improvement over those for August, 1927; those for September showed an increase of slightly over 40% over those of the corresponding month of last year; those for October showed an increase of over 64%, while those for November up to the previous day showed an increase of 45% over the whole month of November, 1927. The factory at Blackheath had been for the last two months working at maximum capacity, and it had been found necessary to lay down further plant to cope with the increasing business. On the previous day they had outstanding unexecuted firm orders of a value of upwards of £20 000, and the present output was believed to be in excess of any period in the company's history. When he said "output," he meant the quantities of goods produced, but prices obtained could not, by reason of increasing competition, carry the same margin of profit as in the earlier days of the radio industry. The first accounts would be made up to June 30th, 1929, which would be for ten months' trading.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—At the general meeting on November 29th, Sir John Ferguson, chairman, said the profit for the year of £236, when compared with the loss last year of £45 476, showed an improvement of £45 712. That improvement was due in a great measure to the income-tax over-reserved in previous years, amounting to £20 000, now brought to the credit of the profit and loss account. Their total sales were less by 3·04% than those of 1927, and the result of their French factory was hardly less unsatisfactory than that of the previous year. Their foreign branches had done well in face of a very slightly increased turnover. The principal feature of the balance-sheet was the wiping out of the reserve fund of £265 000 to meet the losses caused by the French currency. In regard to Persan, competition had been more or less continuously severe. In the case of rubber insulated wires and cables, this reached a point in 1927 where the relation of selling prices to manufacturing costs became abnormal, it being an open secret that cable makers were losing heavily. The clearest indication of its abnormality was seen in the recent general advance in selling prices of no less than 41%. The policy earlier begun of concentrating activity on the extension of the most profitable branch of their business was more actively pursued, and the average shop profit was increased by about 40% in the first half-year. As regarded the working of their factory at Burton, the loss for the year under review was considerably less than that of the previous year, the difference being one of £18 228, due to an increased turnover plus a rigid study of economy throughout the works. The position at Silvertown was satisfactory. With reference to the combined activities of their five foreign branches in Buenos Aires, Calcutta, Christchurch (New Zealand), Durban and Melbourne, a net profit of £9 285 had been earned, due chiefly to the successful working of the three first-mentioned branches. The report was adopted.

## New Companies.

ARTHUR E. COOK, LTD.—Cap., £1 000. Electricians, mechanical engineers, etc. Reg. Office: National Deposit Buildings Station Road, West Croydon.

SLOUGH RADIO CO., LTD.—Cap., £500. To acquire business of makers of radio sets and spare parts carried on by W. P. C. Welch, at 22, High Street, Slough.

EDBURYS, LTD.—Cap., £1 000. Motor, electrical, wireless and general engineers and contractors. A first director: E. G. Augood, Brickett, Brickett Wood, Watford.

EALING AUTO-SERVICES, LTD.—Cap., £1 000. Electrical, wireless and general engineers, etc. A provisional director: W. H. Read, 29, Castlebar Road, Ealing, engineer.

FAREX, LTD.—Cap., £100. Manufacturers of or dealers in mechanical and electrical toys and novelties. etc. Reg. office: Gardiner House, Charterhouse Street, London, E.C.

BLACKBURN BRAKE-SHOE CO., LTD.—Cap., £300. Manufacturers of brake shoes and clutches for vehicles, electrical engineers, etc. Reg. office: 19, Victoria Street, Blackburn.

ECONOMIC SALES SERVICE, LTD.—Cap., £3 000. Purchasing or selling agents, electrical engineers, contractors, etc. A director: J. A. Smith, 23, Primrose Avenue, Urmston, Manchester, agent.

BATE ELECTRICAL CO., LTD.—Cap., £2 000. To acquire business of electrician, dealer in electrical appliances, etc., carried on by C. L. Tucker, at 6 and 7, Creed Lane, Ludgate Hill, London, E.C., as the "Bate Electrical Co."

CONTINUOUS GRAMOPHONES, LTD.—Cap., £225 000. Manufacturers of and dealers in gramophones, wireless and radio sets and appliances, phonographs, telephones, telephonic appliances and electrical or other scientific instruments, etc. Solicitors: Gilbert Samuel and Co., 5 and 6, Great Winchester Street, London, E.C.2. (Public co.')

## Coming Events.

### Friday, December 7th.

INSTITUTION OF ELECTRICAL ENGINEERS (METER AND INSTRUMENT SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. W. Holmes on "Load Levelling Relays and their Application in connection with future Metering Problems." 7 *p.m.*

### Saturday, December 8th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—South Wales Institute of Engineers, Park Place, Cardiff. Paper by Mr. H. H. Broughton on "The Bulk Handling of Coal, Ore and Grain." 6 *p.m.*

### Monday, December 10th.

INSTITUTION OF ELECTRICAL ENGINEERS (WESTERN CENTRE).—South Wales Institute of Engineers, Cardiff. Paper by Mr. W. B. Woodhouse (to be presented by a deputy) on "Overhead Electric Lines." (To be illustrated by a cinematograph film.) 6 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (HASTINGS SUB-BRANCH).—Lewcocks' Restaurant. Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (LIVERPOOL BRANCH).—Ordinary meeting. 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment. Informal meeting. Discussion on "Power Factor Tariffs and Method of Metering." Opened by Mr. E. W. Dorey. 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (MERSEY AND NORTH WALES, LIVERPOOL CENTRE).—The University, Liverpool. Paper by Mr. E. H. Shaughnessy on "Trans-atlantic Radio-Telephony." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. F. B. Wedmore, W. B. Whitney and C. E. R. Bruce on "An Introduction to Researches on Circuit Breaking." 7 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture by Lieut.-Col. W. A. Vignoles on "Safety-First Methods in the Electric Home." 7 *p.m.*

INSTITUTION OF HEATING AND VENTILATING ENGINEERS (ASSOCIATE MEMBERS AND GRADUATES BRANCH).—Borough Polytechnic, Borough Road, Southwark. Paper by Mr. E. T. Ollett on "Air Filtration." 7.30 *p.m.*

### Tuesday, December 11th.

ELECTRICAL CONTRACTORS' ASSOCIATION (SWANSEA BRANCH).—Ordinary meeting

ELECTRICAL CONTRACTORS' ASSOCIATION (LEICESTER BRANCH).—Corridor Chambers Ordinary meeting. 2.30 *p.m.*

ILLUMINATING ENGINEERING SOCIETY.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Paper by Mr. H. Lingard on "The Use of Electric Light for Advertising Purposes." 6.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH CENTRE).—North British Station Hotel, Edinburgh. Paper by Mr. F. Lydall on "The Electrification of the Pietermaritzburg-Glencoe Section of the South African Railways," to be read by Mr. W. Hawthorne; preceded by "A Note on the First Electric Railway in Scotland," by Mr. D. S. Munro. 7 *p.m.*

ELECTRICAL POWER ENGINEERS' ASSOCIATION.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. S. A. Stigant on "The Operation of Modern Transformers." 7.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE).—Hotel Metropole, King Street, Leeds. Paper by Mr. W. W. E. French on "Short-Circuits in Large Power Stations." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—Engineers' Club, 17, Albert Square, Manchester. Informal discussion on "Tariffs." (Opened by Mr. L. Romero. 7 *p.m.*

### Wednesday, December 12th.

RUGBY ENGINEERING SOCIETY.—Benn Buildings. Paper by Mr. L. J. Davies on "Wireless Valves."

ELECTRICAL CONTRACTORS' ASSOCIATION (EASTBOURNE SUB-BRANCH).—5, South Street. Ordinary meeting.

SHEFFIELD ILLUMINATION SOCIETY.—Y.M.C.A., Fargate. Presidential address. 7.30 *p.m.*

ROYAL SOCIETY OF ARTS.—John Street, Adelphi, London. Paper by Mr. G. G. Blake on "Applications of Electricity to Medical Practice." 8 *p.m.*

### Thursday, December 13th.

INSTITUTION OF MECHANICAL ENGINEERS.—Cardiff. Paper by Mr. H. W. Swift on "Power Transmission by Belts: An Investigation of Fundamentals."

ELECTRICAL CONTRACTORS' ASSOCIATION (NOTTINGHAM BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (EAST YORKS. BRANCH).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (DUNDEE SUB-CENTRE).—University College. Paper by Mr. H. K. Hunter on "Radio Receivers: Design, Practice and Tendencies in 1928-29." 7.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (IRISH CENTRE).—Trinity College, Dublin. Paper by Mr. P. A. Spalding on "Commercial Problems relating to the Applications of Electricity from the Shannon Distribution System." 7.45 *p.m.*

INSTITUTE OF PATENTEES.—Caxton Hall, Westminster. Lecture by Major H. A. Proctor on "Invention as a Solution to the Unemployment Problem." 8 *p.m.*

### Friday, December 14th.

PHYSICAL SOCIETY.—Imperial College of Science, Imperial Institute Road, South Kensington. Lecture by Dr. E. Griffiths, F.R.S., on "A Survey of Heat Conduction Problems." 5 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. T. H. Lockett on "The Applications of Electricity in the Printing Industry." 7 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row. Annual meeting. 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—College of Technology, Manchester. Faraday Lecture by Mr. Ll. B. Atkinson on "How Electricity Does Things." 7.30 *p.m.*

### Saturday, December 15th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (WESTERN SUB-BRANCH).—60, Wind Street, Swansea. Paper by Mr. E. W. Davies on "Some Electrical Tests."

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BRITISH RADIO CORPORATION, LTD., Elm Grove, Weybridge, wireless engineers. £12 19s. 2d. October 19th.

ELECTRICAL CONTRACTING CO., 7, Christmas Street, Bristol, electrical contractors. £62 14s. 3d. October 29th.

JONES, Clarence Medlycott, and JONES, Lily M. (his wife), 28, Palace Road, Upper Norwood, wireless dealer. £11 19s. October 22nd.

JONES, R. AND W. E. BROS., Bank Street, Rhos, electricians. £14 7s. 2d. October 23rd.

KING, A. J., AND CO., Whittaker Street, Radcliffe, electrical engineers. £13 19s. 9d. November 1st.

RETLAW, Mr. C., 116, King Street, Hammersmith, wireless dealer. £15 4s. 10d. October 18th.

WALTON, Thomas, 3, Chester Street, Newcastle-on-Tyne, traveller. £26 9s. 10d. October 24th.

WESTERN ELECTRICAL CONTRACTS CO., 17, George Street, N.W., electricians. £34 8s. October 23rd.

## Bills of Sale.

HAWORTH, Richard, 1, Cecilia Road, Cherry Tree, near Blackburn, electrician. Dated November 29th, filed December 1st. £57 10s.

MARTINHO, William, 115, Mulberry Street, Liverpool, electrician. Dated November 27th, filed November 29th. £40.

## Deed of Arrangement.

HUTTON, Charles, 28, Westfield Terrace, Deanstones Lane, Queensbury, late trading at 18, Gibson Street, Consett, electrician. Dated November 26th, filed December 3rd. Trustee, T. J. Alderdice, 1, Edith Street, Consett, accountant. Secured creditors, £5; liabilities unsecured, £548; assets, less secured claims, £191.

## Receiverships.

GRIFFIN (A. W.) AND CO., LTD.—R. Custerson, wireless instrument maker, of Sambourne, Warwick, was appointed receiver and manager on November 19th under powers contained in debenture dated August 21st, 1928.

JOHNSON, ROSS AND CO., LTD. A. W. Kingsley, of 39–41, Parker Street, W.C.1, was appointed receiver and manager on November 23rd, 1928, under powers contained in debenture dated May 25th, 1927.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

GUNN (THOMAS), LTD., general ironmongers and electricians, Fore Street, London, E.C., and branches. We are informed by one of the joint liquidators of the above company, Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., that a second and final dividend of 2s. 4d. in the £ has now been declared and paid to all creditors, making a total distribution of 6s. 4d. in the £.

MANLOVE (R. C.), 695, London Road, Westcliff-on-Sea, wireless dealer, etc. A meeting of the creditors of the above was held on November 29th, at the offices of Matthews, Wiseman and Co., 70, Victoria Street, S.W., when Mr. P. Houston, of the British Traders' Association, was elected to the chair. The statement of affairs submitted showed ranking liabilities of £640, and, in addition, there were fully secured creditors for £2 290, holding security valued at £2 456. The assets were estimated to realise £1 087, or a surplus of £447. The assets consisted of plant, fixtures and fittings £239, estimated to realise £120; stock £874, expected to produce £699; book debts and hire purchase accounts £111, valued at £89; cash in hand £12; and surplus from fully secured creditors £166. Mr. Wiseman reported that last May the debtor was introduced to a gentleman who was carrying on business under the style of "Kingstons" at 628/630, London Road, Westcliff. The debtor agreed to join the business, and became a partner, introducing £454. On August 28th a dissolution took place, the debtor took over the business, and agreed to pay his outgoing partner a sum of £250. The debtor had since traded alone. The original premises were held on a lease at a rental of £425 per annum, and, following the dissolution, the debtor moved to his present address, occupying a shop which he had purchased. Between May 14th and November 21st of the present year the turnover was £1 945, with a gross profit of £534, which was equal to 27%. There was, however, a net loss of £66. The debtor had put into the business sums aggregating £1 060, and he had only drawn out £53. The debtor had been endeavouring to sell the business as a going concern. It was hoped that a sale could be effected, and that sufficient would be obtained to pay all liabilities in full, and leave a surplus for the debtor. After a short discussion, during which sympathy was expressed with the debtor, it was decided that a deed of inspectorship should be executed to Mr. E. H. Hawkins, of Poppleton, Appleby and Hawkins, 4, Charterhouse Square, E.C. A committee of three of the principal creditors was also appointed. It was understood that the business would be continued with a view to a sale as a going concern. The principal creditors are:—Burrows, John H., and Sons, Ltd., £16; Abingdon Works, Ltd., £35; Brown Bros., Ltd., £37; Hills, P. F., £20; Lines Bros., Ltd., £24; Mullard Wireless Co., £27; Rudge Whitworth, Ltd., £53; Telephone Berliner, £24.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been duced.*]

BOWYER-LOWE CO., LTD., Letchworth, electricians.—Registered November 14th, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on factory in Spring Road, Letchworth. *Nil. August 14th, 1928.

MICO, LTD., Newcastle-on-Tyne, manufacturers of accumulators, etc.—Registered November 21st, debenture, securing all moneys due or to become due to the holder, A. F. Hawdon, 25, Sanderson Road, Jesmond, electrical engineer, under a certain guarantee; general charge. *£350. November 12th.

### Satisfactions.

BARNETT (C.), LTD., London, E., wireless accessory dealers.—Satisfaction registered November 26th, £200, registered June 15th, 1928.

BROADBENT (T.W.), LTD., Huddersfield, electrical engineers.—Satisfaction registered November 21st, all moneys, etc., registered March 15th, 1923.

GENERAL ELECTRIC CO., LTD., London, W.C.—Satisfaction registered November 23rd, £57 520, part of amount registered July 26th, 1921.

## London Gazette, etc.

### Winding-up Petition.

MULTIRAY WIRES AND ALLOYS, LTD. A creditor's petition for winding-up has been presented, and is to be heard at the Royal Courts of Justice, Strand, London, on December 10th.

### Bankruptcy Information.

TURTON, John William, of Market Place, Banbury, Oxford, electrical engineer. Receiving order, November 29th. Debtor's petition.

WISHAW, Bernard Henry, Bakewell Road, Matlock, Derby, electrical wireless engineer. Receiving order, November 28th. Debtor's petition. First meeting, December 11th, 11.30 a.m., Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. Public examination, December 18th, 11 a.m., Court House, 20, St. Peter's Churchyard, Derby.

### Notices of Intended Dividends.

DAVIES, Charles Harrison, 6, Stamford Arcade, Ashton-under-Lyne, electrical engineer and contractor. Last day for receiving proofs, December 19th. Trustee, J. D. Turner, Byrom Street, Manchester, Official Receiver.

WOOD, Norman Hurst, 32, Highbury Avenue, Thornton Heath, Surrey, lately at 38, St. Charles Square, North Kensington, W.10, electrical engineer. Last day for receiving proofs, December 15th. Trustee, T. Gourlay, 29, Russell Square, London, W.C.1, Official Receiver.

### Order Made on Application for Discharge.

HALL, Geoffrey Samuel, trading as GEOFFREY S. HALL AND CO., lately at 8, Malden Road, New Malden, electrical engineer. Discharge suspended for four weeks, until November 30th.

## Bankruptcy Proceedings.

YEEND, Reginald, 19, Victoria Avenue, Lynn Road, Wisbech, Cambridge, electrician, lately 57, West Street, Wisbech, Cambridge, and Red Lion Street, Spalding, Lincoln. The first meeting of creditors herein was held recently at the Official Receiver's Office, 41, Sidney Street, Cambridge. According to the statement of affairs, there were liabilities of £438, against assets of £94, thus leaving a deficiency of £344. Debtor attributed his failure to becoming liable for the debts of a partner, and to over-stocking before the slump. The case was left in the hands of the Official Receiver as trustee.

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# October 13th, 1928

The Cable Makers' Association desire to call the attention of sellers and buyers of Insulated Electric Cables to the "**Order**" made under the **Merchandise Marks Act** which provides that

*On and after October 13th, 1928, all imported insulated electric cables must bear an indication of origin, in the form required by the order.*

***The indication of origin must appear***

***At the time of importation.***

***On exposure for sale either wholesale or retail.***

***On sale either wholesale or retail.***

***In any advertisement or offer for sale (e.g., catalogue, circular or quotation) of any such cables and wires, as of a particular brand or make, or under a specific designation, an indication of origin must be included thereon.***

Buyers will now be able to know whether they are purchasing British or Foreign Cables, and substitution which has been for some time in operation, can be prevented.

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**Advertisement of the Cable Makers' Association, Sardinia House, Sardinia Street, Kingsway, London, W.C.2**

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

300 592 J. L. Baird and Baird Television Development Co., Ltd. Talking films (13/5/27.)
300 517 J. L. Baird and Baird Television Development Co., Ltd. Synchronising-mechanisms. (13/5/27.)
300 565 S. Z. De Ferranti and Ferranti, Ltd. Electric radiator fires. (9/6/27.)
300 234 British Thomson-Houston Co., Ltd., J. G. Wellings and C. W. Wood. Electric protective devices. (22/6/27.)
300 528 R. B. Stephenson and E. C. Gorman. Electric switches. (8/7/28.)
274 466 Allgemeine Elektricitats-Ges. Synchronous motor for working clocks, tariff apparatus, or the like. (15/7/26.)
274 485 H. Panisch (trading as Elektro-Chemische Fabrik Dr. F. Spitzer). Electric battery, more particularly consisting of dry cells. (14/7/26.)
300 566 A. F. Berry. Electric heat-radiators. (10/8/27.)
300 535 Igranic Electric Co., Ltd., and F. Clayden. Switches, pushes and the like used in conjunction with electric signalling-apparatus, such as electric motor-car hooters, electric bells, and the like. (13/8/27.)
276 019 J. B. J. M. Abadie. Manufacture of luminous electric discharge tubes containing rare gases. (14/8/26.)
300 536 D.P. Battery Co., Ltd., and J. Waddell. Secondary batteries. (13/8/27.)
300 603 A. Carpmael (I. G. Farbenindustrie Akt.-Ges.). Electrolysis of brine. (16/8/27.)
300 692 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Inductance and like coils. (18/8/27.)
300 696 M. B. Redfern (legal representative of C. G. Redfern (deceased)]. (Naamlooze Vennootschap Machinerieen en Apparaten Fabriken.) Devices for testing electric voltage regulators. (18/8/27.)
300 702 Automatic Telephone Manufacturing Co., Ltd., and P. N. Roseby. Imitation fires. (19/8/27.)
300 743 Siemens Bros. and Co., Ltd., and A. E. Caswell. Circuit arrangements in automatic and semi-automatic telephone systems. (21/9/27.)
300 744 British Thomson-Houston Co., Ltd., A. P. Young and J. Hutt. Devices for the interconversion of electric oscillations and sound waves or equivalent mechanical vibrations. (22/9/27.)
300 754 Electro-Mechanical Brake Co., Ltd., G. N. Cadbury and S. Smith. Fluid-operated brakes for tramway and other rolling stock. (11/10/27.)
279 907 Siemens and Halske Akt.-Ges. Method of and means for controlling the intensity of a pencil of light. (1/11/26.)
300 789 English Electric Co., Ltd., A. D. Sloan and F. A. Youngmark. Construction of rotors for high-speed machines. (11/11/27.)
300 791 General Electric Co., Ltd., and E. H. Cropt. Electric motor control systems. (12/11/27.)
280 965 C. W. Thoerig and H. Karvaly. Electrical water-heating apparatus for domestic purposes. (19/11/26.)
300 799 H. V. De Christiani and A. Cuminatto. Process for improving the efficiency of electrothermic installations, and apparatus for carrying the said process into effect. (28/11/27.)
299 414 Soc. Electro-Metallurgique De Montricher. Mounting of furnace electrodes (26/10/27.)
300 817 English Electric Co., Ltd., and E. H. H. Hassler. Brush-gear of dynamo-electric machines. (21/12/27.)
298 969 Naamlooze Vennootschap Handelmaatschappij Cablon (Cables Corporation). Electric cable. (18/10/27.)
282 759 Marconi's Wireless Telegraph Co., Ltd. Pyro-recording paper and the like, suitable for use in picture and the like telegraph receiving apparatus. (31/12/26.)
300 826 A. E. Hughes and Liverpool Electric Cable Co., Ltd. Electrical conductors. (6/1/28.)
283 550 E. S. Heurtley. Submarine or land cable telegraph systems. (13/1/27.)
285 031 Siemens-Schuckertwerke Akt.-Ges. Protective choking-coil for high-tension electric installations. (9/2/27.)
285 872 British Thomson-Houston Co., Ltd. Systems of electric distribution. (24/2/27.)
286 719 British Thomson-Houston Co., Ltd. Electromagnetic sound recorders and reproducers. (10/3/27.)
300 849 Radiophon Co. Loud-speaker for radio-telephonic purposes. (27/1/28.)
300 861 C. R. Tack. Electrically-released door-bolt with alarm, for use on bathroom doors and the like. (21/3/28.)
300 862 Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric and Manufacturing Co.). Furnaces. (22/3/28.)
289 099 Maschinenfabrik Oerlikon. Circuit arrangement for electric brakes in motor-truck trains comprising at least two motor-trucks. (22/3/27.)
290 635 British Thomson-Houston Co., Ltd. Sound-reproducing apparatus. (18/5/27.)
291 110 Siemens and Halske Akt.-Ges. Simultaneous low-frequency and carrier-frequency telephony. (27/5/27.)
300 886 H. H. Berry. Electric fires or radiators. (11/6/28.)
292 924 Metropolitan-Vickers Electrical Co., Ltd. Electrical circuit-controlling apparatus. (25/6/27.)
294 662 Telefunken Ges. fur Drahtlose Telegraphie. Aerials. (28/6/27.)
296 060 E. Kelsen. Apparatus for electrolytically producing metal alloys. (24/8/27.)
297 824 H. Stahl. Electrically-driven hoists. (29/9/27.)
299 429 Soc. Electro-Metallurgique De Montricher. Mounting of furnace electrodes. (26/10/27.)

## Applications for Patents.

### November 6th.

32 421 L. G. H. Cantle and N. E. Carvill. Electrical pick-ups.
32 325 S. O. Cowper-Coles. Manufacture of metal tubes and sheets by electro-deposition.
32 409 F. B. Dehn (Mills Novelty Co.). Bow control device for automatic cells, etc.
32 380 C. S. Franklin. Frequency control devices for radio transmitters.
32 411 H. Halperin and K. W. Miller. Bonding cable sheaths. (30/11/27, U.S.)
32 394 B. B. Johnson and Relay Automatic Telephone Co., Ltd. Automatic telephone systems.
32 341 T. I. Lloyd. Electric heater for trouser presses.
32 413 Metropolitan-Vickers Electrical Co., Ltd. Thermal relays. (10/11/27, U.S.)
32 568 Metropolitan-Vickers Electrical Co., Ltd. Microphones. (7/11/27, U.S.)
32 410 W. J. Pitt. Means for electroplating.
32 356 S. Taylor. Electric signal alarm for railways.

### November 7th.

32 508 Akt. Ges. der Maschinenfabrik Escher, Wyss et Cie. Temperature actuated electric switching device. (15/12/27, Switzerland.)
32 546 J. L. Baird and Television, Ltd. Synchronising devices.
32 533 R. H. Baker and C. W. Parsons. Electric switches.
32 510 British Thomson-Houston Co., Ltd. Method of colouring glassware. (7/11/27, U.S.)
32 512 British Thomson-Houston Co., Ltd., and D. E. Jewitt. Ship propulsion systems.
32 451, 32 452 J. A. Crabtree. Electrical plug and socket couplings.
32 453 J. A. Crabtree. Manufacture of bases for electric switches, etc.
32 524 Electroacustic Ges. Arrangements of sound transmitters and receivers on ships. (25/11/27, Germany.)
32 552 H. Junge and W. Westenholz. Arc lamps.
32 444 W. Outhwaite. Electric switches.
32 544 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone instruments.
32 520 Siemens-Schuckert Akt. Ges. Signal circuits for lighting underground workings. (23/11/27, Germany.)
32 521 Siemens and Halske, A. G. Induction furnaces. (8/12/27, Germany.)
32 910 Soc. Maritime Nationale. Device for correcting radiogoniometric indications on ships. (22/6/28, France.)
32 529 S. Thompson. Electrical heating device.
32 500 E. J. Timberlake. Electromagnets for loud speakers.
32 542 E. F. Tyler and S. Wiseman. Electric switches.

### November 8th.

32 599 J. E. Allan and S. B. Freeman. Manufacture of insulated electric cables.
32 677 Almeida Accumulators, Ltd., and E. Almeida. Secondary cells.
32 678 Almeida Accumulators, Ltd., and E. Almeida. Electric cells.
32 660 T. Bailey. Electric fuse insulator.
32 690 J. L. Baird and Television, Ltd. Transmission of energy.
32 620 F. Buxton. Railway traffic controlling systems, etc.
32 606 W. R. Everett. Radio aerials, etc.
32 572 J. P. Gumbley. Neon lamps.
32 651 J. R. Hardwick, L. P. Lowry and Standard Telephones and Cables, Ltd. Telephone systems.
32 625 A. N. Hazlehurst. Primary batteries.
32 616 S. T. Hosken. Wireless apparatus.
32 688 W. S. James. Wireless receiving apparatus.
32 705 A. E. Jones. Selenium cells, etc.
32 627 S. H. Long and Siemens Bros. and Co., Ltd. Wireless telegraph and telephone receivers.
32 571 J. Lucas, Ltd., and E. H. C. Robinson. Dynamos, etc.
32 671 Marconi's Wireless Telegraph Co., Ltd. Aerial systems. (8/11/27, U.S.)
32 672 G. A. M. Mathieu. Radio telegraph transmitters.
32 701 R. R. Pecorini. Glow discharge lamps.
32 648, 32 649, 32 650 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Telephone systems.
32 697 M. Trouton and Wireless Music, Ltd. Electromagnetic vibrating devices for acoustical instruments, etc.
32 571 E. O. Turner. Dynamos, etc.

### November 9th.

32 863 Associated Telephone and Telegraph Co. Train control systems. (25/7/27, U.S.)
32 864 Associated Telephone and Telegraph Co., C. Gillings and W. H. Paulett. Telephone systems.
32 730 British Power Railway Signal Co., Ltd., and E. C. Irving. Light for controlling railway traffic, etc.
32 788 British Thomson-Houston Co., Ltd., and H. S. Holbrook. Electrical apparatus for power distribution systems.
32 789 British Thomson-Houston Co., Ltd., and J. C. Read. Transformer connections.
32 706 D. M. Broughton and Radiovisor Parent, Ltd. Electrical relay.
32 861 C. G. Carrothers and R. O. Kapp. Electric protective arrangements.
32 839 D. Cronsioe. Crystal receivers for radio-telephony, etc. (10/11/27, Sweden.)
32 790 International General Electric Co., Inc. Annealing furnaces. (9/11/27, Germany.)
32 731 J. Jamieson. Automatic safety signalling device for trains.
32 802 B. Krol and Mullard Radio Valve Co., Ltd. Electron discharge tubes.
32 704 E. Mathieu. Cable carrying posts.
32 841 C. Berrage-Moulton. Electromagnetic sound-reproducing devices.
32 862 N. V. Philips' Gloeilampenfabrieken. Voltage indicators. (19/12/27, Germany.)
32 857 P. J. Packman and Plessy Co., Ltd. Television apparatus, etc.
32 773 P. R. Painton and Standard Telephones and Cables, Ltd. Electric condensers.
32 792 Siemens-Schuckertwerke A.G. Electric switches. (17/11/27, Germany.)

### November 10th.

32 932 J. P. Annacker. Electrical fuses.
32 916 A. Avtsine. Electric trolley-heads. (14/12/27.)
32 961, 32 962 British Thomson-Houston Co., Ltd., L. Griffiths and A. P. Young. Contact breakers.
32 904 English Electric Co., Ltd., and T. Zweigbergk. Magnetic arc blow outs.
32 879 H. Hastings. Electrically operated musical instruments.
32 894 J. V. Rushton. Recording relative strengths of electric currents, etc.
32 950 Siemens-Schuckertwerke A.G. Vacuum switches. (18/11/27, Germany.)
32 966 D. S. S. Steuart. Telephone instruments.
32 917 F. Szalay. Devices for preventing tilting of bows of current collectors. (4/8/28, Hungary.)

# METAL AND CHEMICAL PRICES.

Tuesday, December 4th

| | Price. | Inc. | Dec |
|---|---|---|---|
| *Copper*— | | | |
| Best Selected .. .. .. per ton | £73 0 0 | 10s. 0d. | — |
| Electro Wirebars .. .. „ | £75 5 0 | — | — |
| H.C. Wires, basis .. .. per lb. | 10 3/4 d. | — | — |
| Sheet .. .. .. .. „ | 10 1/2 d. | — | — |
| *Phosphor Bronze*— | | | |
| Wire (Telephone) basis .. per lb. | 1s. 1 3/8 d. | — | — |
| *Brass* 60/40— | | | |
| Rod, basis .. .. .. per lb. | 8 1/2 d. | — | — |
| Sheet „ .. .. .. „ | 10 1/2 d. | — | — |
| Wire „ .. .. .. „ | 10 3/4 d. | — | — |
| *Pig Iron*— | | | |
| Cleveland Warrants .. .. per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „ | £14 15 0 | — | — |
| *Lead Pig*— | | | |
| English .. .. .. per ton | £23 0 0 | 10s. 0d. | |
| Foreign or Colonial .. .. „ | £21 15 0 | 12s. 6d. | — |
| *Tin*— | | | |
| Ingot .. .. .. .. per ton | £241 15 0 | £2 5 0 | — |
| Wire, basis .. .. .. per lb. | 3 1/2 | 1/4 d. | — |
| *Aluminium Ingots* .. .. per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. „ | £26 2 6 | £1 0 0 | — |
| *Mercury* .. .. .. .. per bottle | £22 8 6 | — | 1s. 0d. |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 15 0 *Boric Acid* (Crystals) „ £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2 1/2d
*Sodium Bichromate*—Per lb. 3 1/4d.

*Rubber*—Para fine, 10 1/2d.; plantation, 1st latex, 8 7/8d.

∴ The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works, Co., Ltd.

## LEAD MARKET REPORT.

During the first three days of last week the lead market was, according to James Forster and Co., quiet, with a slightly easier tendency. On Thursday, however, prices jumped 12s. 6d. per ton to £21 15s. for November, £21 18s. 9d. for February. On Friday, after a firm opening at £21 17s. 6d. for November and £22 2s. 6d. for February, there was a slight reaction of 2s. 6d. per ton at the close.

Closing prices on November 30th were £21 15s. for November, £21 16s 3d. for December, £21 18s. 9d. for January, and £22 for February, a rise of 11s. 3d. to 10s. on the week.

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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**CHRISTMAS PUBLISHING ARRANGEMENTS.**

**Some alterations in publishing arrangements being necessary on account of the position of the Christmas holiday this year, it is requested that editorial contributions for our December 21st issue should reach this office not later than Monday, December 17th, and that matter for the issue of December 28th should arrive by Monday, December 24th.**

**The latest date for the receipt of advertisement copy and blocks for these issues are:—December 17th (for December 21st), and December 19th (for December 28th).**

**The editorial and publishing offices of THE ELECTRICIAN will be closed from 4 p.m. on December 24th to 9 a.m. on December 27th.**

# Current Topics.

## Electric Cooking on Trains.

FEARS that the accident in a L.N.E. Rly. kitchen car at Leeds last August, which resulted in the death by electric shock of one of the staff, would act as a setback to the development of electric cooking on trains are set at rest by the report, which has just been issued, of the Ministry of Transport inquiry into the fatality. The freedom from trouble of electrically equipped kitchen cars has been remarkable, especially in view of the exceptionally arduous duty which the equipment has to perform in confined space, with continuous vibration and swaying, not to speak of the imperative need for speedy service in providing a large number of passengers with two or more meals in rapid succession. In view of these conditions the inspector, Col. A. C. TRENCH, suggests the desirability of avoiding as far as possible the use of portable apparatus, or, where this is unavoidable, that there should be frequent inspections of the internal connections, to ensure that insulation remains in good condition. As the report points out, there are points on various kinds of cooking apparatus where insulated cables come into close contact with metal at a considerable temperature, and it is thought that the inevitable deterioration of the insulation at these points and the consequent need of frequent detailed inspection has not been sufficiently appreciated. Interesting points arising from the inquiry are that the kitchen was taking an external a.c. supply at the time of the accident, whereas the safer d.c. is normally used when the train is in motion, and that searching tests in the course of the inquiry did not reveal any failure in the earth connections of either plugs or flexibles. The report ends with the statement that the use of electric cooking in trains offers various advantages in addition to the most important one of the elimination of gas cylinders from the vehicle, and expresses the hope that this unfortunate fatality, which was evidently due to very unusual circumstances, will not retard in any way the extension of electric cooking in dining cars.

## Lighting in Explosive Atmospheres.

THE use of portable lamps in petrol depots and in other places where explosive gases are, or may be, present, is arousing considerable interest, particularly since the Home Office issued its recommendations on this subject. The article on "Lighting in Dangerous Areas" which appears on a later page of this issue, is therefore worthy of careful attention. The importance of the subject is only realised when it is remembered that it is by no means impossible for very serious accidents to occur through the use of faulty lamps. We have direct knowledge of one instance where a man's head was blown off while he was examining a petrol drum with a "safe" portable electric lamp.

## Electrical Fires and Hand Extinguishers.

A MEETING of considerable interest to the electricity supply and manufacturing industries was that held by the Association of Liquid Chemical Fire Extinguisher Manufacturers in London last week. The chief speaker was Mr. SIDNEY G. GAMBLE, who, after 26 years as second in command of the London Fire Brigade, professes never to have seen an electrical switchboard involved in fire. The type of extinguisher most favoured for use in electrical fires would seem to be that with carbon tetra-chloride as its content, by reason of its non-conductivity; but, though the danger of shock is successfully eliminated, the fumes given off render the machine highly dangerous where the fire is within a building. The most commonly used extinguisher, namely, the soda-acid type, is equally dangerous, in that the stream ejected is a good conductor. What then of the sole remaining type? The froth or foam extinguisher is the type most usually recommended, though here again it was pointed out the liquid jet which precedes the frothing stage is a good conductor of electricity. At the present stage of development of these appliances, however, we gathered that C.T.C., $CO_2$, and foam types are the most popular where the possibility of electric shock is present. Apart from the amount of information which the meeting produced, we were very much struck with the apparent lack of experience of the audience in handling electrical fires, in spite of the fact that the London and other fire brigades were well repre-

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sented. No one present expressed an opinion as to the difficulties met with in such fires, and, beyond the results of certain tests which were specially made to ascertain the conducting powers of the stream from an extinguisher, there seemed to be no actual information available. Another point of interest was the fact that, though several questions were asked as to how best to extinguish an electrical blaze, no mention was made of the properties of sand. This latter point is of particular interest, for among the audience were several railway firemen whose charges include trai. s w rking on third rail and overhead systems.

## Immunity or Efficiency?

AT a meeting such as that under discussion, one would have thought that some mention would have been made of fires in connection with sub- or power stations, and yet, throughout the discussion, no remark had any bearing upon these buildings. We appreciate that power station staffs are trained in fire fighting of the kind most likely to be met with in their employment, but never before had we assumed that their efficiency was such that the local fire brigade would never be needed to assist them. In the circumstances, whether it be immunity from fires or efficiency in fighting them, the staffs of our power stations are deserving of congratulation. The fire brigades, as represented at the meeting, were apparently unfamiliar with such conflagrations, while, as previously mentioned, even the second in command of the London Fire Brigade during at least twenty-six years' service has never seen a switchboard fire. After the many paragraphs which we have read in the daily newspapers concerning fuse blowing, the position strikes us as being not only unique but distinctly reassuring.

## Jubilee of the Incandescent Lamp.

WE are glad to learn that special recognition is being given by the Institution of Electrical Engineers on December 20th to the late Sir JOSEPH SWAN'S pioneer work in the development of the incandescent electric lamp, which has had such far-reaching results in the fifty years that have passed since the first Swan lamps were shown to the public at Newcastle-upon-Tyne. Although during his lifetime SWAN received some, at least, of the honours to which his remarkable work entitled him, the passage of years, and unauthorised claims for a prior invention by an American who was working along somewhat similar lines, have led to some public misunderstanding as to who was the real inventor of the incandescent lamp. The authentic story of SWAN'S invention which was published in THE ELECTRICIAN of November 2nd last clearly showed that there is no possible doubt that the incandescent lamp is a British invention. The I.E.E. celebration of the jubilee of Swan's invention will serve a useful purpose in emphasising that fact.

## London Electricity Charges.

FOR the sake of those electrical engineers who, by reason of having their residences in the portions of London in which electricity charges are too high to permit liberal use of electricity for domestic purposes, we hope that something really constructive will be done by the special committee which has been authorised by the London and Home Counties Joint Electricity Authority to undertake a review of the charges and conditions imposed by electrical undertakings in their district. In some parts of the London area, of course, prices leave so little to be desired that anyone living there and failing to use electricity for every possible purpose might justly be convicted of gross wastefulness in his domestic arrangements. But, cheek by jowl with the fortunate being who enjoys an all-in domestic rate of ¾d. per kWh plus a fixed charge, there are long-suffering martyrs who are being mulcted in such sums as 8d. and 6d. for lighting, with a quarterly minimum, and over 2d. per kWh for heating and cooking. We all know that certain factors have an important bearing on these discrepancies, and that the cost of a unit of electricity under differing conditions may be as justifiable in some cases at a shilling, as it is in others at a fraction of a penny. Nevertheless, we do feel that in London certain of the causes of present high charges are removable, and that a more uniform development of multi-part tariffs will be of mutual benefit to suppliers and consumers. Although we do not claim to see any relation between the announcement of this inquiry and the County of London Co.'s decision to introduce an attractive two-part tariff for domestic consumers in the New Year, it is certain that the public interest in tariff questions in the London area is causing the supply undertakings concerned to pay serious attention to the formulation of charges which will mutually benefit both supplier and consumer.

## Compulsory Registration.

WHILE we do not think that the compulsory registration of electrical installation contractors, the demand for which was revived very forcefully at the E.C.A. dinner at Chesterfield, is yet within the realm of practical politics, the widening interest in and discussion of the pros and cons of such a step is significant, as indicating the growing realisation in the industry of the fundamental fact that the proper development of domestic electricity is very largely dependent upon the provision of sound wiring installations. It is obvious that the most ambitious selling schemes of manufacturers of domestic apparatus must be largely ineffective if the potential buyers of the appliances do not possess the equipment which enables them to be used freely and with safety. Before anyone can hope to bring about legislation for compulsory registration, it will be necessary for a bigger percentage of the properly qualified installation contractors to become registered under the voluntary scheme inaugurated five years ago. In so far as the discussions on compulsory registration emphasise this fact, the renewed activity in this direction must be all to the good.

## The Radio Manufacturers' Association.

THE annual report of the R.M.A., some brief particulars of which are given elsewhere in this issue, shows that during the past year the Association has established itself as the representative of the whole radio manufacturing industry. Its membership has expanded from 53 to 107 and there can now be few radio manufacturers eligible for membership who are not on its roll. Reviewing the year's work, the points which, in our opinion, are of outstanding interest, —apart, of course, from the question of royalties—include the drawing up of regulations for radio apparatus working from the supply mains, the application to the Board of Trade for the marking of imported radio goods, and the wider use of exhibitions. After the long-drawn out unpleasantries of past associations connected with the radio industry, it is gratifying to see that an organisation has at last been formed which can lay claim to receiving the support of the industry which it is supposed to represent, and which can, above all, show such a satisfactory record of accomplishments at the end of its second year.

## Wayleave Tact.

WHILE some people emphasise the difficulty of obtaining wayleaves for overhead lines, others are finding that consents are usually obtained without much trouble if only the matter is conducted with tact by the officials concerned. An amusing example of the value of tactful wayleave negotiations was related the other day by a high official who has a good deal to do with these matters. A supply authority's representative desiring a wayleave over part of a farmer's property talked the matter over with the farmer's wife, and with such good effect that when he produced a wayleave form for 10s. the lady apologised for her inability to pay on the spot, as she had no change pending the return of her husband. This story is vouched for as true.

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# SOME SPECIAL TESTS FOR INSULATING MATERIALS.

## Classification of Tests—The Intensity of Sampling—A Special Investigation of Papers and Non-ignitable Boards for Electrical Purposes.

By A. R. DUNTON, A.M.I.E.E.

IT has been ascertained that any modern engineering establishment engaged upon the general production of electrical apparatus has to stock or maintain a supply of no fewer than 400 different insulation materials, all of which are further subdivided into possibly different thicknesses, sizes, or qualities.

At first impression the number quoted may seem lower than might be expected, but it should be clearly understood that this number refers to distinctly different materials from which a very large number of items indeed can be manufactured, as, for instance, the various combinations of synthetic resin and paper for the formation of synthetic resin varnish paper boards or tubes. In addition, there exist a large number of specialised materials, the demand for which does not call for stocking, but the quality control of which is essential if reliable performance is to be obtained.

In some cases the maintenance of quality is assumed if the purchasing specifications are accepted by the supplier, but the necessity for checking is always present, even under the best of conditions.

### Sources of Information.

For many materials used the manufacturer may have no purchasing specification, purchases being made on the basis of samples previously submitted. In such cases the question of tests may be difficult, but helpful information can generally be derived from the various studies and reports issued from time to time by the E.R.A., and listed by them in their publication, reference 067.

Another valuable source of information will be found in the tests generally described at length in every B.E.S.A. specification issued, as, for instance, the B.E.S.A. specification for Pressboard No. 231, where a full series of tests is described.

In all cases tests will be found to fall under one of the following classifications: electrical, mechanical, physical, chemical.

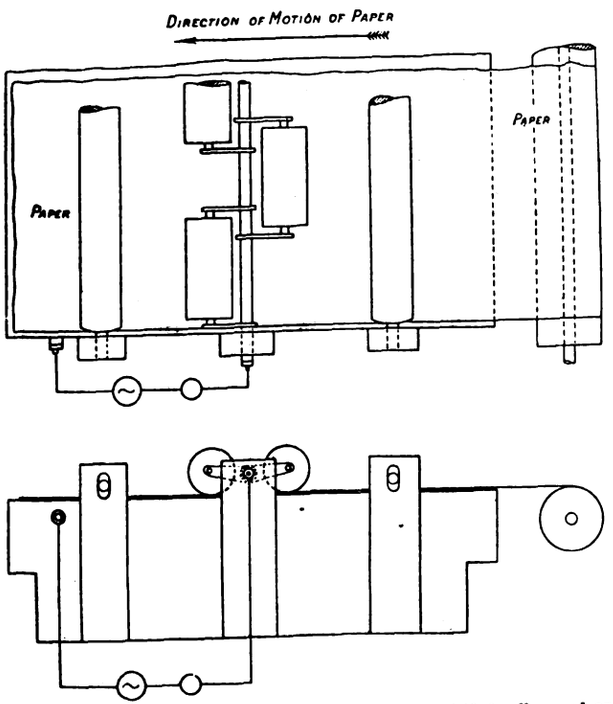


Fig. 1.—Method of testing papers by running between electrified rollers and an earth plate.

The series of each kind of test necessary may again be grouped under two classifications: (*a*) investigational tests; (*b*) acceptance tests governing the purchase of materials.

In the first instance, it is generally an accepted practice to subject a new material to a very exhaustive series of tests in which every known feature is critically examined and compared with existing data.

The results of these tests, if satisfactory, may lead to the adoption of the material, and its allocation to some selected class of work.

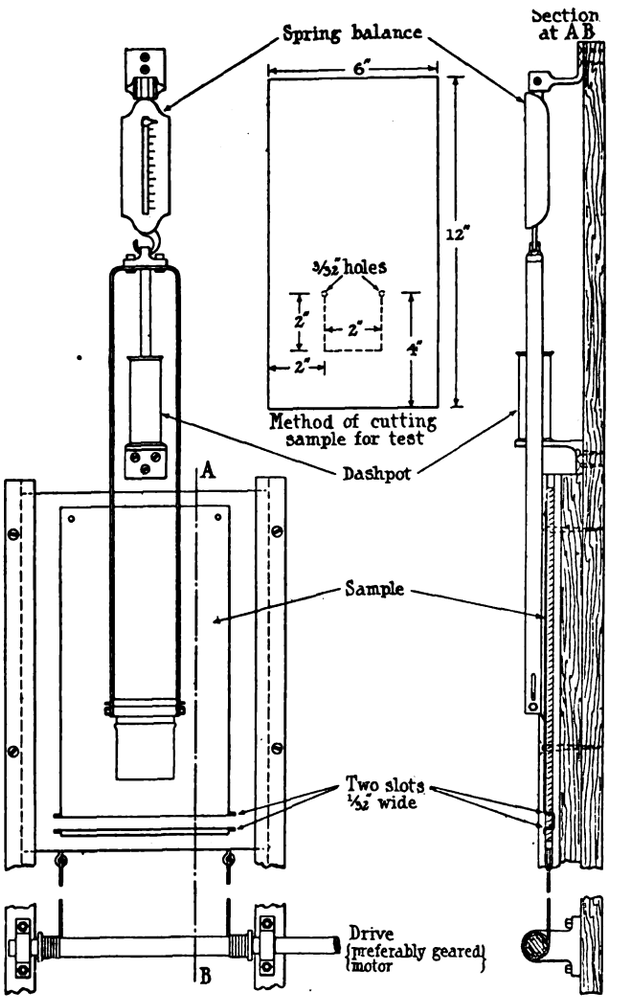


Fig. 2.—A paper tearing test apparatus developed in this country by the E.R.A.

At this stage a purchasing specification is generally issued, with the result that future tests may be regarded as "acceptance tests," and are limited as far as possible so as to check only the special features desired.

In the majority of cases, especially where expensive electrical materials are involved, such as synthetic resin varnish paper boards, the acceptance tests should be confined to "proof tests," which greatly reduce the material costs involved in the tests, as in many cases the material tested is still fit for service. There are, however, criticisms against this from the designer's point of view, since these tests do not reveal the margin of safety, and, therefore, possibly limit the field of application of a material.

### Saving in Costs.

The intensity of sampling and testing, i.e., the percentage to which tests are applied for acceptance purposes, will be found to depend upon the reliability experienced with previous consignments. Where confidence in the source of supply can be felt, a considerable saving in testing costs will in most cases result. This factor should be borne in mind when

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comparing prices, as there are instances where the initially higher cost of a material is offset by the reduced number of tests necessary, and the smaller amount of material used for testing purposes.

Taking a very broad aspect of this subject, most materials, for the purpose of testing, fall under one of the following classifications :—

Treated and untreated papers; treated and untreated fabrics; treated and untreated boards, sheets, and rods; gums, varnishes, and oils; electrical moulding powders, cements, etc.

It should not be overlooked, however, that in addition to the special tests here mentioned, a very large number of recognised tests must be applied if it is required to ascertain fully the properties of any particular material. A typical list of such tests is that for papers shown in the table on page 675.

The following notes describe some interesting examples of tests recently developed for investigating special features of importance in insulating materials.

## Papers.

In papers used for layer insulation in fine wire coils, especially those required for magnetos, the presence of conducting particles would lead to failure.

Papers for this purpose should be tested by running them between electrified rollers and an earth-plate, as indicated in Fig. 1. It is possible to obtain high-grade papers in which no conducting particles are found.

With the development of paper-insulated conductors for extra high tension transformers, in addition to excellent electrical properties, a tough, strong non-ageing paper is essential. The selection in this case is greatly facilitated by ascertaining the tearing strength, so as to ensure that the paper can be applied to the conductors under considerable tension without risk of failing when the insulated conductor is bent.

There are in existence two different types of testing apparatus, both of which record the stress necessary to cause tearing. In America the Elmendorf tearing tester (Fig. 3) has been developed, whilst a more simply constructed apparatus (Fig. 2) has been found to give satisfaction in this country.

For the purpose of conductor insulation, in addition to a large variety of other uses, the difference in the ageing properties of different papers is a most important factor.

It is a well-known fact that papers manufactured from mechanical wood pulp are much inferior to those made from chemical wood pulp, or the even better papers which are made from cotton.

Considerable attention is being given to this subject, but up to the present the best method of ascertaining the ageing properties of a paper consists of a comparison of the bursting strength before and after an artificial ageing period.

## *APPARATUS FOR TESTING PAPERS AND BOARDS.*

*These pictures illustrate several types of apparatus used in the testing of paper and similar materials for electrical purposes. The methods of application are briefly set out in the accompanying article.*

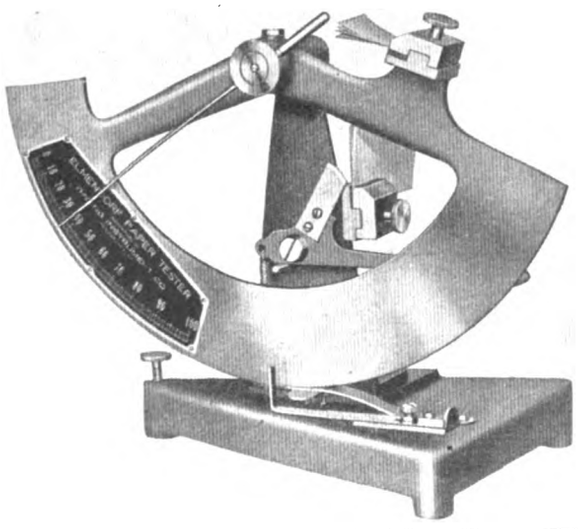

Fig. 3.—The Elmendorf tearing tester.

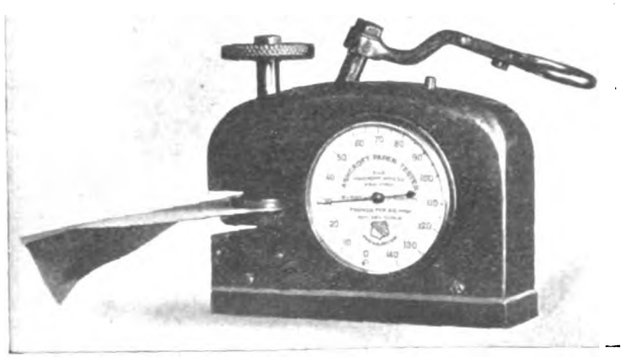

Fig. 4.—A portable tester for bursting strength.

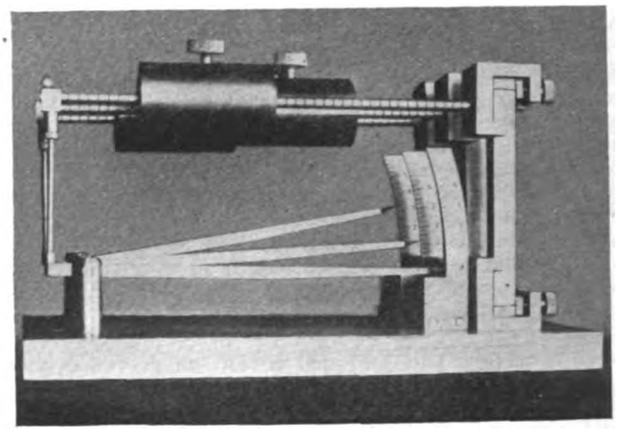

Fig. 5.—An improved "Martens" softening point tester.

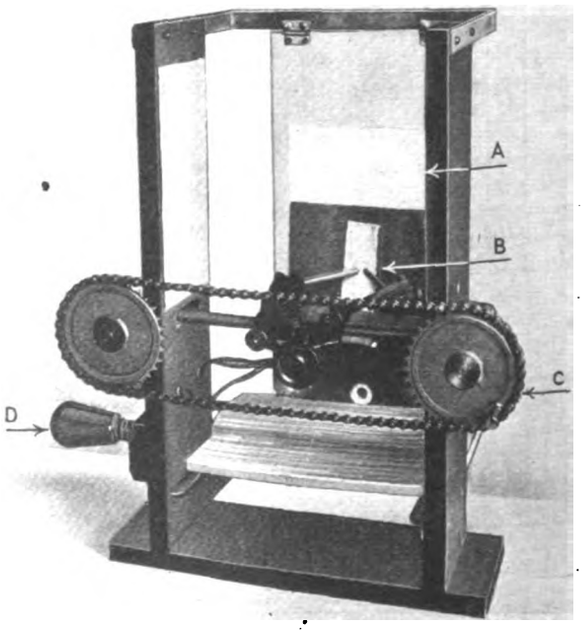


Fig. 6.—The Metropolitan-Vickers carbon arc penetration tester. (A) Metal earth plate; (B) Arc carbons resting on test specimen; (C) Arc control gear; (D) Indicator lamp.

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The paper during this test is clamped over a small aperture, and the force necessary to thrust a plunger through it is recorded by means of one or other of several different types of apparatus existing for this purpose. Fig. 4 shows a popular portable tester which gives good results.

In the manufacture of shellac or synthetic resin varnish paper boards and tubes—often referred to as " Bakelite "—the type of product depends in a very critical manner on what is termed the " porosity " of the paper.

A special test to determine this feature is conducted by noting the quantity of air which can be drawn through a paper diaphragm when clamped in an apparatus similar to that shown in Fig. 7, which has been developed by the Research Department of the Metropolitan-Vickers Electrical Co. A portable apparatus for the same purpose has been developed by the Gurley Co. of New York, who have introduced an apparatus termed a " Densometer," consisting of two cylinders which collapse one within the other. In this case the imprisoned air *escapes* through the paper diaphragm used, and a record is made of the quantity lost in a given time.

A special test has recently been introduced for determining and comparing the arc-resisting properties of non-ignitable boards. In this test a controlled electric arc is allowed to play on the surface of the board, and the time of penetration is recorded by the closing of a separate test circuit from the arc carbons through the specimen to an earth plate.

This apparatus is illustrated in Fig. 6, in which can be noticed the specimen under test held on a vertically hinged support.

Most of the tests on treated and untreated fabrics, tapes and cords, take into account tensile and tearing observations, but where the requirements are essentially electrical it is well to carry out the electrical strength tests, not only in the free state, but also under tension, which in many cases more nearly resembles the actual service conditions.

## Electrical Mouldings.

There are at the present time many different methods for producing moulded articles, some of which are intended for use only under normal conditions, but others are claimed to be suitable for service at high temperatures.

Unfortunately, in this country there exists no recognised classification of moulded materials, with the consequence that the stated softening point is often the subject of considerable doubt.

On the continent a better state of affairs is found, due to the existence of a definite classification by the V.D.E., which is based to a great extent on the determination of softening point by a method suggested by Prof. Martens, at one time director of the Material-Prüfungs-Amt. In this test a rectangular bar, made from the moulding material under investigation, is held in a vertical position and subjected to a uniform bending stress throughout its length. The stress is applied by means of a weighted lever supported by the bar, as illustrated in Fig. 5, which shows an improved type of apparatus recently

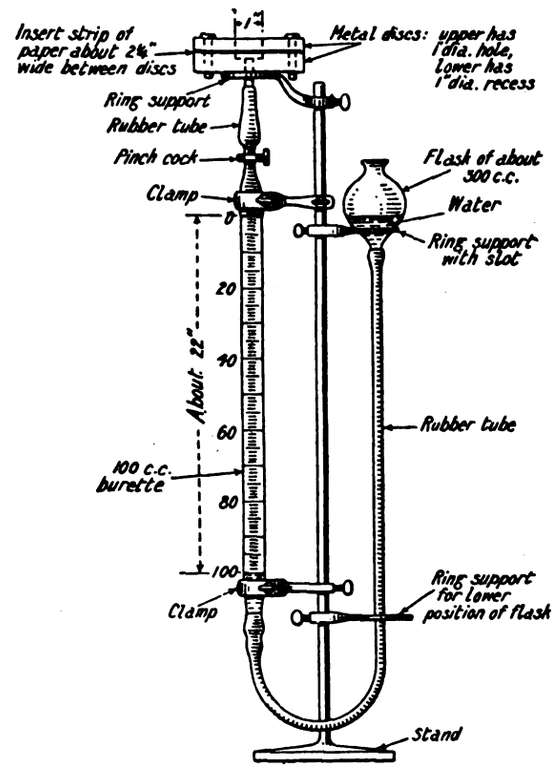


**Fig. 7.—The E.R.A. porosity tester.**

constructed to facilitate the detection of the "collapse" which takes place at the critical temperature of the material.

In the apparatus shown three specimens under test can be observed at the same time, and temperature deflection curves plotted.

The author has pleasure in making acknowledgment to the Metropolitan-Vickers Electrical Co. for permission to give particulars of some of the tests here described, and especially to Mr. A. P. M. Fleming, Manager of the Metropolitan-Vickers Research Department, in which a considerable amount of the development work on these special testing devices has been carried out.

TABLE I.—TEST REPORT ON PAPERS.

| SAMPLE | OBSERVATIONS | | | | CHEMICAL | | | | | ELECTRICAL | | MECHANICAL | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Tensile Strength | | Tearing Strength | | Bursting Strength | | |
| | Supplier | Maker's Reference | Colour | Thickness | Density | Porosity | Acidity or Alkalinity | Moisture | % Ash | Electrical Strength | Conducting Particles | Longitudinal | Transverse | Longitudinal | Transverse | As Received | After Ageing | % Variation |
| | | | | | | | | | | | | | | | | | | |
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**Reproduced above is the special ruling for a test report on papers which are required to be used for electrical purposes referred to in Mr. A. R. Dunton's article on "Some Special Tests for Insulating Materials" which is concluded on this page. The various appliances used for the tests are illustrated opposite.**

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# BOOK REVIEW.

**Protection Contre les Effets Nuisibles de l'Electricité.** By F. G. DE NERVILLE and A. HARDY. (Paris: J. B. Baillière et Fils.) Pp. 850. 125 francs.

This large volume, one of a series of the Encyclopedie D'Electricité Industrielle, published under the direction of Mons. André Blondel, contains seven chapters, four of which, on lightning, electrical accidents, stray currents, and interference with Post Office circuits, can be termed regular treatises.

In the prefix the authors state that it is not a good thing to frighten users of electricity but one should give confidence by explaining what dangers exist, and how they can be avoided.

The first chapters deals with the physiological effects of electricity; the element of surprise is important. Dr. Jellinek found that a rabbit under chloroform was resuscitated after a shock of 1 500 V, although the same voltage killed a similar rabbit in a normal state. Examples are given of some fatal accidents with 110 V alternating current, and various methods of resuscitation are described.

Chapter II deals with the properties of earth connections. While the resistance diminishes rapidly at first with the area of the plate, beyond a certain point the advantage is small. After about 2 metres deep the resistance of an earth tube connection does not diminish much. If doubled tubes are used they must be placed two to three metres apart.

Chapter III deals with lightning and lightning conductors. The question of the oscillatory nature of a discharge is discussed and the authors state that the wave has undoubtedly a steep front. Great controversy reigns regarding the tension and intensity of a stroke; about 3 metres is the longest jump experienced from a lightning conductor to another metallic body. The work of Franklin, Gay-Lussac, Pouillet, Lodge and Melsons is discussed. A very high conductor does not materially increase the zone of protection; trees close to the Eiffel tower have been struck. Lodge pointed out that impedance was a greater obstacle than electrical resistance; a few ohms make but little difference to a steep wave. Owing to the drying of the subsoil through drainage the earth plates in many Paris buildings have had to be lowered.

## Value of Corona Effect.

Various forms of gap dischargers for Post Office work are described, and 40 pages are devoted to various forms of arrestors for power circuits. On very high tensions the corona effect is of value as a safety valve and that is why lines of, say, 80 000 V are rarely damaged. The value of an earth wire with wood posts is open to controversy. No one type of discharger has proved its supremacy; their value is contested, and some say it is negative.

Water jets, water tubes, choke coils and gap arrestors are discussed and compared; the authors think that gap arrestors are of value up to 1 000 V. Lead oxide arrestors for very high tension seem preferable to those of the electrolytic type, as they contain no inflammable oil.

The Pfiffner, Moscicki and Dubilier condensers are described. The authors think that, owing to their fragility, condensers are of greater value theoretically than practically. Discharger earths should be kept clear of other earths.

Chapter V deals with "vagabond" earth currents from traction and power circuits; experiments near Lausanne showed that with direct current a high tension (Thury) transmission need not give rise to difficulties. The great problem is to deal with street tramway circuits; a metallic mass such as a water pipe running alongside tends to drain currents. A bitumen covering to pipes has not proved a successful preventative; with a wet soil 1 V difference is sufficient to cause damage with a neighbouring pipe; the use of salt for snow melting is deprecated where there are tramways.

The section dealing with interference caused to communication circuits, a problem which is of importance now that 132 kV grid lines are being erected at home, occupies 140 pages. D.c. tramway systems sometimes give rise to difficulties such as false calls; a 50 period current may give a constant note in a telephone receiver, and trolley systems sometimes give trouble through generator and motor teeth. The surtensions induced by single-phase traction or by three-phase transmission circuits may be dangerous to life and give acoustic shocks. Single-phase traction has been the cause of many difficulties; inductive effects have a longer range of action than static effects, but the latter are more dangerous. With single-phase traction there is a tendency for the return current to leave the rails and to dip into the earth with effects as if the depth was 500 to 2 000 metres. The tensions produced are analysed mathematically. While the rotation of pairs in telephone cables eliminates induced perturbations between them, a single-phase current can induce a comparatively dangerous voltage between the pairs and the lead sheath. Tensions of 170 V on normal running and 1 000 V following a short on a single-phase traction circuit have been observed in the U.S.A. Various systems for the protection of telegraph apparatus involving the use of impedances and of resonance are noted, and methods regarding telephone circuits described. The use of specially arranged positive and negative feeders, neutralising static tension conductors, and negative boosters is explained, but despite such measures difficulties occur, especially when traction short circuits take place. Difficulties with h.t. trolley railway traction are noted, and it is pointed out that harmonics from d.c. plant can be got over by rotating and double circuits.

The inductive effects due to shorts or the sudden cutting off of heavy currents must give rise to difficulties where the air loop enclosed by contact wire and rails is a large one. It might be noted that when the Midi railway abandoned single-phase traction for d.c. it was thought that Post Office troubles would be overcome; this has not been the case.

Regarding interference from high tension power lines the researches of the Californian Committee of Inductive Interference are discussed, and especially the effect of the balanced and so-called residual tensions relative to the earth; while the former has the fundamental frequency the latter has troublesome harmonics, and its amplitude is dependent on line and branch characteristics and on operation methods; it has to be considered as the three lines operating as one circuit with the earth as return, the effects being analogous to those found with single-phase traction.

The advantages of earthed neutrals are stressed, and mathematically examined; inclined teeth or poles on alternators, star-mesh transformer windings, transpositions of communication circuits with arranged transpositions of power circuits, careful line maintenance to reduce out of balance through insulator arcing, are recommended as palliatives. Double power circuits are explained. Tables and curves are given showing the effect of different arrangements.

The book is concluded by a chapter on the control of installations, and the French regulations are given in an appendix. Taken as a whole, the work, in accordance with the scheme of the series, is encyclopædic in character. The ground covered, however, is so large, that in one or two matters, not of great importance, recent researches and experiences have not been dealt with, although it would appear that they would tend to illustrate and amplify, rather than contradict the views given. Many English engineers fight shy of useful works written in French, without realising that after a school grounding, it is easy to understand technical and especially electrical, books in that language.

T. R.

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### BOOKS RECEIVED.

"Heat and Thermodynamics." By J. K. Roberts. (Blackie and Son.) Pp. xvi. 454. 30s. net.

"The Road to Enjoyment." By Dr. L. P. Jacks. (London: Ernest Benn, Ltd.) Pp. 32. 6d. net.

"The Recovery of Citizenship." By H. J. Laski. (London: Ernest Benn, Ltd.) Pp. 28. 6d. net.

"Producer v. Consumer." By Sir Ernest Benn. (London: Ernest Benn, Ltd.) Pp. 30. 6d. net.

"The Return to Laisser Faire." By Sir Ernest Benn. (London: Ernest Benn, Ltd.) Pp. 221. 6s. net.

"A Bibliography of Metallic Corrosion." By W. H. J. Vernon. (London: Edward Arnold and Co.) Pp. xi+341. 21s. net.

"The Economics of Coal Mining." By Robert W. Dron. (London: Edward Arnold and Co.) Pp. vii+168. 10s. 6d. net.

"Handling London's Underground Traffic." By J. P. Thomas. (Westminster: London's Underground.) Pp. vii+237. 7s. 6d. net.

"Practical Colour Simplified." Vol. 1. By W. J. Miskella. (Chicago: Finishing Research Laboratories, Inc. Pp. xiii+113.

"Television." By Alfred Dinsdale. With a Foreword by Dr. J. A. Fleming, F.R.S. (London: Television Press.) Pp. xx. 180. 5s. net.

"Die Technik Elektrischer Messgeräte." By Dr. G. Keinath. Part I. (Berlin: R. Oldenbourg.) Pp. viii+612. Unbound, 33 marks; bound, 35 marks.

"Die Technik Elektrischer Messgeräte." By Dr. G. Keinath, Part II. (Berlin: R. Oldenbourg.) Pp. viii+416. Unbound. 22.50 marks; bound, 24.50 marks.

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# SAFE LIGHTING IN EXPLOSIVE ATMOSPHERES.

## Portable and Transportable Lamps—Safety Devices—Lamps for Examining Cans and Barrels—Compressed Air Lamps.

By EDWIN LYON, B.Sc.(Tech.), A.M.I.E.E.

IN petrol depots, powder magazines, oil refineries, and in gaseous or fiery mines, the question of safe lighting is of the greatest importance.

Gas, or any other illuminant with an exposed flame cannot be used, except the oil flame safety lamp with protective gauzes.

Electric lamps are inherently safe because the actual source of light is sealed from the atmosphere, and unless the glass of the bulb is broken the filament cannot ignite gases. The special precautions which must be taken when the current for lighting is taken from the high voltage supply, have already been described in these columns. Briefly, any system which complies with the regulations of the Coal Mines Act (1911) is safe.

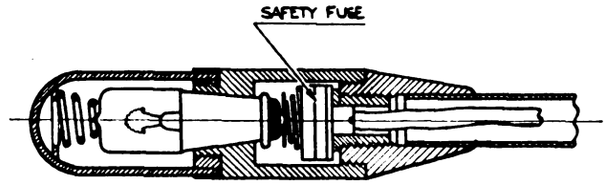
In places where no supply is available, and where the presence of high voltage lamps would be dangerous, some forms of portable or "transportable" lamp must of necessity be used.

It is possible to ignite an explosive mixture of methane such as is found in the coal mine, or pentane (petrol) with the glowing filament of an electric bulb, but to secure an explosion the glass of the bulb must be smashed without breaking the filament, a very unlikely happening, requiring a blow hard enough to fracture the covering glass or lens and the glass bulb—but not hard enough to fracture the fine filament. There is also a definite time lag before ignition takes place, due to the cooling effect of the gas.

The bulb in a portable lamp should be well protected to avoid this potential danger, and some form of safety device to disconnect and isolate the bulb from the circuit is an advantage.

The Home Office now test and approve portable lamps for use in petrol vapour, the actual test being made by the Chief Testing Officer of the Mines Department, who is responsible for the safety of the mining type of lamp. Lamps which have been approved for use underground in coal mines are, *ipso facto*, regarded by the Home Office as being safe in petrol vapour.

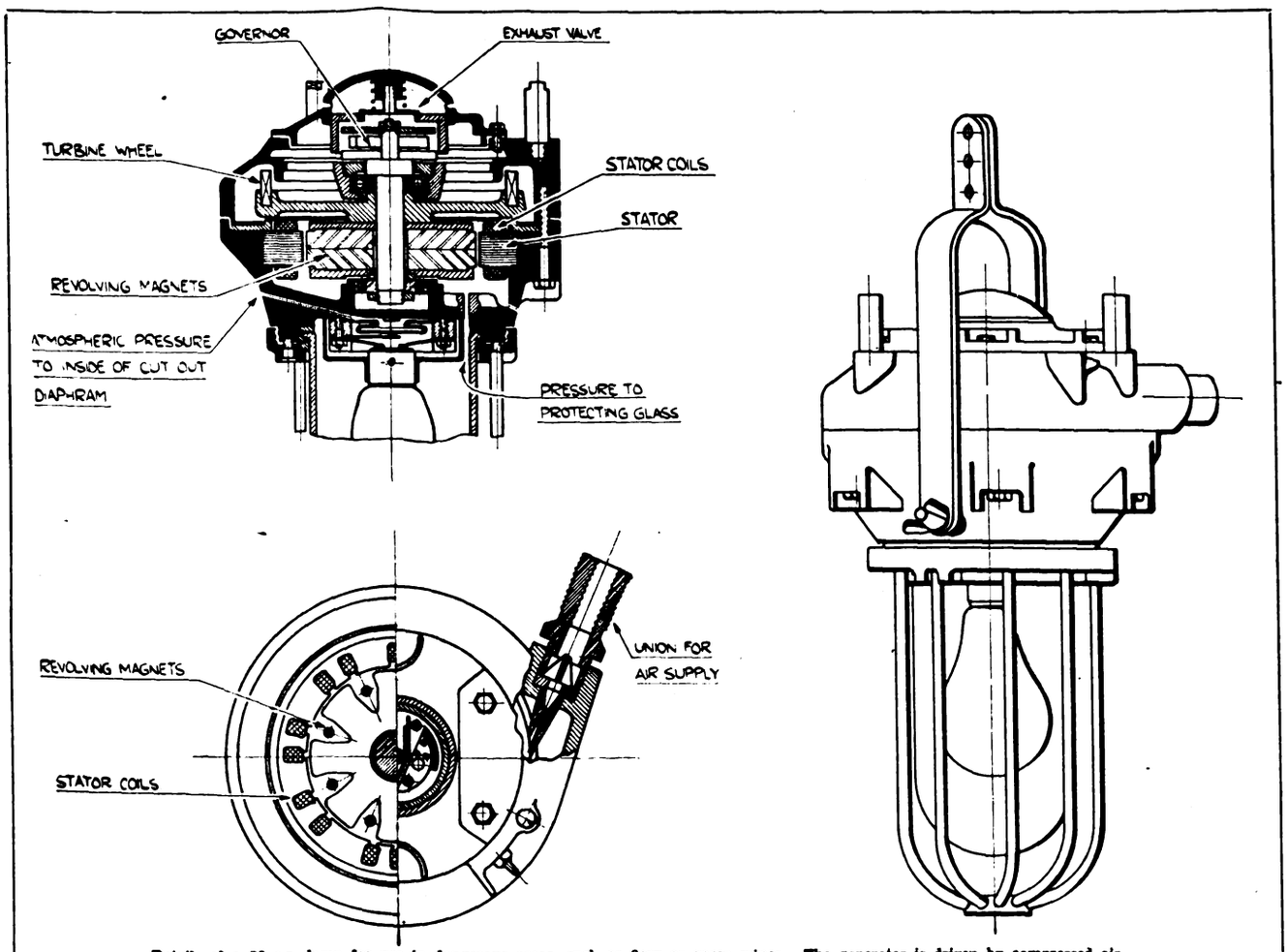
For watchmen, and work in tanks, some form of bull's eye




**Section of lamp head for inspecting petrol cans, showing safety fuse action. If the bulb is broken it is automatically disconnected from the battery.**

lamp is very useful, the usual types being capable of giving 10 c.p. for 10 to 12 hours continuously, and weighing 5 or 6 lb. Lighter lamps, more approaching the flash-lamp type, but strongly made and safe, are used for inspection work in tankers, etc.

An unusual lamp, which can be secured to the cap, with the accumulator in a case carried on a belt round the waist, is very useful for working in tanks, as both hands are free and the light is concentrated on the work, and turns with the wearer's head.




**Details of a 60 c.p. lamp for use in dangerous areas, such as fiery or gassy mines. The generator is driven by compressed air.**

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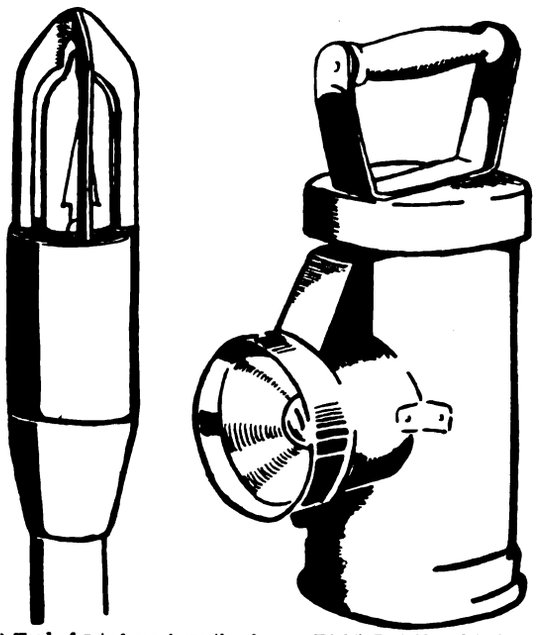
Where the inside of a can or barrel has to be examined, a small tubular bulb in a protected holder can be inserted. The



(Left) Head of petrol can inspection lamp. (Right) Portable safety lamp for use in explosive atmospheres.

accumulators are carried in a strong case, and cab tyre cable connects them to the bulb.

With petrol cans and barrels, a certain amount of explosive vapour is usually present inside, and none but reliable and safe lamps should be used, as at least one fatality is known to have occurred through an explosion taking place during inspection.

The manufacturers of mining lamps specialise on lamps for use in dangerous places, and these same firms manufacture equipment for use in other dangerous areas.

Portable lamps for use in powder magazines should not be made of steel, but some softer metal such as aluminium or brass, so that friction sparks will not be made by contact with other metals.

Where compressed air is available, a self-contained lamp fitted with a turbine and generator can be used as a single lighting unit, or as a distributor for several lights. By this means it is possible to obtain much higher candle-powers than are given by portable lamps, and at the same time safety is ensured by automatic devices in the lamp.

The inside of the well-glass is under pressure from the air supply, and if the glass is broken or removed it relieves an automatic cut-out, somewhat similar to an aneroid barometer, and short circuits the generator. A safe light of 100 c.p. can be obtained with this type of lamp.

To prevent interference with the lamps when in use, some form of lock must be fitted. A small padlock on the larger lamps is effective, whilst a special shaped key such as a triangular recess in a round pin is used on hand lamps. Lead rivets through a locking hole are also used, as by this method it is possible to ascertain whether the lamp has been tampered with.

The simplest method is the fitting of small locks which can only be opened by an electro-magnet, and where a large number of lamps are used this method saves much time.

Lamps for use in any explosive atmosphere should be of an approved pattern, maintained in sound condition by one or more persons definitely responsible, and every lamp should be locked when in use, and opened only when the cell is to be removed for a charge.

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# BULK SUPPLY AND TWO-PART TARIFFS.

## Arriving at the Fixed Charge—An Illogical Business—Back to the Hopkinson Theory—Cooking and Load Factor—Expediency Tariff Dangers.

By A SUPPLY ENGINEER.

THE subject of my text is—bulk supply and a two-part tariff. Shortly we supply engineers will all be tied to the grid and selling electricity on elementals that are to-day fashionable, but are fundamentally wrong, if we listen to the guile of Mistress Expediency.

I would start by saying most emphatically that I am not arguing against either the principle of bulk supply or a two-part tariff. Both are and must be right, but I would like to have an opportunity of pointing out the frailties.

I buy in bulk and have a multi-tariff, but I am only an individual, and who I am, what I am, and where I am, interests no one, for I am only speaking hypothetically of the two-part tariff now being frequently adopted.

Take an ordinary suburban or dormitory area—not my own—with a load factor of about 20% (units sold and peak load sent out) and try and fit in " bulk " supply and a modern two-part tariff.

I will first start with the tariff which is based on floor area, or the popular one at the moment, one meter, one circuit, one penny per unit. A proper catchpenny phrase.

The domestic tariff is 6d. The tariff maker takes down his ledgers and takes out a number of sample cases and averages out groups of houses on the following basis, working backwards, setting up a fixed charge for each size of residence.

As an example, an average consumer, who lives in a 2 000 sq. ft. house, consumes 1 unit per 10 ft. per annum, therefore he is paying £5 per annum, or in other words, 200 units at 6d.

A larger house will be based on 1 unit per 11 ft. etc., and 1 unit for 12 ft. as the house gets larger.

The tariff monger says, " Well, I want £5 from this 2 000 ft. size of house," and arrives by simple arithmetic at the following tariff :—

| | | | |
|---|---|---|---|
| Fixed charge .. .. .. | £4 | 3 | 4 |
| 200 units at 1d. .. .. .. | 0 | 16 | 8 |
| | £5 | 0 | 0 |

He also takes the opportunity of ridding himself of the vexing meter rent.

The consumer can then do what he pleases and consume any amount of current for any purpose at 1d., at any time. It is extraordinarily illogical, as the fixed price is fixed on the lighting of his house, and has nothing to do with the general uses to which electricity is put by the user.

Now, I would have a word on load factor and diversity factor, and their effect on a two-part tariff.

This ordinary domestic consumer has a lighting load factor per lamp installed of 5%.

16 lamps of 30 W = 500 W.

Per max. demand per peak load of 8% :

60% of 500 W, 300 W.

It is generally agreed that this class of business has a diversity factor of 2 to 1, making the load factor 16%.

### Elementarily Wrong.

One-in-all tariffs do not tend to improve diversity factors. Why ? The lower charge will induce people to be extravagant, and if the consumer merely uses more light, and after dark, then elementarily the tariff is wrong. We have only to go back to the Hopkinson theory to prove this, which will be brought to the engineer's notice very promptly under " bulk " when the maximum demand needle creeps up.

I am not interesting myself in any small factory loads which have a load factor of about 15%, or what I call convenience motors, with a load factor of 5%. Factory loads undoubtedly fill up the valleys and provide a divisor.

The whole jumble of business with its various diversity factors has a load factor of 20% made up chiefly by the diversity factor of not only the diversity in Jones's and Smith's domestic habits, but of the diversity of the power and domestic load.

The question is, will this be improved ? How is the engineer going to be affected when this load factor becomes a task master under bulk ? Suppose we take the figure at £5 per kW per annum, and 0·4d. for all units broken down at the consumer's terminals, allowing an efficiency of 80% ; and work

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out the cost at the various load factors for an ordinary bulk supply tariff.

| | | | |
|---|---|---|---|
| 5% | 438 kWh per kW .. .. .. | 3·15d. per kWh |
| 10% | 876 do .. .. .. | 1·76d. ,, |
| 15% | 1 314 do .. .. .. | 1·36d. ,, |
| 20% | 1 752 do .. .. .. | 1·08d. ,, |

This scale aptly sets out the vital importance of maintaining the load factor when current is purchased. It's very elemental is that cost follows the load factor.

The reader may say that the bulk prices are ridiculously high, but drop the peak load £1, or the unit charge a decimal point, and it does not materially affect my argument that with the secondary rate of 1d. at the consumer's terminals you are merely working for the generating station.

I will now look at the effect and object of the two-part tariff. The chief, of course, is the greater incentive to use electricity for all household purposes, but if the load factor is worsened, or the diversity factor affected, then we have our small standing charge eaten into to pay the power company; that's bad.

Electric cookers; well, we all know their selling points: 1 unit per capita per diem, so that a house with five people consumes 1 825 units a year and the stove has a 5 kW peak.

A 5 kW peak with an output of 1 825 has a load factor of under 4%. Well, from the load factor cost table the unit cost will be 3d per unit, and I am not putting this up seriously; but it does shew the very poor load factor of the individual consumer.

This, of course, is absurd, but cooking, it is stated, has a wonderful diversity factor at something over 5 to 1, so that this load in reality has about the same load factor as a whole as the ordinary supply; no better and no worse. Say, for the sake of argument, we agree 20%. I would point out that from results of undertakings that have pushed cooking, it is certainly proved that the load factor has not risen, but rather has fallen, which is bad.

## An Unknown Factor.

The radiator load is quite an unknown factor. It certainly has no load factor qualities; it may have a wide diversity factor. I remember that the sudden cold period last winter had a very disastrous effect on my load factor. It certainly will not do much to fill the valleys without increasing the peaks, as this load must clash with the lighting.

The supply engineer has also to worry over his mains. A large sum has been spent in providing the network, and I am assuming this has been well spent, but not on the all-electric house basis, and if and when this comes, some provision must be made for the extra loads required. It is difficult to say how much, but one thing is quite clear, mains as a whole will want a fixed charge made for their maximum demand, as high as, or even higher than, the power station.

I am prepared to sink my principles in the other fixed charges which do not follow either the unit or the kW rates, meters, accounts, management, rents, etc., and many other expenses in running a Supply Department, and I agree that these can be borne per consumer, for the small consumer is just as much worry and trouble as the large consumer, and the large consumer should get something for the quantity factor.

I do not know if I have made myself clear on the following: we are to-day selling current on expediency tariffs to groups:—

GROUP 1.—The lighting consumer pays at 6d. per unit, £30 per kW on a 16% load factor.

GROUP 2.—The power consumer pays at £5 and ¾d. about £10 per kW on a 16% load factor.

GROUP 3.—The cooking and heating enthusiast at 1d. per unit on a 20% load factor is going to pay £7 10s.

Why this difference? Merely expediency. The cost when purchased and delivered is all the same; just one unit of electricity. All clash with the peak, and all should bear their proper proportion of the standing charges in the capital cost of providing the plant that generates the electricity, and the mains that distribute it.

It will be said that we have been pursuing this policy of expediency successfully for years. This is true, but these low domestic so-called power rates have been built up, always on the assumption that power stations have always had spare plant standing idle, and mains have been of a size ample to look after the reasonable domestic load of the district, but mostly lighting.

The future outlook is that every kW registered will have to be paid for, and a general development of heating and cooking will require mains specially laid for their purpose. Individual load factors now do not demand lower prices, for it is the diversity factor that matters.

Digressing for a moment, if you buy electricity at £5 per kW of maximum demand, you can make a living by charging every individual consumer £5, because of the diversity factor, but not the unit charge, unless the unit charge is proportionately a high one.

If this article interests anyone, it might possibly draw a badger, or even start a new hare, but the shadow is already on the wall, the N.J.E.A. are going to get busy on rates of charges and the probable way out will be a two-rate tariff.

What I want to stress by this article is that it is 20 years since most of us discarded the old maximum demand two-part tariff, and went for a flat rate. Now we are wandering round the same old circle and have come back again and are designing another somewhat similar two-part tariff, which is being built up on sand, discarding in our wanderings the sound elementary fundamentals of the Hopkinson tariff.

Would it not be better to get back to a tariff whereby each consumer pays his proper share of the proper cost of not only generating the electricity, but distributing it to his terminals? The simplest way of arriving at this is to devise a three-part tariff—the intermediary rate of which provides something for the provision of the necessary mains—and get away from this worshipping of the Goddess of Expediency; for she will turn and rend you.

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# INDUSTRIAL DRIVES.

## Some Notes on the Choice of Motors.

By A. G. POWELL.

IN choosing a motor to fulfil any desired service, the following data is essential:—

(1) The starting and running load.
(2) The type of drive required.
(3) The speed required and the necessary speed variation, if any.
(4) The proposed locality of the motor.

If the supply is direct current, it can be safely assumed that a compound interpole motor will give every satisfaction, in that it has a very high starting torque, is capable of wide speed variation with no commutation troubles, and also is able to deal with sudden wide variations in the load without distress.

In the case of alternating current, however, the type of motor depends almost entirely upon whether or not any speed variation is required. It must be realised that speed regulation obtained by the insertion of resistance into the rotor circuit is a very inefficient method, and that it will probably prove a paying proposition to instal a.c. commutator motors, in spite of the much higher first cost of this type.

When a constant speed motor is suitable, all that remains is to decide whether the starting torque required is low enough to permit an ordinary squirrel-cage motor to be employed. If it is not, either a slip-ring motor, or one of the several new designs of high torque squirrel-cage motors now available must be used. This latter type of motor has a very promising future, and certainly looks like displacing the slip-ring motor in such cases as that referred to; this type is said to develop about twice running torque when starting with a starting current of approximately three times full load current. The great advantages of the "high-torque" type as compared with slip ring motors are their simplicity and their low price, the cost being very little greater than that of a squirrel-cage motor of the same size.

With regard to the horse power developed whilst running, the motor, of whatever type, should be of such size that the average operating load is about 75 per cent. of its rated horse power, as the usual practice is to design the motor to give its maximum efficiency and power factor at this load.

The proposed locality of the motor is a very important point, particularly as regards the atmosphere in which the motor has to work. In the case of chemical works and other situations in which the atmosphere may be corrosive or explosive, it is the wisest policy to have a totally enclosed machine, in spite of the rather high cost involved. Motors of the protected type, pipe-ventilated and weatherproof types all have their correct locations, and a little thought spent in the careful choice of the correct type for any given situation will be amply repaid by a trouble-free installation and a long-lived motor.

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# THE RADIO MANUFACTURERS' ASSOCIATION.

## Difficulties of Export Trade—Large Increase in Membership—Council Increased to Eighteen—The Royalties Position—The Year's Work.

THE annual dinner of the Radio Manufacturers' Association was held at the Hotel Victoria, London, on December 6th, with Sir William Bull, M.P., President, in the chair.

CAPT. IAN FRASER, M.P., proposing the toast of the Association, said the industry might be proud of its record, especially during the past year. In 1925 the value of imports of wireless apparatus and valves into this country was £790 000. In 1927 they were only of the value of £450 000, a drop of 40%. In the period from 1925 to October, 1927, the number of licences in this country had risen from 1½ millions to 2½ millions, and the total was now over 2½ millions. The export figures, however, were not quite so happy. The United States had exported about two million pounds' worth of wireless apparatus in each of the last three years, Germany had increased from 1¼ million pounds three years ago to over two million pounds at the present time, whereas British exports had remained more or less constant during those three years at 1¼ millions. He believed, however, that he was right in saying that certain licences which had, perhaps, been a handicap in the internal trade, had also been a handicap to the export trade in certain parts of the world. He congratulated the Association upon bringing this matter to a head. He congratulated the R.M.A. upon its progress. Since Mr. Bowyer-Lowe had been its chairman it had increased its membership from 53 to 107.

### A Representative Association.

Mr. A. E. BOWYER-LOWE, chairman of the Association, said, in reply, that it was no exaggeration to say that the Association was now representative of the radio trade of Great Britain.

SIR WILLIAM BULL, proposing the toast of the British Broadcasting Corporation, spoke of the rapid rate of increase in the number of wireless listeners. During October, 1928, he said, 21 561 new licences were taken out, as against 5 071 in October, 1927. The total number in force on October 31st this year was 2 542 958, an increase of 194 100 in twelve months.

SIR JOHN REITH, in response, said that it was satisfactory that the early policies of the B.B.C. had been abundantly and conclusively vindicated and approved. The B.B.C. still had its problems. One concerned relay stations. The B.B.C. did not wish to confine the relay stations to one British private wave-length, but the crowding of the ether made it inevitable. The regional scheme could not cover the country as adequately as was desired, because Britain had to be satisfied with ten wave-lengths. The new London station would probably begin its operations not later than the autumn of next year. At the latest, three months after the London station had begun its transmission on its first wave-length, a start would be made in the North of England region, and at similar intervals new stations would be started for Scotland and Wales and the West Country. The London station would transmit its alternative programme when listeners in London and the south-east considered they had got a sufficiently strong signal.

MR. J. T. MOULD, vice-chairman of the R.M.A., proposed "Our Guests," and Mr. E. H. SHAUGHNESSY responded.

At the annual meeting of the Association, held at the Hotel Cecil, London, on December 7th, Sir William Bull, the retiring President, was re-elected, and the ballot for 18 members instead of 15 resulted in the election of representatives of the following firms to serve on the Executive Council: Brandes, Ltd.; the British Thomson-Houston Co., Ltd.; the Brownie Wireless Co. of Great Britain, Ltd.; Burndept Wireless (1928), Ltd.; the Chloride Electrical Storage Co., Ltd.; Climax Radio Electric, Ltd.; the Dubilier Condenser Co. (1925), Ltd.; Ferranti, Ltd.; the General Electric Co., Ltd.; Graham Amplion, Ltd.; Hart Collins, Ltd.; the Igranic Electric Co., Ltd.; L. McMichael, Ltd.; Metro-Vick Supplies, Ltd.; the Mullard Radio Valve Co., Ltd.; W. G. Pye and Co.; R. I. and Varley, Ltd.; and the Bowyer-Lowe Co., Ltd.

The annual report presented at the meeting stated that the mandate given to the Council at the first general meeting in December, 1926, to endeavour to secure a reduction in royalty charges has engaged the close attention of the Royalties Committee during the past few months. After the announcement of the Brownie Wireless Co. of Great Britain, Ltd., to the Royalties Committee that they were making application to the Comptroller-General of the Patent Office for a compulsory licence under certain of the Marconi patents, it was agreed that the R.M.A. should support the Brownie Co. in that application. The Comptroller-General's award, which was published on August 27th, found that the terms of the licence issued by Marconi's Wireless Telegraph Co., Ltd., to set makers, and the royalty charges made therein, constituted an abuse of monopoly rights, and ordered that a licence should be issued to the Brownie Co. Upon the publication of the Comptroller-General's award, the Royalties Committee decided to endeavour to secure an amicable settlement with the Marconi Co. satisfactory to all parties, and if those endeavours failed, to give guidance to Marconi licensees as to their position. Accordingly, an interview with Marconi's Wireless Telegraph Co., Ltd., was arranged, but proved abortive. The Royalties Committee, after consideration, decided to recommend Marconi licencees to follow a certain procedure and in order that the suggested action should be adopted by manufacturers generally, whether members or not, the Royalties Committee called a mass meeting for September 12th, when it was resolved that parties to the meeting would apply to the Marconi company for a licence on the terms and conditions set out in the Comptroller-General's decision in the Brownie case and, in the meantime, operate under such terms and conditions, notifying the Marconi company accordingly, it being understood that in the event of legal proceedings being taken against any manufacturer as a result of his following the procedure recommended, the R.M.A. would bear the cost.

The Marconi Co. replied stating that they did not accept the Comptroller's decision, that they had lodged an appeal and that during the subsistence of existing licences they would require to receive royalty payments at the old rate. In the event, however, of the Court upholding the Comptroller's decision, then the Marconi Co. would issue to their present licensees on request a new licence, as from the date of the giving of the judgment on the appeal, on the same terms as those which the Judge might grant to the Brownie Co. The Royalties Committee considered the position as affected by the attitude adopted by the Marconi Co. and issued a further letter to manufacturers recommending them to stand fast by the position originally adopted. The Marconi Co. having refused to grant new licences to manufacturers on the terms of the Brownie award, the Royalties Committee was advised that one licensee should apply to the Patent Office for a licence of right on the new terms and, at the same time, the original Brownie application being in respect of two patents only, that company should apply for a compulsory licence to cover the other eleven patents set out in Licence A (2), both applications to be made at the expense of and conducted in a manner approved by the R.M.A. Such applications have been lodged with the Patent Office.

### The Radio Exhibition.

The National Radio Exhibition organised by the Association and held at the New Hall, Olympia, from September 22nd to 29th, was during the seven days of the show visited by 123 531 paid ticket holders, as against 99 315 for 1927, and 116 570 for 1926; the latter exhibition was open for 13 days. This year 264 stands were provided, as against 229 in 1927, and the stand area was increased by over 5 000 sq. ft.

The negotiations with the B.R.V.M.A. for better terms on valves supplied to manufacturers for incorporation in complete sets were brought to a successful conclusion in July last by the issue of the B.R.V.M.A. Set-makers' "A" Agreement.

Early in the year attention was drawn to the need of steps being taken to prevent the risk of accidents through listeners using battery eliminators or receiving sets working from the supply mains. The Institution of Electrical Engineers set up a committee to draw up Wiring Regulations for Battery Eliminators and the R.M.A. was represented on this committee. Accordingly, when the increasing urgency of the matter became apparent a technical committee was appointed to go into the question, with the suggestion that such committee should co-operate with the I.E.E. and the B.B.C. Finally, agreement was reached on a series of draft regulations for radio apparatus connected to electricity supply mains, which were submitted to the Council and approved. After completing the preparation of the draft regulations, the

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technical committee considered what steps might be taken to secure their adoption in practice and, if possible, their legal enforcement. It was agreed to recommend as follows: (*a*) That the R.M.A. support an application which is being made by the I.E.E. to the Electricity Commissioners to secure legal enforcement of the Regulations. (*b*) That members of the Association be recommended to give all possible publicity to the regulations in connection with their advertisements of apparatus conforming thereto. (*c*) That members be recommended to include in apparatus designed for connection to supply mains specific directions concerning the installation thereof. The Regulations, as finally approved, have been adopted by the Institution of Electrical Engineers and printed in their Wiring Rules.

Owing to the amount of wireless apparatus being imported into this country from abroad, the Council held that it was desirable that foreign apparatus sold in the British market should bear some indication of its origin. Accordingly, a committee was appointed to draw up an application to the Board of Trade for an Order in Council, under the Merchandise Marks Act, for the marking of imported radio apparatus with the country of origin, and, feeling that in a matter of this kind the assistance of the National Union of Manufacturers would be of great service to the Association, the active co-operation of that body was sought and obtained. The application has been referred by the Board of Trade for inquiry to the Merchandise Marks Act, 1926, Standing Committee, General Merchandise.

# CORRESPONDENCE.

***The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.***

## Page Sizes of Technical Journals.

[To the Editor.]

Sir,—Further to my letter of September 15th (published in your issue of September 21st), you will be glad to know that, largely as a result of the correspondence in your columns which then took place, this matter has been taken up strongly by the Engineering Section of the Incorporated Society of British Advertisers. As a result, one of the two sizes mentioned in my letter (viz., 10 in. by 7 in.), has been suggested as a suitable standard type size of page, and negotiations are now taking place with the various publishers.

I should like to expresss my indebtedness to you for giving the matter some preliminary ventilation, and I hope that as a result, one of the outstanding difficulties of technical advertising may shortly be removed, or at all events lessened.—I am, etc.,

Brookhirst Switchgear, Ltd.
H. M. Goody, Publicity Manager.

Northgate Works, Chester.
December 6th.

## Hot Spot Temperature.

[To the Editor.]

Sir,—Mr. Norris's opinion, as I understand it, is expressed in his I.E.E. paper and other publications as follows:—

(1) The maximum safe load on a transformer depends upon the temperature of the hottest spot; (2) that hottest spot temperature cannot be known by measuring the temperature of the oil; (3) it is valuable, in fact, necessary, to know the temperature of the hottest spot, and dangerous to rely upon information regarding the oil temperature.

These opinions were criticised by Mr. Kennett's advertisements, and by his letters in your paper in these terms:—

(*a*) "The hottest oil temperature is a very satisfactory indication of the true loading of a transformer"; (*b*) "hot spot indicators are an anomaly"; (*c*) "that a hottest oil temperature of 900° C. is a test of how much load to put on any individual transformer."

Mr. Kennett's advertisements and letters were obviously calculated to discount the idea of hottest spot temperature indication and to advocate reliance upon oil temperature, and upon his modest claim to build transformers without hot spots.

Every transformer has, when in use, a hottest spot, and that is what Mr. Norris evidently refers to in his published notes on the subject.

To prevent misunderstanding, perhaps Mr. Kennett will give us references to the "advertisements and writings" mentioned in his firm's advertisements, which read as follows:—

"A good deal has been written and advertised lately of the virtues of 'hot spot' indicators and 'hot spot' measurement. . . . 'Hot spot' indicators are an anomaly. . . . Hackbridge transformers are designed without 'hot spots.'"

It would interest many of your readers to have access to those advertisements and writings.—I am, etc.,

"Southerner."

December 4th.

[To the Editor.]

Sir,—Recently Mr. Kennett was responsible for advertisements in this and other technical journals from which the following are typical extracts:—

> "A good deal has been written and advertised lately of the virtues of 'hot spot' indicators and 'hot spot' measurement."
>
> "'Hot spot' indicators are an anomaly."
>
> "Hackbridge transformers are designed without 'hot spots.'"

Since nothing to my knowledge has been written or advertised recently on "hot spots," I assumed that the Hackbridge Electric Construction Co., Ltd., used the terms "hot spot" and "hottest spot" synonymously, and were referring to recent publications and advertisements in the "Journal of the Institution of Electrical Engineers," and elsewhere, on "hottest spot" temperatures and safe load indicators.

They have since denied both these assumptions.

If, therefore, the Hackbridge Electric Construction Co., Ltd., did not intend their advertisements to lead engineers into thinking that transformers could be built without "hottest spots," it is for them to substantiate their statement that "A good deal has been written and advertised lately" about "hot spots," as they have since defined the term as distinct from "hottest spots."—I am, etc.,

E. T. Norris.

Chorlton-cum-Hardy.
December 4th.

[To the Editor.]

Sir,—Higher critics might be pardoned for discerning marks of common origin in the above two letters.

The authors still do not attempt to justify the first aggression or stick to the point, to which my last letter attempted to pin them, but instead, by way of diversion, make further attacks, and wish to put the onus of proof upon me. This is another common political device which is, however, contrary to the principles of logic and British jurisprudence.

Mr. Norris at last appears able to distinguish between the meaning of the common expression "hot spots" and that of his own introduction, "hottest spot." This is sufficient admission that his first letter should not have been written.—I am, etc.,

W. C. Kennett.

Walton-on-Thames.
December 11th.

[This correspondence is now closed.—Ed.]

## B.E.A.M.A. and Bank Credit Policy.

[To the Editor.]

Sir,—In connection with your comments on the above, I should like an opportunity of expressing the industrial and the credit policies' underlying problem from another angle.

It is axiomatic that firms must make a profit if they are to exist. Suppose every firm in the kingdom to be producing one article only—making electric motors. The motors cost £19 to produce and must be sold at £20 if firms are to exist. Under the present monetary system only $\frac{19}{20}$th of our production can be sold at home, $\frac{1}{20}$th must be sold in the export market. This, of course, is after paying for imports by exports. The fact that there are hundreds of thousands of different products turned out by industry does not invalidate this condition.

But every country in the world is controlled by a similar central bank monetary technique, and it is obvious that all countries cannot secure this favourable balance of trade—an essential condition of healthy national existence under the Gold Standard. Hence the fight for foreign markets, because industry's production does not automatically finance consumption.

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In the past these difficulties have been alleviated to some extent by—

(1) Scientific research, enabling a bigger volume of production to be realised at a lower cost.

(2) Issues of new credit for capital extensions—i.e., goods not coming on the market.

(3) Big incoming supplies of gold from Klondyke, South Africa, and Australia.

(4) Possibly by an increased velocity in the circulation of money. But as production is also a rate which is cumulatively increased, it is possible that reliance on this factor should only be utilised for minor adjustments. The annual issue of £25 000 000 of additional currency each Christmas certainly does not suggest that in practice its virtues are limitless.

It may be that scientific research in the cheapening of commodities has played more than a fair share in solving our financial problems. The number of partly working factories to-day suggests that under the present monetary technique we have saved too much, and cannot look for the same volume of new capital extensions we have had in the past. Gold production is falling, and there are no signs of big fresh discoveries of this yellow metal.

We are therefore led to ask if it represents the greatest wisdom to build up further monetary claims to non-existent gold, or, to put it in another way, to further increase the number of claims to the same piece of property. In no other sphere of life—except the financial sphere—do we develop a system of building up claims to something that does not exist, or making 30 owners for one piece of property.

In my opinion this is the world's dangerous " hottest spot " to-day.

Far from balancing our imports by exports, re-exports, etc., Prof. Pigou, in the Royal Economic Society's Memorandum, 1927, informs us that in—

| | | | | | |
|---|---|---|---|---|---|
| 1913 | we had | £181 000 000 | favourable | balance | of trade |
| 1920 | ,, | 252 000 000 | ,, | ,, | ,, |
| 1922 | ,, | 154 000 000 | ,, | ,, | ,, |
| 1923 | ,, | 102 000 000 | ,, | ,, | ,, |
| 1924 | ,, | 86 000 000 | ,, | ,, | ,, |
| 1925 | ,, | 54 000 000 | ,, | ,, | ,, |
| 1926 | ,, | 12 000 000 | *unfavourable* | balance | of trade due to General Strike and/or return to Gold Standard. |

The Board of Trade informs us that in 1927 we had £96 000 000 favourable balance of trade.

These figures seem to me to justify the B.E.A.M.A. contentions up to the hilt regarding the starvation of the home and Empire markets.

## International Finance.

Since 1911 we have raised £780 000 000 of new capital issues for investment outside the Empire, and there would appear to be a risk that we are so developing the world means of production as to starve the home and Empire developments. If this continues we shall lose the Empire to international finance.

Possibly I am prejudiced, but I cannot escape the conclusions that the B.E.A.M.A. are right, and that the world's central problem lays in developing a monetary technique which will enable production to automatically finance consumption without raising the price level.

In the prosperous United States over 28 000 firms fail every year in spite of instalment buying, mainly because of this flaw in the financial technique. No fewer than 94 % of new firms go bankrupt, and it would be folly to suggest that all this percentage is due to mismanagement, etc. In this country the figures must be even worse, and if every firm simultaneously had to strike its balance sheet on the same system of accountancy, it would be found that the losses of some firms were the gains of others. Can industry afford to continue to be the victim of such a haphazard monetary game ?

A remedial policy for this flaw in the financial system is far more pressing than wasting our time on the politician's nostrums of protection, rationalisation, nationalisation and other expedients put forward to " fob off " the public from the central problem of industry and finance.

There should be a full, open inquiry into the Central Bank's technique to discover the principles of central bank credit control, which so astute a banker as Mr. McKenna says is " undeveloped, if not unknown." I would suggest that known principles should include :—

(1) As much legal tender—i.e., non-interest bearing money, as our budget. This will reduce the amount of loans industry will require from the banks, and provide industry with sufficient money to pay its taxes.

(2) Sufficient credit in existence to enable industry to buy up its products after imports are paid for by exports.—I am, etc.,

H. J. D. Thompson, A.M.I.E.E.

155, Pilgrim Street,
Newcastle-upon-Tyne.
December 10th.

[We agree that the credit policy of the Bank of England is a matter which invites the serious consideration of business men. Our comments, however, referred to the apparent inconsistency of the B.E.A.M.A. " Survey " in referring in one place to a change of policy since the spring of this year and in another to the initiation of this same policy over eight years ago. Mr. Thompson's figures of bankruptcies in the U.S.A. are startling, but he does not explain whether the " firms " include the equivalent of the limited liability companies. If he does include the registered companies the figures for this country are probably much better than he suggests, the proportion of failures of companies to new companies registered being, for the last three years, well under 40%.—Ed.]

# CONSULTING ENGINEERS.

## Representative Attendance at Association's Annual Dinner.

Mr. H. Howard Humphreys presided at the annual dinner of the Association of Consulting Engineers, held at St. Stephen's Club, London, on December 5th, when there was a large attendance of members and guests including distinguished representatives of all branches of engineering.

Unique among Association dinners in being held in a club, it is also noteworthy for the witty and philosophical quality of the after-dinner speech making. Hence the speeches are exceptionally interesting, but like others of similar quality, do not readily lend themselves to reporting. As most of the speeches were not of directly electrical interest, we will not attempt to do more than reproduce the toast list. The first toast, " Local Government," was proposed by Mr. H. W. Couzens, and replied to by the Mayor of Westminster. Mr. F. W. La Trobe-Bateman proposed " Bench and Bar," which brought delightful replies from Mr. Justice Hawke and Mr. W. J. Jeeves, K.C. " Industrial Progress " was the next toast, proposed by Mr. A. W. Lewis and responded to by Mr. Frank Hodges. Finally, the toast of " The Association, of Consulting Engineers " was given by Lt.-Col. K. Edgcumbe, President of the Institution of Electrical Engineers, and briefly acknowledged by Mr. H. Howard Humphreys.

# ELECTRICAL WOMEN.

### Branch Activities Include Electrical Works Visit.

A meeting of the Rugby branch of the Electrical Association for Women was held in the Percival Guild-house on November 29th, when a talk and demonstration on " Fuses and Their Uses " was given by Mr. A. S. Kettle of the British Thomson-Houston Co.

One of the most interesting items on the season's programme of the Birmingham and Midlands branch of the Association was the visit to the Revo Electric Co.'s works on December 4th, when Mrs. Hayes (hon. sec.), Mrs. Howie of Walsall (hon. treasurer), together with forty members spent the afternoon viewing the works, following with interest the various processes of manufacture of electric cookers, fires, irons, kettles, washboilers, waterheaters, fans, switchgear and electric light fittings for industrial and public lighting requirements. After the tour of inspection the party were escorted to the works canteen and saw the developments made in restaurant cooking apparatus manufactured by the Revo Co. The party were then entertained to tea by the directors and chiefs of staff, amongst those present being Mr. F. H. Reeves (managing director), Mr. A. E. Felton, Mr. A. Vaughan, and Mr. G. Barrow (directors). A vote of thanks to the Revo Electric Co. was proposed by Mrs. Howie and seconded by Mr. Oliver Lee. Mr. A. E. Felton responded in a suitable manner.

The Dowager Lady Swaythling, who is a recent member of the Electrical Association for Women, took the chair for Mr. S. C. Hurry of the Jackson Electric Stove Co., Ltd., on December 5th, at 46, Kensington Court, W.8, when he gave a talk on " Electric Water Heating in Old and New Houses." The meeting was well attended.

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# COMPULSORY REGISTRATION.

## Demand Expressed by Speakers at Dinner of Chesterfield Electrical Contractors—Praise for Work of National Register—Increased Support from Station Engineers.

COMPULSORY registration of electrical installation contractors was the keynote of the speeches at the first annual dinner of the Chesterfield Sub-Branch of the Electrical Contractors' Association, held at the Station Hotel, Chesterfield, on December 6th, Mr. Edgar R. Morris, chairman of the Branch, presiding.

Mr. G. S. WHITELAM, immediate past-president of the Chesterfield Chamber of Trade, who proposed "The E.C.A., Allied Associations, and Officials," spoke of the efforts of the Chamber of Trade to ensure that only accredited electrical contractors should receive the support of its members. To this end the Chamber had enthusiastically supported a resolution urging the importance of protecting the general public from shoddy electrical work, and pointing out the danger, not only to property, but to life, of such work. The resolution strongly urged upon the Government the necessity for introducing a Bill for the registration of all duly qualified electrical contractors. Mr. Whitelam also spoke of the steps taken to give the resolution wider influence.

Mr. L. C. PENWILL, referring to the Chesterfield Chamber of Trade's efforts to obtain compulsory registration for electrical contractors, stated that this would mean competition on a fair basis. Not only should the work be done on a definite specification, but labour should also be paid for on a definite basis and at a fair and just rate. He spoke of the growing success of the E.C.A., but stated that while the membership of the Association now totalled 1 200, it was alleged that there were 10 000 electrical contractors throughout the country.

Mr. H. Moss said the question of compulsory registration for electrical contractors was, to-day, of the greatest importance. His exposure in THE ELECTRICIAN last April, of shoddy wiring and the need for compulsory registration, had started a ball rolling that was gaining in momentum almost daily.

The National Register of Electrical Installation Contractor had been trounced in the past for its apparent inactivity, but there were to-day distinct signs of movement and a keen desire to show that the authority was a real live body.

The present position of the National Register was that 1 527 firms had applied for registration and out of that number 1 266 had been accepted. No fewer than 174 applications had been declined, 32 withdrawn, and 127 registrations cancelled and certificates withdrawn, for various reasons, such as bankruptcies, etc.; 5 have been "struck off" on account of bad workmanship.

Mr. Moss did not agree with those who complained that the National Register did nothing but draw fees from contractors. The Register had, within the last few months, printed and distributed among central station engineers, architects, consultants and similar people, 10 000 copies of an article published in THE ELECTRICIAN on "The Need for Compulsory Registration." They had also embarked upon a publicity campaign including advertising, the drawing up of brochures and other printed matter for supply to registered contractors at cost price. Further, the National Register had, within the last few days, been able to get into a morning paper. with a daily circulation of nearly two million copies, an inspired article on "Electric Wiring Risks," all of which went to prove that there was a distinct liveliness on the registration front.

Quite a number of central station engineers and corporations had allied themselves to the registration cause, and would not place any more work with non-registered contractors, Hull and Leeds being the two last converts.

There were, Mr. Moss continued, two main reasons why the question of compulsory registration was bound to be of prime importance. First, because the safety of the people was at stake; and, secondly, because the whole business of electrical development depended on safe, satisfactory and reliable installations being installed in British homes to-day.

Some people asked why a National Register should be necessary. It was because, during the years since the War, hordes of men and boys had started in business as electrical engineers and contractors, without ability, practical or technical training, commercial experience or business honesty, and had, owing to the slack methods and policy of some suppliers, been able to get trade terms and be put practically on an equal footing with the best installation engineers in the country.

These inexperienced men were fire-makers of the worst kind, a positive danger to the community, and a financial drain on the resources of the electrical trade through their cut-throat competition and constant failures, and they must be weeded out and prevented from carrying on business in a trade which called for competent, technically trained, skilled men.

Mr. W. H. BURTON (hon. secretary of the Chesterfield Sub-Branch) expressed the opinion that compulsory registration would be of the greatest value to the industry.

Mr. R. ROBSON congratulated the Chesterfield Chamber of Trade on its efforts to obtain compulsory registration.

Mr. D. H. DAVIES said that the Chesterfield Corporation had now spent £30 000 on its wiring scheme, all of which had gone to E.C.A. members. The work was very satisfactory, and in four years the maintenance of the 4 500 consumers' installations affected had only cost £4 5s. 6d. He contended that it was the duty of a supply authority to protect its consumers by insisting on getting good installations for them.

Mr. A. D. PHILLIPS said that supply engineers were in favour of compulsory registration, and, in the best interests of the public, would welcome it. In the meantime he looked to members of the E.C.A. for a lead in this direction, and expected members of the E.C.A. to set an example by doing nothing but sound, reliable work.

Mr. I. SCOTT MACKENZIE was of the opinion that contractors carried out work at prices which did not leave them a sufficient margin of profit.

Other speakers included Messrs. H. C. Hazel, W. A. Shaw, T. H. Beardsell, H. E. Drabble, A. J. Ward, and Ald. H. Varley.

**Members of the Chesterfield Sub-Branch of the Electrical Contractors' Association and their guests at the first annual dinner of the branch. A report of the speeches—in which the demand for the compulsory registration of the electrical installation contractors was emphasised—is given above.**

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# HAND FIRE EXTINGUISHERS.

## Types to Use in Dealing with Electrical Fires—Strength of Containers—Dangers of Corrosion—C.T.C. Extinguishers in Buildings—The Advantages of Hand Extinguishers over Buckets.

AT a meeting of the Association of Liquid Chemical Fire Extinguisher Manufacturers, at the Institution of Mechanical Engineers, on December 4th, Mr. Sidney G. Gamble delivered an address on the use and maintenance of hand fire extinguishers, with Mr. A. E. Wiseman in the chair.

The paper contained much of interest to the electrical industry, and in pointing out that the amount of insured property destroyed by fire annually throughout the world is estimated at over £40 000 000, Mr. Gamble explained that the usual causes of such fires were defective construction, oil, gas, electric and other forms of lighting and heating. To those responsible for the maintenance of businesses and manufacturing premises the question of providing efficient protection against a possible outbreak was an urgent one. Many people preferred to rely upon their local fire brigade; but it should be quite clear to all that it was the duty of every far-seeing man to have near at hand some means whereby he could overcome or hold in check a fire on his premises until the fire brigade was summoned. There was not a wide selection of suitable appliances, hand pumps, chemical extinguishers and buckets being the most frequently adopted. The hand pump was a comparatively expensive appliance, while the fire bucket, though useful in the hands of skilled persons, was an additional danger to life in the case of electrical fires. In the case of hand chemical fire extinguishers, these had now reached a very efficient standard, and were much more easily handled by females than buckets, an important point to consider, when it is remembered that there are a very large number of females employed in factories and business premises. The chemical fire extinguisher, too, was now the universally recognised first-aid appliance for dealing with fires in their early stages, and in a great many instances the efficient use of one of these appliances had prevented what might have been a very serious fire, before the arrival of the fire brigade.

Comparing the advantages of a hand chemical fire extinguisher over the hand pump and fire bucket, the most impressionable facts were (1) chemical fire extinguishers can be used for fire only, and are always ready for instant service; (2) they gather no impurities; (3) they throw a continuous stream where it will do good, and without waste, and (4) they do their own throwing, and will give effective results 20 or 30 feet away from the fire. Extinguishers on the market are of three distinct types: the soda-acid type, the foam or froth type, and the carbon tetra-chloride type. The soda-acid type is probably the best known, and was the original type introduced. The fire extinguishing fluid is produced by the inter-action of a soda solution and an acid, so proportioned that when they are mixed a sufficient pressure of gas is produced to eject the whole of the contents of the extinguisher. The liquids are kept apart in the appliances until required for use, when they are brought together by one of several methods. The commonest methods adopted are by (1) breaking the acid bottle by means of a plunger; or (2) by turning the appliance upside down, thereby releasing the acid from a loose stoppered bottle. The foam or froth type of extinguisher is a more modern invention, and was introduced primarily to deal with fires in highly inflammable liquids such as petrol, oil, etc. It makes use of an acid salt and a solution of bicarbonate of soda to which is added a foaming ingredient. When the two solutions mix, a thick, tenacious foam is produced, which is lighter than the inflammable liquids referred to, and floats upon the surface of the blazing fluids, thus forming a blanket which excludes the air, and thereby prevents combustion. When the two solutions are mixed the volume of foam produced is about eight or ten times the combined volume of the two solutions.

### A Non-Conducting Medium.

The carbon tetra-chloride type of extinguisher ejects its liquid by means of a pump or a compressed gas cartridge, which, when in contact with fire, evolves a vapour which forms a blanket round the burning material. This chemical has peculiar properties. It is not liable to deteriorate or freeze, and it is free from acid, salts or alkali. It is a non-conductor of electricity, and is therefore specially suitable for fires involving electric currents, which would be a source of danger if tackled with an extinguisher containing water.

In distributing extinguishers about a building they should be placed near exits, in order that, in case of fire, the person who uses them may do so from a place of safety and with means of escape provided. After the exits have been covered, other extinguishers may be distributed at central points in close proximity to where a fire is likely to start. In every case they must be in a clear space, providing free and unimpeded access.

### Protection from Frost.

Soda and acid and foam extinguishers should be protected from frost, and should be kept in places where they are not likely to be subjected to low temperatures. At a temperature of 40 deg. F. the action of a foam extinguisher is liable to be very sluggish. This sluggishness can to some extent be overcome by placing the finger over the nozzle for twenty seconds or so, thus allowing the solutions to have time to react and give a reasonably good jet of foam. The soda bicarbonate used in charging a soda-acid type of extinguisher should be dissolved in warm water in preference to cold water. On no account should boiling water be used. Attention was also drawn to the fact that the mixing of the acid charge for the inner container of the foam extinguishers should be done in an enamelled vessel, and not in a galvanised vessel, on account of the chemical action which would result.

Every reliable extinguisher is made in conformity with one or other of the specifications now in existence. These specifications have from time to time been compiled and issued by the Fire Offices Committee, The British Fire Prevention Committee, H.M. Office of Works, and H.M. Board of Trade, and recently a standard specification for materials and constructional strength has been issued by the British Engineering Standards Association. It should also be remembered that an extinguisher is not bought with the idea that it is to be used within the next twenty-four hours, and therefore it should be bought with the conviction that, with a small amount of care and attention, if it be required five to ten years hence, it will be found as sound and efficient as on the day it was purchased.

In the discussion which followed, it was pointed out that care should be taken when installing hand fire extinguishers, that the correct type was chosen. Cases had been known where liquid extinguishers had been used to extinguish an electrical fire, with disastrous results. One speaker stated that whereas C.T.C. type were often recommended, he had experienced shocks when using such extinguishers; further, as most electrical fires were under cover, the fumes placed the operator in considerable danger. The same speaker had recently experimented with a machine employing methyl-bromide, and having regard to the non-conductivity and non-toxic properties of these chemicals, he believed such a mixture would be better than the C.T.C. at present used for extinguishing fires involving the supply mains. In the case of oil-immersed transformer fires, it was suggested that $CO_2$ was the best extinguishing medium. Whereas foam type extinguishers were sometimes used in electrical fires, these were not altogether fool-proof, in that before the foaming actually becomes active, a thin stream of liquid is ejected, which if brought into contact with a live wire, would immediately subject the operator to danger of shock. The soda-acid type should not in any case ever be used in such fires for the reasons given above.

Another point of interest raised at the meeting with respect to extinguishers for use in electrical fires, was to the effect that manufacturers of these machines before placing them on the market, usually submit them to some authority, such as Faraday House for an expression of opinion and figures as to voltage with which tests were made. The reports issued state whether or not this or that machine, according to type, may be used with safety with fires involving electricity supply mains. In appropriate cases the voltages at which safe tests were made are given, and in accordance with these reports manufacturers so sell their machines. It is also interesting to note that Mr. Gamble could give no opinion as to how best to extinguish an electrical switchboard fire, on account of the fact that never in his experience had he seen such a fire, neither had he any second-hand information on the subject.

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# NEWS IN BRIEF.

## Electric Heaters for Tramcars—The Birmingham Electric Club—The E.C.A. Annual Dinner—Electrical Wages—Jubilee of the Electric Lamp—The Henley Dramatic Club.

THE annual meeting of the Birmingham Electric Club will be held to-day, Friday, at 7 p.m., at the Grand Hotel.

The change over from the manual to the automatic telephone system at Leicester took place at midnight on Saturday.

At a meeting of the North Western Centre of the I.E.E. on December 18th, Mr. E. Tatton will read a paper entitled " Power Station Sites."

The General Electric Co., Ltd., is carrying out the lighting scheme at Eastbourne electricity department's new showrooms and offices.

On June 30th last the number of telephones in the United States was 18 893 000, a gain of 742 000 during the previous twelve months.

The Government of Manitoba has decided to introduce legislation for providing further hydro-electric development for rural electricity supply.

The Shawinigan Water and Power Co., Ltd., has just brought into operation, in its No. 2 power station at Shawinigan Falls, a 45 000 H.P. generating unit.

The Canadian Hydro-Electric Corporation has established what is believed to be an output record by generating 6 054 837 kWh of electric energy in a single day.

During the year ended March last over 25 000 persons visited Bradford electricity department's Sunbridge Road showrooms, about 6 000 more than in last year. Since April, 1926, 1 700 electric cookers have been installed for city housewives, and the number of domestic consumers of electricity, 25 500, is greater by 3 771.

A meeting of the North Midland Centre of the I.E.E. was held at the Hotel Metropole, Leeds, on Tuesday, when Mr. W. E. French opened a discussion on " Short Circuits in Large Power Systems."

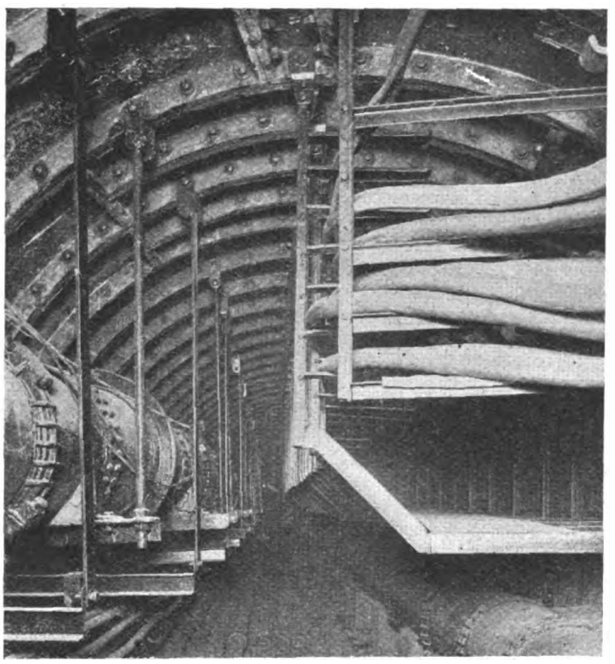
The Metropolitan Electric Tramways are experimenting with tubular electric heaters for the top saloons of their tramcars in very cold weather. These are fixed along the sides of the car at floor level, and are regulated by a switch on the canopy above the lower saloon doors.

At a recent meeting of the Council of the E.C.A. and its Allied Associations a resolution was passed to the effect that, as from May 1st next, no member of the N.E.C.T.A. should deal with wholesalers or factors (not being specially-appointed agents for the goods in question) or not approved by the Council as coming within the definition of the Trading Policy of the Association.

The Jubilee of the incandescent electric lamp, which was first shown in public by the late Sir Joseph Swan at Newcastle-on-Tyne, on December 18th, 1878, will be commemorated by the Institution at the ordinary meeting to be held on December 20th, when a short lecture on Swan's work will be delivered by Mr. J. Swinburne, F.R.S. Samples of early lamps will be on exhibition. The meeting will commence at 5.30 p.m. instead of 6 p.m. as usual.

A paper on " Extra High Tension Switch Gears " was read to members of the Newcastle-on-Tyne Junior Institute of Engineers by the chairman, Mr. W. Reed, last week.

The annual dinner of the Electrical Contractors' Association will be held at the Savoy Hotel, London, on January 22nd. The 1929 annual conference will be held at Bournemouth from June 16th to 28th, inclusive.



*IN connection with the opening of the new Piccadilly Circus station of the London Underground Railway, on Monday, the above photograph shows the pipe subway which has been made. The picture is of interest apart from the development of the railway, in that it shows not only the main pipes, but also part of the electricity supply cables for the district. In view of the heavy street traffic conditions experienced in London, the housing of pipes and cables in suitable subways, thus eliminating the necessity for digging up the road wherever a repair or extension is required, is not only a wise precaution, but also an example which we should be glad to see more often followed.* *See page* 695.

A contract amounting to £2 275 has been placed by Salford Corporation for the construction of foundations and structural steel work in connection with the turbo-alternator at Agecroft power station.

In connection with the erection of the new switch house, Leeds Electricity Committee has accepted tenders for the excavation and concrete raft work and steel construction work at schedule prices.

The Swedish Telegraph and Telephone Department, in its preliminary budget plan for 1929–30, calls for 7 000 000 kroner for further extension and development of the telephone and telegraph system.

What is believed to be the most powerful concentration of light ever attempted was switched on at the Commercial Museum, Philadelphia, recently, when illumination representing 1 680 000 000 c.p. was used.

At a recent meeting of shareholders of the Duffield Iron Corporation, Ltd., and Duffield Coal Products, Ltd., Mr. Duffield said the Coal Products Co. intended to provide improved and cheaper means of producing gas for steel works and industrial undertakings, and to make cheaper electricity from a system of steam generation.

R. A. Lister and Co. gave a dinner in London on Wednesday to their agents and distributors. This firm, it will be remembered adopted some time ago the system of employee-directors, of whom there are six elected by their fellow-workmen.

Henley's Dramatic Club is producing at the Cripplegate Theatre, London, on December 20th, the three-act farce " It Pays to Advertise," by Walter Hackett and Roi Cooper Megrue. The cast will include the Misses L. Coster, H. Starbuck, N. Taylor, C. Woodall, and Messrs. F. J. Bettley, F. H. Batten, S. L. Crafford, E. W. Galley, W. C. Gibbs, T. E. Hoather, H. Stanley, and W. G. Turner. The play will be produced by Mr. H. Thornton, and tickets may be obtained from Mr. W. G. Turner, 11, Holborn Viaduct, London, E.C., or from any other member of the cast.

The National Joint Council for the Electricity Supply Industry at a meeting on December 7th passed a resolution in favour of the wages agreement of December, 1927, being continued for a further 12 months. The application of the trade unions for an increase of 10 % is to remain in abeyance, with the exception of that part having reference to new rates for specified grades. The national workmen's side is to formulate machinery to be adopted for regulating the wages of employees in the industry.

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# PERSONAL.

THE appointment of Mr. R. S. Pilcher as general manager of Manchester Tramways was confirmed by the Council last week.

Mr. C. E. Allsopp, of Bradford Electricity Department, has now returned to business after many months illness, during which he has had two operations.

Mr. D. E. Bell, general manager and engineer of the St. Helens Corporation Tramways, has been appointed general manager of Yorkshire (Woollen district) Electric Tramways, Ltd.

Mr. Harry Moss has again promised to lecture before the Leeds and West Riding Branch of the Electrical Association for Women, his subject being " Some More Things You Should Know About Your Electrical Installation."

Miss Elizabeth M. Brewer, formerly Lady Superintendent, No. 8 Filling Factory, Southwark, and recently L.C.C. Officer, has been appointed Factory Welfare Superintendent to Lissen, Ltd., Lissenium Works, Richmond, Surrey.

Dr. W. H. Eccles, Lieut.-Col. K. Edgcumbe, Mr. W. McMordey, and Sir Alfred Yarrow were among the guests at the twent-first anniversary dinner of the Imperial College of Science and Technology, held in London on Monday.

Ald. W. J. Stapleton has been elected chairman of Hackney Electricity Committee, and Coun. G. Green, vice-chairman. Ald. Stapleton and Mr. L. L. Robinson, borough electrical engineer, have been appointed to represent the Borough at the Conference of Local Authorities owning Electricity Undertakings in Greater London.

Mr. W. T. Tallent-Bateman, who for the last five years has managed the affairs of Ferguson, Pailin, Ltd., in India, Burma, Ceylon and South Africa, is about to return to England for a few months stay; he will arrive at Southampton from Cape Town on the " Windsor Castle," due on December 17th. Mr. Bateman's temporary address for correspondence will be c/o H. T. Hughes, Mayfield House, Chapel-en-le-Frith, via Stockport.

A recommendation that the salary of Mr. Charles Furness, electrical engineer and tramways manager, Blackpool, be increased from £1 250 to £1 600 was discussed by Blackpool T.C. on December 5th. The open council decided to refer the question to the Staff Salaries' Sub-Committee for further consideration. Counc. Rounds thought the time inopportune to bring the matter forward. Coun. Taylor advocated that the recommendation be thrown out altogether. Whereas the Committee proposed to increase Mr. Furness's salary by £350 a year, they had decided to divide only £201 among certain members of his staff for special services during the autumn illuminations.

Mr. Robert Blackmore has been appointed district engineer for the North West England and North Wales Electricity Scheme, under the Central Electricity Board. Mr. Blackmore who will take up his new duties on January 1st., has been engineer-in-chief of the Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board since 1904, and was previously with the St. James and Pall Mall Electric Lighting Co., and the National Electric Supply Co., Preston. He was formerly city electrical engineer for Wakefield, and during recent years has acted as consulting engineer to the Accrington, Fleetwood, Glossop, Leigh, Nelson, Oldham and other Corporations. He has also had a large experience in textile mills as consulting engineer for the electrification of about one hundred factories.

## Obituary.

MR. ALFRED CHARLES FARRINGTON, aged 54 years. He was for the past ten years electrical engineer at the Queenborough Pottery Works.

MR. C. J. H. STREET, on November 24th, aged 53 years. He was engineer and clerk of works to Pritchett and Gold and E.P.S. Co. Ltd., and joined the staff of the original company, Pritchett and Gold, Ltd., accumulator makers, at Feltham, Middlesex, 23 years ago.

ALDERMAN ALBERT WILKINSON, Mayor of Luton, on December 7th, after a very serious operation. He was an enthusiastic supporter of electricity supply and was chairman of Luton Electricity Committee for over 30 years, chairman of the Home Counties (No. 9 area) Joint Industrial Council for the Electricity Supply Industry, chairman of the Home Counties (No. 9 area) District Joint Board of Employers and Members of Staff for the Electricity Supply Industry, member of the National Joint Industrial Council for the Electricity Supply Industry, and a member of the National Joint Board for the Electricity Supply Industry.

# IN PARLIAMENT.

## Imperial Telegraphs Bill—The Financial Position Under Discussion.

THE motion that this Bill be read a third time was passed in the House of Commons on Monday by 235 votes to 97.

During the debate in the Committee stage various amendments were proposed.

Mr. W. J. Baker proposed that, in Clause 1, which is to the effect that the Board with the consent of and on the terms approved by all the partner Governments may sell the Pacific cable undertaking to the Communications Co. as from April 1st, 1928, the words " and on the terms approved by " should be omitted. He said cables which cost £7 134 797 were to be handed over for £2 500 000. The Government was prepared to let the Marconi Co. have over £17 000 000. They should insist on the value of the Marconi Co. being the value of the shares prior to the boom which was engineered as the result of information obtained from the Imperial Conference.

Mr. W. Wellock asked why the Government was to receive cash for its cable holdings and the private companies were to receive shares in the Communications Co.

### No Leakage of Information.

The Postmaster-General said the recommendations of the Imperial Conference, which was composed of delegates fully accredited by their respective governments, had been accepted by the Government. It had been argued that instead of fusion under private control it should have been fusion under Government control. If the Labour Party had been the Government they could not have carried out that course because they would have discovered that their views did not coincide with those of the rest of the Empire. To achieve the transfer there would be at least five agreements. When those agreements were laid on the table it would then be for the Opposition, if they were not satisfied with them, to move a vote of censure. Mr. Baker said money had been made by information improperly obtained from the Imperial Conference. He had no right to say that without having some sort of foundation for it. He (the Postmaster-General) was perfectly certain that no leakage of information could be traced to any member of the Imperial Conference.

Capt. Wedgwood Benn said it was not a sufficient defence to say that other Governments were concerned. The contract had to be defended in the light of British interests.

Mr. A. M. Samuel (Financial Secretary to the Treasury) said the sum put down was the considered opinion of the value by the Experts Committee. It was not for us, who were not the predominant partners, to try to dictate to the others. The Pacific Cable ownership was divided into 18 portions, of which Australia, Canada and New Zealand held 13, while we held 5.

Mr. C. G. Ammon said this was a link in a much larger chain to take over the wireless system. The Conference had passed resolutions over and over again that it was important that these communications should be in the hands of the Government. What had happened to make the Conference change its mind?

The Dominions Secretary (Mr. Amery) agreed that in the beginning the Imperial Conference did commit itself to a series of state-owned wireless stations, but when the Imperial Economic Conference discussed the question in October, 1923, it could no longer affirm the desirability for a State-owned system, because wireless outside this country was already in private hands.

The amendment was rejected, as was a further amendment moved by Mr. Baker that the price at which the Pacific Cable undertakings were sold should be one approved by a resolution of the House.

An amendment proposed by Mr. Ammon, postponing the operation of the Bill for two years was also defeated, and clauses 1 and 3 were added to the Bill.

On clause 4, which provides for the sale to the Communications Co. of the Imperial transatlantic cable undertakings on such terms as the Treasury may approve, Mr. Ammon moved to omit the words " on such terms as the Treasury may approve," and to insert " at a price not less than £2 500 000.

The Postmaster-General said at one moment the Opposition argued that the beam was so valuable that the cables were worth little or nothing, next they complained that the price the Government was getting for them ought to be five times as much. He was prepared to defend the price of £450 000 for the Imperial cables as a satisfactory bargain for the

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Government. The cost of the two cables to the Government was £1 068 000, but they earned no profits since 1920 and 1922, when the second cable was bought. Last year, owing to the beam system, the operating revenue of the cables had not been sufficient to cover depreciation. He was satisfied that the Government was making a good bargain. Mr. Ammon's amendment was defeated.

A motion that clause 4 stand part of the Bill was carried.

Capt. Wedgwood Benn moved a new clause to establish an Imperial Advisory Committee representative of Empire Governments to have control over the Communications Co. The clause was rejected.

A clause proposed by Mr. Malone to limit the interest or dividend on the Communication Co.'s capital to a rate to be fixed by the Treasury was rejected, as was another clause proposed by Mr. G. M. Gillett to limit the company's capital to £20 000 000.

A proposal by Mr. Edward Grenfell that the chairman of the company should be approved by the Government was rejected.

The Bill was reported and, as stated above, passed for third reading.

## Replies to Questions.

**There has been no general lowering of efficiency of the telephone service.**

The Minister of Transport does not at present propose to seek any powers to undertake and work hydro-electric schemes in Scotland. It has been the practice of Parliament to insert in special Acts authorising such undertakings provisions that would enable them eventually to be acquired by the State.

In many cases artificial-light treatment for children attending public elementary schools is provided at the light department of a general hospital. Treatment at a school clinic is allowed only on condition that a medical officer with special experience of artificial-light therapy will be in charge and that he will be assisted by a nurse who has also had special experience of this work.

The negotiations between the General Post Office and the telephone administrations of the 18 European countries with which Great Britain is in telephonic communication for the purpose of establishing a person-to-person service are in an early stage, and the Postmaster-General is not in a position to make any statement about their progress. There is no difficulty so far as Great Britain is concerned.

In reference to an inquiry whether a petition for an inquiry with the view to safeguarding the industry of manufacturing automatic electric refrigerators has been received by the Board of Trade, the President says that he must adhere to the practice not to state whether a particular industry has made an application under the safeguarding procedure, except on the appointment of a committee of inquiry.

The Postmaster-General is always prepared to investigate complaints of overcharge for telephone calls, and to make allowance where there is clear evidence of error on the part of the Post Office. He would welcome a device which would place the possibility of error beyond dispute, but no automatic register suitable for attachment to a subscriber's telephone instrument has yet been found capable of distinguishing between effective and ineffective calls.

The capital cost of the four beam stations erected for the Australian, Canadian, Indian and South African services, was approximately £242 000. On the Australian service during the first 52 weeks of its operation 7 306 000 words were handled; on the Canadian service 4 591 000; on the Indian service 10 078 000; and on the South African service 8 375 000. During the first complete week of operation of each service the number of paid words handled was 53 000, 59 000, 115 000, and 88 000 respectively. During the week ended November 11th, 1928, the respective totals were 181 000, 113 000, 253 000 and 200 000.

Sir V. Henderson, on behalf of the Home Secretary, says statistics are not available as to the principal trades in which Saturday had been abolished as a working day, or the number of work places and persons affected by such abolition. The five-day week had been introduced in a number of factories in different industries, and the fact that the workers seemed to be almost unanimously in favour of it might be taken to indicate that the weekly earnings had not been substantially affected. The proprietors of THE ELECTRICIAN, Messrs. Benn Bros., Ltd., were pioneers in regard to the five-day week, and, after some years' experience of it, we can state confidently that it is generally appreciated by the staff, and we believe that output has not been prejudicially affected.

# TELEPHONE PIONEERS.

## Big Gathering of Old Members of the National Telephone Co.'s Staff.

AT the Criterion Restaurant, London, on Monday, a large number of ex-members of the National Telephone Co.'s staff, who were in the company's service prior to the transfer of the undertaking to the Post Office on January 1st, 1912, and some guests, chiefly connected with the Post Office telephone service, met at dinner. The number of persons present was nearly 450.

Lieut.-Col. C. B. CLAY, formerly metropolitan superintendent of the National Co., said he had been anxious to see whether the old members of the National Co.'s staff could not get together, and it had taken about 17 years to do it. He consulted Mr. Gill, and at a small dinner of the old chiefs of the company it was agreed to organise the present dinner, at which he was very proud to preside. There were present many N.T.C. veterans, including Lord Harris, their old director, Mr. S. J. Goddard, their general superintendent, Mr. Albert Anns, their second secretary; Mr. Dane Sinclair, their first engineer-in-chief; Mr. F. Gill, second engineer-in-chief; Mr. W. W. Cook, assistant engineer-in-chief; and seven old superintendents. They had also present two of the oldest telephone men, Mr. C. J. Phillips, who joined the service on September 9th, 1879, and Mr. J. S. Holt, who joined the old Lancashire and Cheshire Co. in November, 1879, and who was now 85 years of age.

He (Col. Clay) suggested that a Telephone Pioneers' Society might be formed.

Lord HARRIS, responding, said that he was the last surviving director of the old National Company, and he was less capable than any of his old comrades to speak on the history of the company, as he came in comparatively late, and his activities were rather in the direction of overcoming political obstruction than in pushing the activities of the telephone itself. The public was not now as critical of the telephone as it was in the company's time. During the whole life of the company it had not a friend outside the board, the staff and the executive officers. He used to accompany his friend, Mr. James Staats Forbes to interview various politicians, and with very little success. Much of the opposition to the service at that time was most absurd, and if it had not been for the audacity of the late Mr. W. E. L. Gaine and Mr. Goddard, the company would not have been in as good a position as it occupied at the time its licence expired.

Mr. STANLEY J. GODDARD said he was now a telegraph man, but now that telegraphy and telephony could be carried on simultaneously on the same cables it was possible that telegraph and telephone men might come closer together. The National staff were a happy lot in the old days, and they had no reason to be ashamed of themselves. They all worked to produce a service which he thought was going to stay.

### Recent Telephone Progress.

Mr. W. A. Valentine and Col. T. F. Purves also replied to the toast. Mr. VALENTINE said he had been asked to reply for those who were still in the "firing line." Speaking of the progress that had been made, he said London, Sweden, Spain and Germany could be connected over the transatlantic wireless with New York, San Francisco or Vancouver, and they looked forward to the time, not so very far distant, when they would converse with India and Australia.

Col. T. F. PURVES, Engineer-in-Chief of the General Post Office, said before the transfer of the company's undertaking they of the Post Office had made many friends in the ranks of the National Co., whose knowledge and longer experience they recognised. He thought it was now admitted that the men who did the great and delicate work of grafting the two staffs together did it with a measure of success which deserved the highest commendation. He did not think the transfer of the undertaking to the Post Office made the Press or public less inclined to criticise it.

Mr. FRANK GILL, who was received with loud applause, proposed the toast of "The Chairman," and remarked that perhaps the scope of the telephone service was not always realised. If there were a telephone in that room one could ring up 26 million telephones. He also suggested that a big telephone push in this country would do a great deal to reduce unemployment, and confer a general public benefit.

The CHAIRMAN, in acknowledging the toast, said thanks were due to Mr. T. A. Prout, secretary, and Mr. H. M. Darville, hon. treasurer, for the work they had done. (See page 693.)

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# LEGAL INTELLIGENCE.

## S. G. Brown and the Lektophone Corporation in Loud Speaker Patent Dispute.

IN the Chancery Division, on December 5th, Mr. Justice Tomlin began the hearing of an action by the Lektophone Corporation of Jersey City, U.S.A., against S. G. Brown, Ltd., of The Works, Victoria Road, Willesden, N.W., for an injunction restraining the alleged infringement of their letters patent No. 16 602 of 1914, for damages, and for delivery up or destruction on oath of all alleged infringing articles in the defendants' possession or under their control.

Infringement was denied, and the defendant company alleged that the patent was invalid on the grounds of prior publication and common general knowledge, lack of subject-matter, and insufficiency of description in the specification. They counter-claimed for revocation of the patent.

### The "Mascot" Model.

The plaintiffs complained of a sale by the defendants at the Radio Exhibition at Olympia about September 26th, 1927, of a "Mascot" loud speaker. The patent which they alleged had been infringed was granted to Marcus Clarence Hopkins for an invention of "improvements in or relating to sound regulating machines," and of this they were registered legal owners.

The prior specifications relied on by the defendants as rendering the patent invalid were: Bowley of 1899, Stroh of 1901, Boult of 1903, Lumiere of 1909, Brown of 1910 and 1911 (2), Lumiere of 1912, and an American specification of Shanks of 1906.

Opening the plaintiffs' case, Mr. T. Whitehead, K.C., went on to deal with the question of the transmission of sound, and explained the production of musical notes as differentiated from noise, dealing with overtones, partials and harmonics. He then spoke of the generation of sound waves by means of discs, remarking that while large discs had advantages in regard to the perceptibility of sound, they had the disadvantage of weight and force. He touched on the prior specifications, and declared that none of them had anticipated the plaintiffs' patent. Those of Mr. Brown did not solve the problem presented to Mr. Hopkins.

Dr. Eccles was called on December 6th, when he said there had been a great deal of investigation of recent years on the best form of loud speaker horns, and in these days exponential horns were used in connection with any mode of producing sound from a vibrating body. He said he was consulting engineer to the General Post Office until the beam stations were built, and he was the designer of the Rugby wireless station. He was also the scientific advisor to the Gramophone Co. for some years and had acted in that capacity on wireless matters to many Governments in different parts of the world. With regard to the Lumiere patent of 1909, he said it was a form of loud speaker in large commercial use, and Lumiere's corrugated diaphragm had been applied to gramophones. The object of the Hopkins invention was to make a sound reproducer that would operate without a horn and at the same time give a large volume of sound through the musical range. That object, he considered, had been accomplished. He had read and considered each of the prior documents relied on by the defence, and his opinion was that the Hopkins invention had not been disclosed in any of them. The invention was much used in this country.

A specimen of the defendant company's alleged infringing instrument was handed to Dr. Eccles, and he said he had examined it and found that it complied substantially with the particulars given in the plaintiffs' specification.

Cross-examined by Sir Duncan Kerly, he said he placed the coming of the loud speaker with the coming of the Hopkins invention.

A Hopkins loud speaker being produced, Sir Duncan said, "I am instructed that none of the loud speakers on the market, made by licensees under the patent, conform to the description in the specification."

Dr. Eccles said he had heard a Hopkins loud speaker successfully used in connection with a gramophone.

### Commissioners of Inland Revenue Appeal.

In the House of Lords, before Lord Buckmaster, Viscount Sumner, and Lords Wrensbury, Carson and Warrington, on November 30th, their lordships dismissed the appeal of the Commissioners of Inland Revenue, who, in opposition to a decision of the Court of Appeal, contended that the Birmingham District Power and Traction Co. was liable to be assessed to corporation profits tax under Section 53 (3) of the Finance Act, 1920, in respect of the income of three subsidiary companies carrying on motor-omnibus undertakings and not restricted as to tolls or dividends. The Power and Traction Co. carries on a tramway undertaking, and, in addition, holds, either in its own name or in that of nominees, the whole of the issued ordinary shares of a company carrying on a motor-omnibus undertaking which is not restricted by virtue of any Act of Parliament as to charges or dividends. The omnibus company also holds the whole of the issued ordinary shares of two other companies which carry on omnibus undertakings. Each of the three omnibus companies was assessed to corporation profits tax, but on the application of the Power and Traction Co. the assessments were discharged and were transferred to the Power and Traction Co., which thereupon claimed to be entitled to exemption under Section 52 (2) of the Finance Act, 1920. That section exempts for two years the profits of a tramway undertaking restricted by virtue of any Act of Parliament as to charges or dividends.

The Special Commissioners and Mr. Justice Rowlatt confirmed the assessments, but the Court of Appeal reversed the decisions and held that the profits of the subsidiary companies fell into the profits of the principal company, and thereby acquired immunity from corporation profits tax.

Lord Buckmaster, in moving that the appeal should be dismissed, said the respondent company, on the assumption that the application for the discharge of the assessments on the subsidiary companies was rightly made, became the sole subject of assessment for the tax, and the real question was whether the provisions of the section caused them wholly to escape liability. The obvious reason was so much against that conclusion that he had tried anxiously to see if it was possible to escape from its effect, but the words of the section of the Act of Parliament were too plain, and it was only to the words of the section that the House could look.

Viscount Sumner and Lords Wrenbury, Carson and Warrington concurred, and the appeal was dismissed with costs.

### Trade Marks Registration.

In the Court of Appeal, before the Master of the Rolls and Lords Justices Lawrence and Russell, on November 30th, the Court allowed the appeal of the Registrar of Trade Marks, from the decision of Mr. Justice Romer, in the Chancery Division, reversing a decision of the Registrar, who refused the application of the Liverpool Electric Cable Co. for the registration of the words "Liverpool Cables" as a trade mark to distinguish the company's goods.

The contention of the Registrar was that in the case of a town of large size and importance like Liverpool the name became more than a mere town name, and if a person took such a name as a trade mark he was depriving other people of the use of it.

The Attorney-General (Sir T. Inskip, K.C.) and Mr. Stafford Crossman appeared for the appellant; Sir Duncan Kerly, K.C., and Mr. Trevor Watson for the respondents.

In giving judgment, the Master of the Rolls said that the applicant company was incorporated in 1901, and had been trading for something like 26 years.

There was no doubt a considerable body of evidence on behalf of the applicants that the words "Liverpool Cables" had for a considerable time been applied to their goods and had became known as distinctive of the cables manufactured by them. But Sir Duncan Kerly asked the Court to allow the words "Liverpool Cables" to be registered not as connoting that the cables were made there at all. The applicants, in fact, carried on business at Bootle. The claim was made that "Liverpool Cables" meant the applicant's goods and nothing else. Applicants' contention was, therefore, that they had secured a secondary meaning to "Liverpool" so that it meant applicants' goods and no other. Was it right to say with regard to "Liverpool Cables" that the word "Liverpool" had become so distinctive of the applicants' goods that it had lost its primary meaning? That appeared to his Lordship a matter for grave consideration. It must take considerable force of argument to make him hold that the word Liverpool had ceased to be capable of being used in its primary sense and meaning. And when one regarded the rights of the traders at large, and the people of Liverpool in particular, he thought the Registrar would be quite right in holding that a word of that important significance ought not to be used or treated as a word capable of distinguishing.

The argument in Mr. Justice Romer's judgment ran counter to a number of authorities. On these grounds the judgment of Mr. Justice Romer must be set aside, and the order of the Registrar restored. The appeal would be allowed with costs.

Lords Justices Lawrence and Russell agreed.

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# MANUFACTURERS' PLANT.

## Paint Spraying—Belt Conveyor Gear—Electrical Compressors—Special Switches.

AMONG the products of the Midland Fan Co., Ltd., 412, Aston Road, Birmingham, is a portable paint-spraying plant for use by a single operator. Though complete details of the machine are not yet available, the plant includes a 4 in. by 4½ in. air-cooled air compressor; a 2 ft. 6 in. air receiving tank fitted with safety valve, pressure gauge and drain tap; air filter and fittings, ball bearing fan, and one combination flat cone-shaped sprayer pistol, with tubing and fittings.

Donovan and Co., 47, Cornwall Street, Birmingham, have increased their range of switches for trades where special conditions prevail by the introduction of a new oil-immersed switch. Of compact dimensions, it is robustly mounted in a casing of cast iron, adequately earthed, with a drilled wall bracket and screwed conduit which can be arranged with glands for lead-covered or armoured cable.

The switch is intended primarily for use in premises where cellulose spraying is in process, or where petrol is used, and is particularly applicable for the premises of dyers and dry cleaners, painting shops, garages and petrol stations. It is suitable also for use in some situations in the artificial silk industry, where special conditions have to be complied with. It is manufactured in two main sizes, 5 A single and double pole, and 10 A single and double pole.

The type E.L. V.O.1. (two-wheeled) electrically-driven air compressor of Lacy, Hulbert and Co., Ltd., Boreas Works, Beddington, Surrey, is designed for use inside hotels and public buildings, where ease of working and silence are essential. The output is 7 cubic feet of free air per min.; the pressure is 100 lb. per sq. in.; the motor is rated at 1½ H.P. at 950 r.p.m.; the overall dimensions are 42 in. by 57 in. by 26 in., and the nett weight is 580 lb. The plant is stated to be suitable for operating a paint spraying equipment, or automatic hammer or drill. Another machine of the same type, but fitted with four wheels, has an output of 10 cubic feet of free air per min., with a pressure of 120 lb. per sq. in. The motor of the plant is rated at 3 H.P. at 1 300 r.p.m., approximately.

The new belt conveyor driving gear of Mavor and Coulson, Ltd., 47, Broad Street, Glasgow, has an overall length of 3 ft. 5⅜ in., while the width remains the same as that of the older designs. The two main driving pulleys are situated between cast steel cheeks, and are wood lagged. A spill-proof protective decking is fitted over the driving pulleys, ensuring that spilled coal cannot fall into and jam the pulleys, or find its way under the oncoming belt. The spur reduction gearing housed in the steel cheeks is mounted on ball bearings, is machine-cut and case-hardened; the gearcases are oil-tight; there are two oiling points, and it is claimed that the gear will run for long periods without attention to lubrication. A snub pulley is provided, to ensure that the belt has a sufficient grip of the second driving pulley, and this, and the last belt support idler roller are mounted on a separate frame, so designed that it may be bolted to either end of the driving gear. It is therefore possible to reverse the conveyor to suit a right hand delivery or *vice versa*, simply by removing the snub pulley frame, prop pockets and decking, and bolting them to the other end of the gear. Both the snub pulley and the belt support idler roller are mounted on ball bearings which run on stationary shafts, and attention to lubrication is necessary only once in six months. The electric motor, a.c. or d.c., is of normal design, except that the pinion end bearing is constructed with a spigot register and additional flange which is bolted to the waste side cheek of the driving gear.

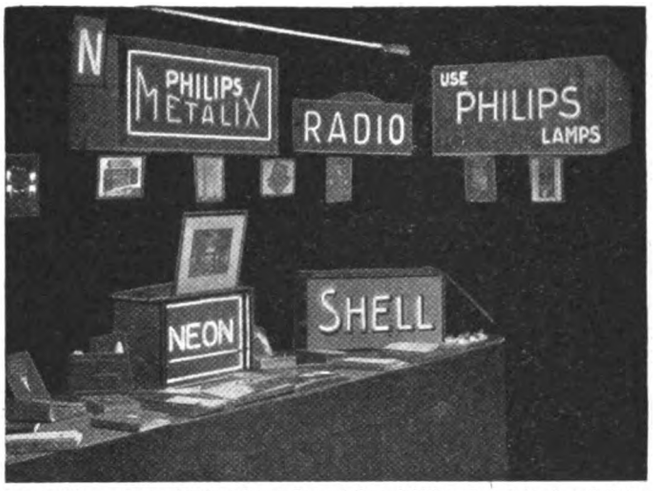
### Direct Drive.

This construction makes it possible to eliminate all couplings and to gear the motor direct to its work, without any chance of misalignment and consequent defective gear meshing. The a.c. switch is of the reversible barrel type, and is bolted direct to the motor casing without appreciably increasing the space occupied by the gear. The pommel and switch cover are fully interlocked, ensuring that neither switch door nor pommel can be moved with the switch on. The d.c. switch is, on account of the necessary resistance and the larger five-step reversing controller, housed as a separate unit. It is coupled to the motor by two short lengths of cab tyre cable permanently connected, and to the switch by fully interlocked plugs. The air turbine motor is of robust construction to withstand the racing which may result from air pressure fluctuations.

# BUSINESS ITEMS.

THE North Metropolitan Electric Power Supply Co., Ltd., has opened new showrooms and offices in High Street, Barnet.

Mr. Ewart Lawson, radio engineer, of Barnsley, has removed his business from Church Street to 20, Peel Street, as from December 8th.




Some of the products of Philips Lamp, Ltd., at the exhibition of electric signs held by the Newcastle Electric Supply Co., Ltd., at Carliol House, Newcastle-on-Tyne, from November 13th to December 1st.

The British Thomson-Houston Co., Ltd., has announced reductions in the prices of 2- and 3-stage receivers and 5 mA and 10 mA battery eliminators.

The Glasgow office and lamp stores of the Tungsram Electric Lamp Works and of their Scotch agents, J. J. Inglis and Co., have now been transferred to 139A, St. Vincent Street.

The London Brick Co. and Forders, Ltd., have placed with Ruston and Hornsby, Ltd., Lincoln, an order for an electrically-operated shovel which, it is said, will be the largest excavator employed in any brickworks in the world. The shovel will weigh approximately 380 tons, and will carry a 7½ cubic yard bucket and a jib 90 ft. long. It will be capable of dealing with 200 tons of clay per hour.

With reference to the recent announcement that the Underfeed Stoker Co., Ltd., had entered into arrangements with the Combustion Engineering Corporation of New York and the Societe Anonyme des Foyers Automatiques of France, whereby the latter are licensed to sell throughout their respective territories "L" type travelling grate stokers, designed and patented by the U.S. Co., we are asked to point out that it appears that the abbreviation "U.S. Co." was taken, at least in one instance, to mean "United States Co.," whereas it was meant to indicate "Underfeed Stoker Co."

The London Power Co. has just placed orders, for the new power station at Battersea, for two turbo-alternators, each of which, with the house service alternators, will have a maximum continuous rating of 67 250 kW (90 000 H.P.). One of those machines has been ordered from the British Thomson-Houston Co., Ltd., Rugby, and the other from the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester. These sets, we are informed, are the largest yet ordered in Great Britain. They are designed for high steam conditions, 570 lb. per sq. in. gauge pressure and a total steam temperature of 850° F.; with feed heating system incorporated. The alternators will be wound for 11 000 V, 3 phase, 50 cycles.

Electric Fires, Ltd. (Norwich), have recently completed a large order for electric water heater tanks for use in the tropics. The tanks are specially teak lagged, are of 40 gal. capacity, and with loadings of 2 kW. They are of the displacement type for direct connection with the cold water main, and in addition an outlet at the base of the tank is provided to enable hot water to be drawn off irrespective of incoming cold supply, thus allowing current to be switched off during peak load hours, and the tank to act purely as a thermal storage tank. Heating is provided by immersion heaters fitted in base and thermostatically controlled. The tanks are of stout gauge tinned copper with teak lagged exterior, and all external pipes and fittings nickel plated. It may be noted that this is a repeat order.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

AYR CORPORATION.—One year's supply of general stores for the tramways department. Forms of tender, etc., from Mr. W. Grant, tramways manager, Town Buildings, Ayr.

WATFORD GUARDIANS.—Electric light installations at the casual, mental and infirmary blocks. Further particulars from the clerk, Mr. F. Wilson, 7, Church Street, Watford.

WESLEYAN CHAPEL, PWLLHELI.—Electrical installation, in connection with structural alterations. Names of intending tenderers to Mr. R. D. Jones, 36, High Street, Pwllheli.

ABERDEEN CORPORATION, December 14th.—One year's supply of electrical fittings, etc. Schedules, etc., from the Burgh Surveyor.

BLACKPOOL CORPORATION, December 14th.—Supply of e.h.t. h.t. and l.t. paper insulated cables, service boxes and cut-outs. Full particulars from Mr. Charles Furness, Electricity Works, Blackpool.

BARNOLDSWICK URBAN DISTRICT COUNCIL, December 15th.—Complete electricity distribution scheme. Specifications, etc., from Mr. R. W. Fenton, clerk of the Council, Town Hall, Barnoldswick, via Colne; deposit £1 1s.

BRADFORD CORPORATION, December 15th.—Supply of single-deck and double-deck electric trolley vehicles, trolley wire and tramway poles. Specification, etc., from Mr. R. H. Wilkinson, Tramways Department, Hall Ings, Bradford.

PLYMOUTH CORPORATION, December 15th.—Supply of motor-driven rotary boiler feed pump. Specification, etc., from the City Electrical Engineer, Electricity Works, Prince Rock, Plymouth, before December 10th.

ABERDEEN ROYAL MENTAL HOSPITAL, December 17th.—Electric light installation in new verandah at the Hospital. Particulars from the Master of Works, at the Hospital.

CENTRAL ELECTRICITY BOARD, December 17th.—Oil filtering and storage equipment for 13 outdoor transforming stations, in connection with the Central Scotland Electricity Scheme. Specification (No. C.S.-P.S. 1A) from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

LEICESTER CORPORATION, December 17th.—Electric light installation in connection with erection of a public abattoir at Aylestone Road, Leicester. Specifications, etc., from Mr. R. Stephen Ayling, 53, Victoria Street, London, S.W.1; deposit £1 1s.

NEWTON-IN-MAKERFIELD URBAN DISTRICT COUNCIL, December 17th.—Supply of about 150 electricity meters for house services. Particulars from Mr. R. T. Surtees, engineer and manager, New Gas Works, Earlstown, deposit £2.

PORTSMOUTH GUARDIANS, December 19th.—Three months' supply of electric lamps and stores. Forms of tender, etc., from the Clerk, 1, St. Michael's Road, Portsmouth.

WEST RIDING EDUCATION COMMITTEE, December 19th.—Electric light installation at Wath Secondary School. Specification, etc., from Education Dept., County Hall, Wakefield.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, December 21st.—Extra high and medium pressure cable extensions (contract 44). Specification, etc., from Mr. R. W. Willis. 37, High Street, Cheadle, Cheshire; deposit £1 1s.

STAFFORDSHIRE EDUCATION COMMITTEE, December 28th.—Electric light and power installation in the County Mining College, Stafford Road, Cannock, by registered electrical installation contractors. Specification, etc., from Messrs. Moffett, Rosher and Mann, Union Chambers, Temple Row, Birmingham; deposit £3 3s.

MANCHESTER CORPORATION, December 29th.—Supply and erection of electrical operating gear for sluice valves at Lostock booster station. Specifications from the Waterworks Engineer, Town Hall, Manchester; deposit £1 1s.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc. from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

MIDDLESBROUGH EDUCATION COMMITTEE, December 31st.—Electric lighting installation of ten Council schools and the Stockton Street Practical Instruction Centre. Specification, etc., from the Borough Electrical Engineer.

SOUTHEND CORPORATION, December 31st.—Supply of 3 000 joint boxes, for the light railways and electricity department. Full particulars from Mr. R. Birkett, Electricity Works, London Road, Southend-on-Sea.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

LAMBETH (LONDON) GUARDIANS, January 3rd.—Twelve months' supply of incandescent electric lamps. Forms of tender, etc., from the clerk, Mr. J. L. Goldspink, Board Room and Offices, Brook Street, Kennington Road, S.E.11.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 14th.—Maintenance of electric lighting, heating and power installations (section L) and supply of electric lamps (section S) for twelve months. Forms of tender from Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

STOKE-ON-TRENT CORPORATION, January 16th.—Supply of low tension d.c. switchboard for electricity sub-works, Bagnall Street, Stoke-on-Trent (contract 2 836); and supply of e.h.t. ironclad type switchgear at Central power house, Hanley (contract 2 839). Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300 V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and

*GROUP of Southern contractors, taken outside the Pirelli-General Cable Co.'s works at Southampton, on the occasion of their recent visit. A brief report of the outing was given in our last issue.*

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after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Supply of cables; electricity meters; terminal, service, network and fuse boxes; oil circuit breaker switches; electrical sundries; wires; lamps; transformers, etc., for one year. Specification, after December 17th, from the Town Clerk.

ESSEX COUNTY AND COLCHESTER HOSPITALS COMMITTEE, January 21st.—Internal electric wiring of Brentwood Mental Hospital, with fuseboards, motors, etc. Specification, etc., from Mr. H. H. Gepp, 66, Duke Street, Chelmsford; deposit £5 5s. Only registered contractors are invited to tender.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52) 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Supply of metal clad switchgear and accessories (specification 28/69).

VICTORIAN ELECTRICITY COMMISSION, December 17th.—Manufacture and supply of electrically-operated deep dredger for Yallourn Brown Coal Works (specification 28/94). Specification, etc., from the Agent-Ageneral, Victoria House, Strand, London, W.C.

ANGORA POSTS, TELEGRAPHS AND TELEPHONES, December 18th.—Supply of 50 000 metres of rubber covered field telephone wire. (Reference A.X. 4 849.)

JOHANNESBURG MUNICIPALITY, December 20th.—Supply of tram trucks and electrical equipment for tramcars (contract No. 80). (Reference A.X. 7 113.)

EGYPTIAN STATE RAILWAYS, January 3rd.—Telegraph and telephone wire (approximate cost £E3 600 to £E4 400). Specification will be issued to firms on the Administration's official list. Further information from Chief Inspecting Engineer, 41, Tothill Street, London, S.W. (Ref. E.S.R. 7 903.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of switching equipment and relays, for use in automatic telephone exchanges (schedule C. 381). (Reference B.X. 4 880.)

SOUTH AFRICAN RAILWAYS AND HARBOURS (extension of date), January 10th.—Supply of five electrically-driven traversers and one 5-ton hand-operated crane. (Tender No. 1 344.) (Reference A. 7 023.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 17th.—Air compressor, arc welding set, electrically-driven wheel lathe, motor-driven foundry sand and loam mill, motor-driven rattler and motor-driven stone crushing machine. (tender No. 1 367.) (Reference A.X. 7 226.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, January 24th.—Supply of telephone switchboards (tender No. 143). (Reference B.X. 4 912.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 24th.—Supply of two small d.c. generating sets, running on crude oil, for Maquassi. (Reference B.X. 4 943.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 29th.—Accumulator batteries and counter E.M.F. cells (schedule C. 390). (Reference B.X. 4 906.)

EGYPTIAN MINISTRY OF THE INTERIOR (SECTION DES MUNICIPALITIES ET COMMISSIONS LOCALES), January 31st.—Diesel engine driven generator set, d.c. rotary balancer, and accessories for Kafrel Zayat electric station. (Reference B.X. 4 931.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 11 000 V switchgear, for installation in the Richmond Terminal Station (specification No. 29/3). (Reference B.X. 4 898.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of pillar insulators, with metal parts, for use on 132 000 V outdoor circuits. (Reference B.X. 4 921.)

INDIAN STORES DEPARTMENT, NEW DELHI, February 5th.—Supply of turbo-alternator, boiler, economiser, switchgear and cables. (Reference B.X. 4 944.)

EGYPTIAN STATE RAILWAYS, February 9th.—Electrification and equipment of Heluan line, including equipment of power station, overhead transmission lines, track bonding, motor and trailer coaches, etc. Tenders to General Manager, Cairo Station.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

INDIA STORE DEPARTMENT, February 15th.—Supply of hydro-electric plant, comprising four 12 000 kW water-wheel driven alternator sets, auxiliaries and spares (schedule 4). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

*THE Verreries d'Art light which was presented to the Mayor of Westminster, Major Vivian B. Rogers, on the occasion of the opening of the new "Underground" station at Piccadilly Circus on Monday. The light was used as an indicator to denote the actual starting of the escalators, and was designed and produced by Gallier's (Wholesale), Ltd.* *(See page 695.)*

NEW SOUTH WALES DEPARTMENT OF PUBLIC WORKS. Extension of date.—February 18th. Supply and erection of hydro-electric generating plant for Burrinjuck development. (Reference 4 938.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.—Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Reference B.X. 4 873.)

## Tenders Accepted.

HULL CORPORATION.—Siemens and Halske, supply of cable for the telephone department, £351. (Recommended.)

BIRKENHEAD CORPORATION.—Tudor Accumulator Co., Ltd., replating storage battery at Thingwall sanatorium, £147.

CARLISLE CORPORATION.—J. Telford, electric light installation at the market, £166 10s.; Brush Electrical Co. Ltd., supply of three transformers, £375.

UXBRIDGE URBAN DISTRICT COUNCIL.—Rees Roturbo Manufacturing Co., Ltd., supply and erection of electrically-driven plant at the waterworks, £1 225. (Recommended.)

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., two 6 600 V moulded stone and brickwork cubicles, for controlling two auxiliary transformers at Agecroft power station, £1 593 11s.

ALLOA CORPORATION.—J. A. Campbell, electrical installation, in connection with pavilion at Cochrane Park, Alloa, £105; R. Ormiston, electrical installation in 106 houses at West Ashley Terrace, Alloa, £560.

WESTERN AUSTRALIA DEPARTMENT OF WORKS, ETC.—H. C. Little and Co., Ltd., night lighting equipment of air route between Kalgoorlie (Western Australia) and Cook (South Australia), £12 478.

WESTMINSTER CITY COUNCIL.—Buchanan and Curwen, electric light installation in entrances, staircases and laundries, Regency Street dwellings, £579. (Recommended.) Also tendered: Coleby and Co., £655; H. E. Keen and Co., Ltd., £699; Gaillard, Robinson and Co., £748; Drake and Gorham, £765; Rashleigh, Phipps and Co., Ltd., £768; Speedy and Eynon, £978.

LONDON COUNTY COUNCIL.—Electrical Installations, Ltd., electric light installation in blocks 12 and 13 of dwellings on East Hill Estate, Wandsworth, £339. Also tendered: Eons Electrical Co., £370; G. V. Francis, £384; Alpha Manufacturing and Electrical Co., Ltd., £385; W. Davey, £415; A. Hawkins and Sons, £419; A. Higginbotham and Sons, £435; Gaillard, Robinson and Co., £435; Smethurst and Co. (London), Ltd., £446; County of London Electric Supply Co., Ltd., £474; Williams and Beck, £492; J. Lever and Sons, £514; Thorpe and Bosco., Ltd., £565.

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# WORK IN PROSPECT.

BARNES.—Bank, Ranelagh Gardens. Particulars from Ebeneezer King, Ltd., London.—Houses (35), Clydesdale Gardens, for Mr. C. S. Banks.—Two mixed schools and girls' secondary school, for Surrey Education Committee. Particulars from the Education Architect, Kingston-on-Thames.

BRANSTON.—Houses (20), Navenby, for the Rural Council. Particulars from the Surveyor, Midland Bank Chambers, Lincoln.

CUDWORTH.—Club, Sidcop, for the British Legion. Particulars from the architect, Mr. C. L. Goddard.

FLUSHING (CORNWALL).—Parish hall for St. Peter's Church. Particulars from the Incumbent.

HALESOWEN.—Grammar school extentions, for Worcester shire Education Committee. Particulars from the Director of Education, Worcester.

KIDDERMINSTER.—Housing scheme (18), for the Town Council. Particulars from the borough surveyor, Mr. J. Hawcroft.

LANGPORT.—Additional 12 houses, Somerton, for the Rural Council. Particulars from the Surveyor.

### Wiring Work.

LINCOLN.—School, Skellingthorpe Road, for the City Education Committee. Particulars from the director of education, Mr. R. C. Minton, J.P.

LINTHWAITE.—Houses, Gordon Street East, for the Urban Council. Particulars from the architect, Mr. J. Ainley, 55, New Street, Huddersfield.

MAIDSTONE.—Extensions to Kent County Ophthalmic Hospital, to cost £45 000, for the Board of Management. Particulars from Secretary.

MALDEN.—Housing scheme, for the Urban Council. Particulars from the contractors, Lawes, Cherry and Co., Ltd.

NEWTON-LE-WILLOWS.—Club, for St. Mary's and St. John's Church. Particulars from the rector, Rev. J. R. Meagher.

OLDBURY.—Additional 94 houses for the Urban Council. Particulars from the Surveyor.

PENISTONE.—Grammar school extensions, to cost £4 000, for West Riding Education Committee. Particulars from the County Architect, Wakefield.

READING.—Offices, to cost £1 652, for the Town Council. Particulars from the contractors, Canning and Sargeant, Winnerish Works, Wokingham.

RYDE.—Houses (20), for the Town Council. Particulars from the contractors, Theo. Conway, Ltd., Weymouth.

SEVENOAKS.—Fire station extensions, to cost £3 200, for the Urban Council. Particulars from the surveyor, Mr. H. J. Osborne.

SHIFNAL.—Houses (12), for the Rural Council. Particulars from the contractor, Mr. T. France, The Trench, Wellington, Salop.

STOKE-ON-TRENT.—Tuberculosis hospital, to cost £100 000, maternity home extensions, to cost £10 000; children's hospital, to cost £25 000; extensions, Stanfield sanatorium, to cost £12 500; and maternity centres, to cost £5 000, for the Town Council. Particulars from the Town Clerk.

TILBURY.—Catholic schools, to cost £4 000. Particulars from the contractor, Mr. J. McGran.

TROON.—Public hall, to cost £4 500, for the Co-operative Society. Particulars from the Secretary.

WESTON (RUNCORN).—School for Cheshire Education Committee. Particulars from the County Architect, Chester.

WHELLEY.—New St. Stephen's Church, to cost £9,220. Particulars from the contractors, Webster and Winstanley, Wigan.

## OVERSEAS TRADE.

### Total United Kingdom Exports for Eleven Months Exceed £600 000 000.

ACCORDING to the Board of Trade returns for November, which were issued as we went to press, the exports of United Kingdom goods during November amounted to £63 766 502 as against £70 609 651 for November, 1927, representing a decline of £6 843 149. Total exports for the eleven months of this year amounted to £663 033 126, which, when compared with the total of £650 247 339 for the corresponding period of last year, shows an increase of £12 785 787. The total imports of goods into the United Kingdom during the eleven months amounted to £1 095 677 578, representing a decline of £17 273 916 when compared with the total for the corresponding period for last year. Details of the returns in so far as they concern the electrical industry will be given next week.

# FACTORY LIGHTING.

### Representatives of Twenty London Boroughs and Areas Attend Meeting.

ON December 3rd, the E.L.M.A. Lighting Service Bureau was the venue for a lecture and demonstration given to the owners, workshop stewards, works foremen, etc., representing 20 London boroughs and areas, entitled "Improved Lighting of Factories, Workshops and Workrooms." The assembly was presided over by Lt.-Col. W. A. Vignoles. The lecture, which was illustrated by lantern slides and model demonstration sets, was delivered by Mr. H. Lingard whose remarks dealt with the evolution of the electric lamp manufacture and uses for the past 30 years. Dealing with the introduction in 1902 of electricity—as a luminant—into workshops, the lecturer explained and demonstrated the use then made of carbon lamps with drop lights placed here and there about the workshops, and emphasised how small, at that time, were our ideas of illuminant requirements. The lecturer explained that whilst general lighting with the correct efficiency of illumination for the nature of work to be done, should be the real basis, it was also necessary in certain instances, and for special work, to have local lighting units. The cost of good lighting compared with the wages bill was not worthy of contention. If 32 seconds of a worker's time could be saved in each hour the extra cost for good lighting was more than covered.

During November, lectures were given at Birmingham, Wednesbury, Newcastle, South Shields, Sunderland, Carlisle, Darlington, Wakefield, Bradford, Barnsley, Bath, Exeter and Cardiff.

## ELECTRICAL USES OF TUNGSTEN.

### Its Applications in the Manufacture of Switchgear, Medical Apparatus, and Wireless Equipment.

BY the perfection of a process effecting fusion between large pieces of tungsten and a backing of copper, steel, nickel or silver, tungsten can now be made to give excellent service when applied to X-ray apparatus, high frequency breaker points, circuit breakers, key contacts and certain types of wireless apparatus.

The Tungsten Mfg. Co., Ltd., of Thanet House, 231, Strand, W.C.2, have developed the manufacture of contacts, and are now able to supply all sizes equipped with tungsten discs up to ¼ in. dia., either mounted on a specified backing, or unmounted. The firm also make special tungsten buttons and spark gap electrodes and supply molybdenum and tantalum metals in various forms suitable for use in radio valves, in which application they are claimed to simplify the process of obtaining and maintaining a proper vacuum.

Tungsten is now being used extensively for ultra-violet light apparatus, in which connection it is stated to give the richest radiation and most rapid reaction. The metal is also much used for other medical apparatus.

### THE JOHN BENN BALLOT.

We desire to make a special appeal to our readers—probably the last appeal which can be effective before the closing date—on behalf of the John Benn Hostel Ballot Competition. When attending parties, dances, family gatherings, and other seasonable festivities, you will be doing a great service if you will take some of the Ballot tickets along, and if, at the same time, you give a moment's thought to the 75 boys at the Hostel—and that it is Christmas for them as well—the task of encouraging your friends to help us will not be a very difficult one. For the simple expenditure of one shilling now, you may, after Christmas, instead of suffering from the customary "after Christmas pocket," be riding in a saloon motor car, or be the owner of a valuable article of furniture, a gramophone, a Reville evening cloak, or you may be preparing to leave for a trip to Madeira or Switzerland. Soon you will be too late for a chance in this Ballot, and you should send for your tickets without further delay to the Ballot Organiser, c/o Sir Ernest Benn, Bt., Bouverie House, 154, Fleet Street, London, E.C.4. Tickets are 1s. each, or 10s. for a book of 11. The closing date is December 31st.

Edition XXXI of the company's illustrated list of wireless sets, components and valves has been sent to us by Super Lamp, Ltd., 92-94, Paul Street, London, E.C.2. The December issue of the nett trade price list of electrical material, cable conduits, accessories, switchgear, etc., has also been received. The reference is edition N.S.11.

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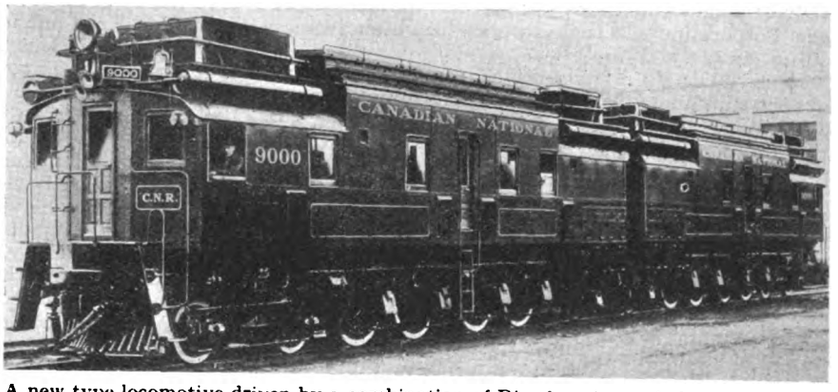
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.

Dundee tramwaymen are giving a Christmas treat to the poor children of the city, and one of the most interesting features of the collecting campaign is this decorated car which Lady Provost High (at the wheel) drove through the city on Monday.




A new type locomotive driven by a combination of Diesel engine and electric dynamo, which has just been introduced by the Canadian National Railways. The engine is virtually a trolley-less electric locomotive, generating its own power as required. The new locomotive is in two units, each fitted with a 12-cylinder Diesel engine of 12 in. bore and 12 in. stroke. Duplicate controls are provided at either end. The complete engine weighs 650 000 lb., and is capable of hauling a train of 2 800 tons at an average speed of 40 miles an hour. The modified Diesel engines for the new locomotives are being manufactured by William Beardmore and Co., Ltd., Glasgow.

On November 27th, at the Balfour Institute, Smithdown Road, Liverpool, the A.T.M. Dramatic Society, under the direction of Mr. Thomas Fisher, gave a highly successful rendering of Maltby's well-known 3-act comedy, "The Rotters," a scene from which is reproduced above.

The above is a reproduction of a photograph taken at the dinner at the Criterion Restaurant, London, on Monday evening, which was organised to afford an opportunity for a reunion of ex-officials and staff of the former National Telephone Co., whose undertaking was transferred to the Post Office on January 1st, 1912. In addition to the National Telephone veterans, the company present included a number of guests, chiefly members of the staff of the Post Office telephone department. The chairman, who can be seen in the right background, and is distinguished by evening dress, was Lt.-Col. C. B. Clay, formerly Metropolitan superintendent of the National Co. Next to him, on his right, is Lord Harris, the only surviving ex-director of the company; the next gentleman is Mr. Albert Anns, who was the company's secretary; and the third from the chairman, on the right, is Mr. Frank Gill, who was the company's second engineer-in-chief. Mr. Stanley J. Goddard, ex-general superintendent, is next to the chairman, on his left, while next to Mr. Goddard are Mr. Dane Sinclair and Col. T. F. Purves. See page 687.

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# ELECTRICITY SUPPLY.

## Tunbridge Wells and Plymouth Mains Extensions—Westminster and County of London Companies' New Tariffs—New Switchgear for Dalmarnock Station—The New Ironbridge Power Station—Scottish Hydro-Electric Projects.

UNDER the new valuation of Maidstone, the assessment of the Corporation electricity works has been increased from £8 471 to £13 111.

Tunbridge Wells T.C. has received sanction to loans of £13 593 for mains and £480 for sub-station equipment, including pillars.

Plymouth Electricity and Street Lighting Committee has approved cable extensions in 25 thoroughfares in Plymouth, Devonport and Stonehouse.

In reply to an inquiry by the Chamber of Trade, Guildford Electricity Committee has decided to ask the Secretary to ascertain how many shopkeepers would be prepared to light their windows at a special rate of 2d. per kWh between 7 p.m. and 5 a.m.

The work of laying cables for Earby Council's scheme for the distribution of electricity has been started. It is proposed to supply current for lighting and power for shopkeepers and householders. Existing gas lamps will be converted into electric standards as soon as the bulk supply from Nelson is available.

The Westminster Electric Supply Corporation is making good progress in changing its system of supply from direct to alternating current. Mains are being laid and consumers' installation replaced at the Corporation's expense. The directors announce that the charge for 230 V a.c. lighting supplies will be reduced to 3¾d. per kWh at the end of this year. The d.c. lighting rate remains at 4½d.

Glasgow Electricity Committee has authorised mains extensions at a cost of £19 500.—The Committee has approved of the purchase of six skeleton switch panels at Dalmarnock power station, at a cost of £1 025.—The Committee has decided to seek consent from the Central Electricity Board for the extension of a 20 000 V switchboard at a cost of £18 027, and double tiering of 20 000 V switchboard to cost £20 071 at Dalmarnock power station.

Two-part tariffs will be introduced by the County of London Electric Supply Co. from January 1st, for domestic and business consumers. The charge per kWh for all purposes (lighting, heating, cooking and for domestic and business appliances) is to be 1d. plus a fixed quarterly charge. Consumers, on application, will be advised of the fixed charge attaching to their premises, so that each consumer can judge the relative advantages of the new tariffs, which will be optional.

The Electricity Commissioners have sanctioned the construction of the new super-power station on the River Severn at Ironbridge, Shropshire, and the borrowing by the West Midlands Joint Electricity Authority of £700 000 on account of the estimated cost of £960 000 for the first section, which was approved by the West Midlands Authority last Friday. The estimated cost of the whole station is nearly £3 000 000, and the ultimate equipment will comprise four 50 000 sets. The Ironbridge station is one of the principal base load stations for Central England.

The assessment of Tynemouth Corporation electricity undertakings has been raised from £1 525 to £7 000. The Electricity Committee has decided to make inquiries as to the extent to which such assessments have been raised elsewhere.—The Committee has authorised mains extensions to cost £950.—The Electrical Engineer has reported with regard to water heating. He recommends that current be supplied for this purpose at ⅝d. per kWh in the summer and ¾d. in the winter, the current being cut off during heavy load periods. The Committee has adopted the recommendations.

An experiment in providing electric light in working class tenements has just been carried through by Mr. Claude M. Leigh. He recently purchased Stobart Mansions, in South London. The tenants, working class people paying rents of about 12s. a week, expressed a wish for electric light. The County of London Electric Supply Co. agreed to wire the premises free of charge, up to six points, provided the whole of the tenants became consumers. The proposal was accepted. Automatic meters are to be installed and the company agrees that the charge for current will not be more than would have to be paid for gas.

Liverpool Electric Power and Lighting Committee has received from the city electrical engineer, Mr. P. J. Robinson, a report in which he intimates that to give a supply of current to the rural districts of Sefton and Whiston, an overhead line should be run out from the existing 6 000 V supply at Hunts Cross to St. Helens boundary, at an estimated cost of £16 000. It is proposed to construct this line for a working pressure of 33 000 V. For the Kirkby and Sefton supplies it is proposed to extend the two existing 6 000 V lines at a cost of about £10 000. The Council has decided to appoint a special committee of 15 members to deal with all matters arising in connection with the scheme for the new riverside power station at Clarence Dock.

At a meeting of Kirkcudbright T.C. on November 29th, the Town Clerk reported in regard to a recent conference with the promoters of the Dee electricity scheme. What affected them intimately, he said, were the proposals in the vicinity of Tongland. There were other dams, one especially that was going to be very detrimental to the fishing. That was at Clatteringshaws on the Black Water of Dee. The intention was to dam the Dee there. It meant that the water there and the spawning ground was lost, and that was very serious so far as the fishing was concerned. If the water was regulated as proposed, it would be a serious matter for them at the harbour, as it would not wash away the silt. He advised the Council to oppose the Order, in its initial stages at any rate, and the Council decided to adopt this suggestion.

The Town Clerk of Hornsey has laid before the Electricity Committee correspondence with the Electricity Commissioners and the Central Board regarding plant extension. The Commissioners suggested that the Council should, instead of making any further provision of plant, ascertain if, and on what terms, a supplementary bulk supply could be obtained from the Central Board. Negotiations have shown that the Board is willing to offer such a supply only on condition that the arrangement shall terminate when the South East England electricity scheme comes into operation. The Commissioners have been informed that Hornsey considers that it should not be called upon to abandon the normal development of the station until the question is decided whether Hornsey is to continue as a generating station. The Commissioners have since held an inquiry into the matter.

The Finance Committee of Inverness County Council discussed recently the applications of the West Highland Power Co. and the Grampian Electricity Supply Co. for electricity supply Provisional Orders. A memorandum drawn up by the County Clerk stated that points which had to be kept in view were the diversion of the natural water resources from the areas to which they rightfully belonged, the effect of such diversion and impounding of waters in relation to the sporting rentals which formed a large part of the assessable rental of the county, the possible disfigurement of the landscape, and resultant loss in tourist traffic. The Mackintosh of Mackintosh said they should oppose the scheme tooth and nail. It was unanimously decided to oppose the schemes, to ask Ross-shire to join in, and to take the necessary steps to bring the matter before the first meeting of Inverness County Council.

The Electricity Commissioners have informed Finchley U.D.C. that they are prepared to sanction a loan of £10 580 for a new boiler, but, having regard to the probable developments under the South East England scheme as affecting the Council's undertaking, they are not disposed to allow a longer period than seven years for the loan. The Electrical Engineer is to interview the Commissioners in regard to the loan period. The Electricity Committee has obtained sanction to borrow £18 000 for mains and consumers services.—The Electrical Engineer reports that the general supply has at times been maintained with some difficulty, partly owing to a scum which was being carried over from the large boiler into the turbine blading, the reason for which had not yet been discovered satisfactorily. By changing temporarily the feed water and by other means he has been able to reduce the trouble. Another difficulty has been the temperature of the cooling water in the lake, and the consequent growth of a green slimy matter (algae) in the condenser tubes which reduced the vacuum and which could not be brushed out. He arranged for the installation of a chlorinating plant, and, in consequence, the particular trouble had been removed.

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# ELECTRIC TRACTION.

## New Underground Railway Station at Piccadilly Circus.

THE re-built station of the London Underground Railways, officially opened on Monday, is virtually a new station, the structural peculiarities of the old station being such that reconstruction on modern lines was impossible. The new station has been built beneath the open space of Piccadilly Circus, west of the former station. The construction of the new station is one of the most remarkable civil engineering feats of recent times, for the task to be accomplished comprised the construction of a spacious booking-hall only a few feet below the roadways, with subways radiating from it to the various streets around the Circus; a lower hall, 42 ft. beneath the booking-hall and connected with it by five escalators; and between the lower hall and the two railways below it—at different levels!—further flights of escalators and the stairways and passages to connect them with the platforms. Certain short passages had to be formed to improve the interchange-traffic connections of the two railways.

Practically all of this involved task had to be conducted without opening the roadways, without interfering with traffic, and without disturbing the services supplied by the gas, electric light, telephone, water, and hydraulic-power mains running in all directions immediately beneath the roadways. To complicate the problem further, a large sewer passed right through the site of the booking-hall.

Owing to the depth of the platforms below the surface, it was necessary to divide the escalators into upper and lower flights, the former connecting with the lower hall, whence the latter strike off in a reverse direction and terminate close to the platforms of the respective Tubes that they serve. The lower hall, in the mid-level of the station, consists of four arched bays, and is 90 ft. long by 32 ft. wide.

In all, there are eleven escalators, the greatest number at any Underground station; and the five of the upper flights are the largest number yet installed side by side. All the escalators are adapted to being worked in either direction.

The upper flights of escalators comprise two and three, respectively, in parallel tunnels running down from the north side of the booking-hall. The inclined tunnels, which are 60 ft. long, are driven from the booking-hall. The one containing the two escalators is of 16 ft. 4 in. dia.; the one containing the three is of 22 ft. 4 in. dia.

The lower flights comprise two triple sets, to left and right, respectively, of the lower hall. The sets on the left, which connect with the Piccadilly Tube, are in an inclined tunnel 63 ft. in length, and have a fall of 39 ft.; whilst the set on the right, connecting with the Bakerloo Tube, are in a tunnel 26 ft. in length and have a fall of 21 ft. The diameter of the tunnels is 22 ft. 4 in. in each case.

All the escalators are of the improved cleat-comb type, with a speed of 100 ft. per min. Each escalator of the upper flights is operated by a 45 H.P. electric motor; those of the lower flights by 35 H.P. motors. These motors are contained in chambers in the upper part of the escalators. By the depression of a button a moving escalator can be at once brought to a standstill, in cases of emergency.

The architectural and lighting schemes are in the best modern style, an interesting feature being the decorative bronze-capped columns supporting the ambulatory roof. From the cap of each column two lights enclosed by opal cylindrical shades are suspended. The lighting of the poster-panels, sub-ways and escalators is also of interest.

Automatic machines will play an important part in the booking arrangements at the new station. For the first two or three months the machines in use will be of the standard electric type, delivering pre-printed tickets; but these will be replaced by a battery of special A.E.G. ticket printing and delivering machines that are on order.

A novel and instructive feature of the booking-hall is a set of train-recording clocks, on the dials of which are automatically recorded the working of the services of the six railways of the Underground. By means of electrical connections between the clocks and the track at certain stations, the passing of a train is recorded on the dial by an inked pointer.

# ELECTRIC COOKING ON TRAINS.

## Result of Inquiry into L.N.E.R. Accident—Liability of Danger Almost Negligible.

IN his report upon the accident which resulted in the death by electric shock of a kitchen porter named D. V. Stocker in the L. & N.E. Railway dining car at Leeds Central Station on August 23rd, Col. A. C. Trench (Ministry of Transport Inspector) states that tests, applied after his inquiry, did not reveal any indication of failure in the earth connections of the plugs or fusibles. The evidence showed that a loose cast iron surround resting on a cast iron stove top became practically insulated from the stove top. The Inspector does not think it practicable to provide for this a reliable special earthing connection, and he suggests the use of an enclosed "hot spot," the earthing of the outer body of which presents no difficulties. He thinks it desirable to avoid, as far as possible, the use of portable apparatus on trains, especially apparatus such as a fish kettle, and he remarks that it is to be hoped that this fatality, which was due to unusual circumstances, will not retard the extension of electric cooking in dining cars, and that the ever-increasing use of electricity for domestic cooking, under conditions less favourable as to expert supervision and maintenance of equipment, indicates that the liability of danger is almost negligible.

# TRADE PUBLICATIONS.

BOWL fires are the subject of a new folder, L. 453, just issued by the British Thomson-Houston Co., Ltd.

In publication No. 508 the Electric Heating Co. gives full descriptions of electric cooking and heating appliances.

The Sun Electrical Co., Ltd., has issued List No. 492, dealing with new fires. The list is a limited issue, and early application is advised.

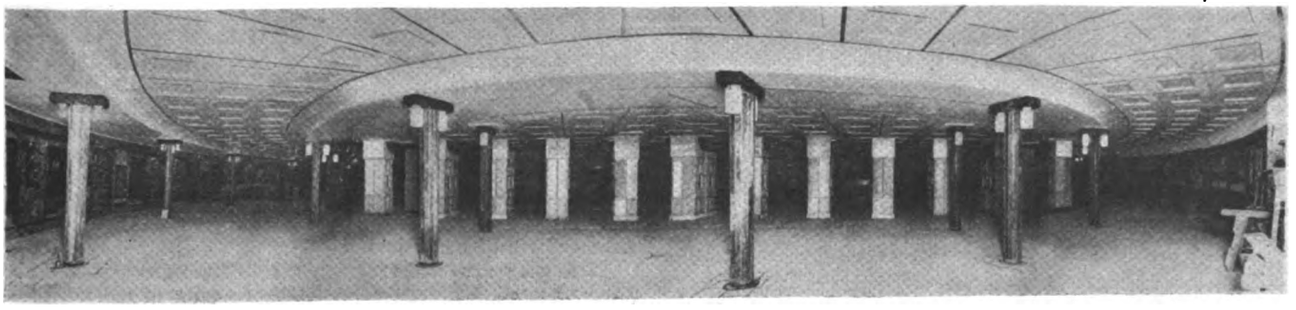
Universal test and battery clips are described and illustrated in a new folder just published by the L.P.S. Electrical Co., Ltd. Another new folder deals with radio wires, cords and flexibles.

Siemens Electric Lamps and Supplies, Ltd., have issued Catalogue No. 199, to supersede No. 156. The new publication describes and illustrates Heliolux, Ultralite, Sanaray and Silvaray enclosed lighting fittings.

A special leaflet produced with Christmas colourings has been published by Siemens Electric Lamps and Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4, in order to announce to the trade and public price reductions of Siemens decorative lamp outfits.

A. H. Hunt, Ltd., have issued a new folder dealing with Hellesen batteries. The reference is No. 101 A. A new folder devoted to Sunray hand lamps and torches has also been published, the reference for this latter being No. 111 A.

Gent and Co., Ltd., Faraday Works, Leicester, have sent us leaflet No. 176, which describes in detail the "Tangent Combined Wave" tuning coil. Leaflet No. 154 F, descriptive of power operated electric bells, sound signals, etc., has also been received. Electric motor syrens and far-reaching sound signals are dealt with in Book 7, section 2A, by the same firm.



A general view of the main booking hall at the new Piccadilly "Underground" station which was opened on Monday. Interesting features of the new station are the lighting effects, the escalators and the ticket machines.

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# COMPANY NEWS.

## Marconi International Marine Shares Relapse—The Metropolitan-Vickers Combine—Improved Lighting and Power Consumption in Ceara—Electrical Refrigerators in Brazil—Western Telegraph Co's Meeting—Directors' Reports and Dividends.

CHANGES this week in our list of electrical share quotations are relatively few. The inevitable relapse has occurred in the market for Marconi's International Marine shares, the price of which has dropped 17s. 6d., from 82s. 6d. to 65s. Marconi's Wireless at 75s. are 1s. 3d. lower; Eastern Telegraph Stock has recovered 7 points. General Electrics are nearly 3s. 6d. up, but Ever Ready shares have dropped 1s. 6d. and British Insulated and Callender's 1s. each. Metropolitan Electric Supply ordinary shares have risen nearly 2s.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest |
|---|---|---|---|---|---|
| % | **Electricity Supply.** | | | | |
| (*d*) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 91½ | 91½ | 100 | 67 |
| (*a*) | Charing Cross Elec. Ord. (£1) .. | 26/6 | 26/6 | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (*e*) | Chelsea Elec. Sup. Ord. .. .. | 27/- | 27/- | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/6 | 43/6 | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (*g*) | Kensington & K'bridge Ord. (£1) .. | 26/6 | 26/6½ | 104/6 | 3/- |
| (*b*) | Lon. Elec. Sup. Ord. (£1) .. .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 45/- | 43/1½ | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | N'castle-upon-Tyne Elec. Sup. Ord. | 25/- | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (*c*) | St. James. & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops. Worcs. & Staffs Power B. Or | 34/4½ | 34/4½ | 23/- | 20/9 |
| (*f*) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/- | 34/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124 | 124 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 127½ | 127½ | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.) .. | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb. .. .. | 81 | 80 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 75½ | 74½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb. .. | 81 | 80½ | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. .. | 62 | 62 | 82 | 30 |
| 4½ | Met. Elec. Trans, 4½% Deb. .. | 72 | 72 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 64½ | 64½ | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. .. | 72 | 71 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 80½ | 80½ | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 81½ | 81½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 110½ | 110½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. .. | 27/- | 26/6 | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 80/- | 81/3 | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/-* | 23/6 | 24/6 | 19/7 |
| 7 | ,, ,, 7% Deb. | 104½ | 104½ | 109½ | 92/- |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 80/- | 81/3 | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf. | 18/3 | 18/3 | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 20/10½ | 20/10½ | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 25/9* | 27/3 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 44/4½ | 41/- | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. | 112/6 | 112/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 38/9 | 38/9* | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. | 28/9 | 28/9 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 55/- | 55/- | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 26/3 | 26/3 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 6/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 261½ | 254½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 67½ | 68½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 26½ | 25½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 28½ | 28½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 20 | Marconi's Wireless T. Ord. .. | 75/-* | 76/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. .. | 65/- | 82/6 | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 26* | 25½ | 23 | 11/3/6 |

(*a*) 1s. 7 7/11d per share. (*b*) £8 8s. 6·66d. per cent. (*c*) 1s. 6·949d. per share.
(*d*) 1s. 8·706d. per share. (*e*) 1s. 9·3d. (*f*) 1s. 0·912d. (*g*) 1s. 7·223d.
‡ Including 1s. bonus. * Ex dividend.

GREAT NORTHERN TELEGRAPH CO., LTD.—Div. 2½%, less tax, at 4s., payable Jan. 1.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Qrtrly. intm. divs. of 3s. p. sh., less tax, on pref. shs. and 5s. p. sh. net on ord. shs. will be payable Dec. 29.

CALCUTTA TRAMWAYS CO., LTD.—Intm. div. on ord. shs., on acct. of current year's pfts., of 4½d. p. sh., tax free, will be payable on Dec. 11. Transfer books are closed until Dec. 10, inclusive.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Div. on 7% cum. pref. shs. in respect of half-year ending Dec. 31, 1928, will be payable Jan. 1. Transfer books will be closed from Dec. 24 to 31, inclusive.

AMERICAN MERGER PLANS DROPPED.—A New York correspondent of the "Financial Times" reports that plans to merge the Westinghouse Electric and Mfg. Co. and the Baldwin Locomotive Co. have been definitely abandoned.

CHATHAM AND DISTRICT LIGHT RAILWAY CO.—A special mtg. will be held on Dec. 18 to consider proposed Bill in Parliament to provide for abandonmt. of light railways, tramways and tramroads, running of ominibuses, etc.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Transfer books of 4½% deb. stk., 5% stk. and 6% pref. shs. (London Register) will be closed from Dec. 17 to Dec. 31, inclusive, for purpose of preparing int. and div. warrts. payable Jan. 1.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Div. on pref. shs. of 3% for half-year ended Dec. 31, and further div. of 3% in respect of participatg. rights for year ending Dec. 31, both less tax, in respect of year endg. Dec. 31, will be paid Jan. 15.

J. G. WHITE AND CO., LTD.—Directors announce that offer has been received from responsible purchasers for all the shs. Issued cap. stands at £72 000 in shs. of 4s. each. Offer is on a basis which will yield from 9s. to 9s. 3d. p. sh. A circular is to be sent out.

WESTERN TELEGRAPH CO., LTD.—Rev. for 9 mths. ended March 31, 1928, £1 009 853; workg. exes. £632 261. After providg. £24 560 for deb. stk. int. and £69 043 for income tax, blce. is £283 988, plus £429 352 brt. in. Three divs. of 2½% each have been paid, makg. 7½%, tax free, for the 9 mths., leavg. blce. £479 419, transferred to gen. res. fund.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Pft. for year ended June 30, 1928, £48 843, agst. £42 376. Int. on debs. and loans, £9 624, disct. on debs., £500, income tax, £2 975. Blce., £35 741. Divs. 8% on pref. and ord. shs. (same as last year); to 1st deb. sinkg. fd., £1 500; to res., £10 000. Fwd. £7 793, agst. £5 958.

ELECTRIC LIGHT AND POWER CO. OF COCHABAMBA (BOLIVIA).—Coupon 37, representing half-year's int. on 6% Govt. guaranteed loan, will be payable Dec. 15, at Erlangers, Ltd., 4, Moorgate, London, E.C.2. Coupons must be left four clear days for examinatn. The co. will on June 15, 1929, redeem at par all the bonds of the above loan then outstandg.

PHILIPS' GLOWLAMPWORKS, LTD. (EINDHOVEN).—The board announces with regard to the £129 000 ord. shs. offered to the General Electric Co. of New York, that the purpose of this transactn. is to obtain the use of the patents and the experience of General Electric Co. of New York in the sale of the glow lamps in America. The General Electric Co. of New York already holds £463 000 of shs. in Philips Glowlampworks.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—An extraordinary gen. mtg. of the co. will be held to-day (Dec. 14) to consider and, if thought fit, to approve additional articles of associatn. to ensure that not more than 25% of total number of issued shs. at any time outstandg. shall be under foreign control, and that the directors shall be natural born British subjects (provided that this prohibitn. shall not apply to persons being directors of the co. on the date of the introductn. of this article into the regulatns. of the co.). A further mtg. at which resolutn. for the addition of the above mentioned new articles will be submitted for confirmatn. will be held on Dec. 31.

WIRELESS PICTURES (1928), LTD.—The report of the directors, to be submitted to the statutory mtg. of the co. to-day (Dec. 14th), states that the total number of shs. allotted is 1 175 000 ord. shs. of 4s. each. Of the shs. so allotted 775 000

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have been allotted on the footg. that they are to be paid for in cash on the terms mentioned in the prospectus, and the full amt. of 4s. has already been paid up on each sh., subject to unpaid calls amounting to £2 864 19s. The residue of such shs., viz., 400 000, have been allotted as fully paid up in consideration of the terms of contracts numbered 1, 2, 3 and 5 in the co.'s prospectus, dated Sept. 14th, 1928. Total amt. of cash received by the co. in respect of the 775 000 shs. issued wholly for cash is £152 135 1s.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—During year ended July 31, 1928, demand for power has been sufficiently large to warrant further extension of steam station by addition of third unit of 6 000 kW, making 18 000 kW. Authority was granted by the 7% participating deb. shareholders to increase 7% participating deb. stk. by £250 000, which will be issued as required. Up to Sept. 30 last power contracts amounting to about 78 500 000 kWh p. a. were signed, and inquiries had been received for about 88 700 000 more. Erection of steam power station with initial capacity of 12 000 kW was completed in Oct. Satisfactory trial runs have taken place, and permanent commercial operatn. is anticipated shortly. In constructn. of the hydro-electric statn., certain difficulties have been experienced which have rendered some delay in completn. unavoidable. The constructn. of the statn. should be complete by March or April, 1930. Steam statn. at Malim Nawar is coming into operatn. immediately, and will be nearly a year in advance of original programme. The General Manager of the co. in Malaya has been obliged to return home temporarily on medical advice. Satisfactory arrangements have been made to carry on his work. A local co. has been formed for distributg. to small towns within concession area. Electricity purchased in bulk from Co. The distributn. co. is named the Kinta Electrical Distribution Co., and has issued sh. cap. of 350 000 shs. of $1 each, of which co. received 35 000, issued fully paid. A satisfactory contract with Federated Malay States Govt. for supply of power to town of Ipoh, has been negotiated. Govt. will purchase 75 000 of the ord. shs. at par.

## Company Meetings.

DELABOLE ELECTRIC LIGHTING AND SUPPLY CO., LTD.—Mr. S. Radcliffe, presiding at the recent annual meeting, said the increase in the receipts in all departments during the year was very satisfactory, and they had every expectation of a further increase. The system had been greatly improved, and had stood the test of the recent gale. They had had to borrow another £300, but they were in a sound financial condition, and did not anticipate any heavy expense in the near future. The Board proposed to carry forward a balance of £250 to the loan redemption account, as it was desired to pay off the £700 loan as soon as possible.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD.—Mr. H. C. Levis, presiding at an extraordinary general meeting on December 5th, said in connection with the acquisition of a large majority of the ordinary shares of the British Thomson-Houston Co., a large majority of the ordinary shares of the Edison Swan Electic Co., and a large majority of both preference and ordinary shares of Ferguson, Pailin, Ltd., Metropolitan Vickers became a holding company of the shares mentioned, and the directors had decided that the name should be changed to "Associated Electrical Industries, Ltd.," but it would be known as Metrovick Electrical Products, Ltd., and would be a trading company. It was the intention to appoint two new directors, Mr. Norman Dixon and Mr. William C. Lusk, managing director of the British Thomson-Houston Co. The Chairman said that 500 000 deferred shares of the company of 1s each would be converted into 25 000 ordinary shares of a par value of £1, to rank for dividend from January 1st.

CEARA TRAMWAY, LIGHT AND POWER CO., LTD.—Mr. E. H. R. Trenow, presiding at the meeting on November 30th, said the accounts showed a decrease in net revenue of rather under £1 000. Last year was the end of the term of office of the President of the State of Ceara, and the usual excitement attending the election had resulted in a shrinkage in receipts. There had been certain competition from omnibus operation which had further reduced the tramway receipts. These disadvantages had, however, been more than offset by economies in operation, and net revenue in Ceara showed an improvement. The ratio of operating expenses on the traction side in relation to receipts were satisfactory, but the transference of Ceara revenue had been affected by the fall in the average value of the milreis by nearly a halfpenny. The omnibus competition, the board hoped, would be but a temporary disadvantage, as steps had already been taken to counter it. Six motor omnibuses were being sent out almost immediately. Furthermore, as a stimulant to the earning side of the business, not only in traction, but in lighting and power, an increase of 40 per cent. in boiler power was just about to arrive in Ceara in the form of a new Babcock and Wilcox boiler. The lighting and power side of the company's business was steadily increasing. He thought they might look forward to a period of improved business, in the capital of the State of Ceara. The report and accounts were unanimously adopted, and the dividend of 5 per cent. was approved.

PINCHIN, JOHNSON AND CO., LTD.—At an extraordinary meeting of the ordinary shareholders on December 5th, the chairman, Mr. Edward Robson, referring to the proposed increase of capital, said the shareholders would have gathered the specific objects of the meeting from the notices which had been sent out. The acquistion of two important Australian businesses, and a controlling share interest in the Indian undertaking, represented the natural effect of their definte policy of providing the organisation with efficient manufacturing facilities in those overseas markets where their sales were of serious importance, and where the expansion of their business necessitated local production arrangments. In these markets tariff walls were being built up that made it increasingly difficult to trade profitably in those territories without local manufacturing resources. With regard to the acquisition of the important group of four English businesses referred to in the notice of meeting, the addition of those businesses to their organisation provided them with an undertaking of a sufficient magnitude to enable them to develop their organisation on lines that ensured the maximum of benefit to the trade, the shareholders, and those associated with the conduct of the business. At their annual general meeting in March last he referred to the probability of their being able to make an issue on bonus terms during the current year. He was pleased to state that the results of their trading and developments generally during the year had fully confirmed their anticipations, and it was the definite intention of the board to give effect to his suggestion. Such shares as were issued as a bonus would constitute a free bonus, and would rank for dividend from January 1st, 1929. The resolutions to increase the capital were carried.

SOUTHERN BRAZIL ELECTRIC, LTD.—At the meeting on November 30th, Mr. E. H. Tootal, chairman, said the board had to present to them a somewhat better statement of results than last year. The gross revenues earned by the subsidiary companies and undertakings in Brazil showed a steady and very satisfactory increase in currency, which was, however, partly set off by higher working expenses caused by the depreciated exchange. As the period to which the accounts were made up dated to eleven months ago—a delay owing to various circumstances beyond the control of the directors—it might be well to state that the improvement had continued during the current year up to date. The funds raised last year by the prior lien bond issue had proved of great advantage in enabling them to carry out necessary capital expenditure, and there was no necessity yet to issue the authorised balance of £100 000. The capacity of the Jaguary impounding reservoir had been considerably increased by raising the dam, and the whole system connected with it had been overhauled, and where necessary rebuilt, and they could now rely upon having an ample volume of water for many years for all requirements likely to accrue. The Companhia Campineira, the most important subsidiary in which they were interested, derived its power from the Jaguary river, and a constant and regular flow was of vital necessity for carrying out the services. At Campinas, with the growth of the population, there was every reason to expect a larger demand for light and power in due course. Other towns, like Piracicaba and Amparo, were also showing steady progress, and would in time become more important consumers. The practice hitherto prevailing of employing enormous quantities of ice for the preservation of food and other articles was now to a large extent being superseded by the use of electrical refrigerators, and they hoped to see a profitable development in this line. The report and accounts were adopted.

BURMA ELECTRIC SUPPLY CO., LTD.—Mr. C. O. Webb, presiding at the meeting last week, said the rupee earnings for the year ended July 31st, 1928, had been converted at the rate of 1s. 6d. to the rupee instead of 1s. 4d. as hitherto, with the result that the large profit on exchange which had figured in the accounts for some years past had disappeared, and the amounts of the receipts and expenses had been correspondingly

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increased. To enable comparison to be made, those figures also had been recalculated on the basis of 1s. 6d. Revenue account showed a working profit of £25 213, compared with £27 994. The reduced profits were accounted for as follows :— Decrease in tramway receipts, £5 090; decrease in motor-omnibus receipts in excess of running expenses and sundry receipts, £162; making a total of £5 252; less increase in receipts from sale of current for lighting and power, £757; decrease in expenses (apart from motor-omnibus expenses), £1 714; making a total of £2 471, and leaving a net decrease in profits of £2 781. The reduction in tramway receipts had been chiefly due to the competition of motor omnibuses. The competitive omnibuses in Mandalay had hitherto been transferred from one route to another, picking up those sections on which the traffic was heaviest for the moment. Rules would come into force on January 1st next under which omnibuses would only be licensed to run on certain routes, and would not be allowed to transfer to other routes during the day. In consideration for the grant of a new tramway Order and a new lighting licence, for 50 years from February last, the company had agreed to convert the present 500 V system of supply to a standard voltage of 250 V, and the work was well in hand.

## New Companies.

WILSON MANUFACTURING CO., LTD.—Cap., £1 000. To acquire business of wireless engineer, manufacturer of and dealer in wireless instruments and accessories, etc., carried on by J. R. Wilson, at 30, Liverpool Road, Stoke-on-Trent.

DUROMET, LTD.—Cap., £100. Manufacturers, importers and exporters of and dealers in electric fittings and appliances, wireless apparatus, etc. Solicitors: Herbert Oppenheimer, Nathan and Vandyk, 1, Finsbury Square, London, E.C.2.

"CELLENOID," LTD.—Cap., £100. Manufacturers of, and workers in, celluloid, ernoid, cellenoid, or similar materials, to manufacture lampshades for electrical and gas fittings, etc. A director: R. Henderson, 181, High Street, Bloxwich, Walsall.

ARCTIC ELECTRIC SUPPLIES, LTD.—Cap., £300. To acquire the business now carried on at 20, King's Road, Reading, as "Arctic Electric," and to carry on the business of electrical and mechanical engineers, etc. Reg. office: 20, King's Road, Reading.

UNIVERSAL FUNDING ASSOCIATION, LTD.—Cap., £1 000. To adopt agreement with R. W. West, to buy, sell and let on hire-purchase electrical appliances and materials, radio instruments, and parts, etc. Reg. office: 6, Broad Street Place, London, E.C.2

EVER READY TRUST AND FINANCE CO., LTD.—Cap., £1 000 000. To acquire and hold shares, stocks, debentures and securities, to carry on business as financiers, promoters, agents and guarantors, etc. Reg. office: Ever Ready Works, Hercules Place, London, N.7. (Public company.)

MIDHURST AND DISTRICT ELECTRICITY CO., LTD.—Cap., £10 000, To take over the Special Order made by the Electricity Commissioners known as Midhurst and District Electricity Special Order, 1927, and to carry on business of electric light and power supply company. Reg. office: 12, Union Court, Old Broad Street, London, E.C.2. (Public co.)

FOODSTUFFS IRRADIATION CO., LTD.—Cap., £250. To manufacture, buy, sell, etc., scientific and electrical apparatus and machinery, and especially such apparatus and machinery used in connection with irradiation and sterilisation of foodstuffs and of all kinds of liquids and solids by mechanical means, etc. Reg. office: 15, Caroline Street, Bedford Square, London, W.C.1.

RADIOVISOR FOREIGN AND COLONIAL, LTD.—Cap., £450 000. To adopt agreements with Hugh Terrell and the Associated Anglo-Atlantic Corporation, Ltd.; to manufacture and deal in selenium and other light sensitive cells, bridges and apparatus, instruments for measuring densities of light, wireless and television apparatus, etc. Solicitors: Kenneth Brown and Co., Lennox House, Norfolk Street, London, W.C.2. (Public company.)

# WESTERN TELEGRAPH CO., LTD.

## Chairman Discusses Merger Scheme—Similar Combines in Other Countries—Dividend at Rate of 10 Per Cent. per Annum for Nine Months.

THE 95th ordinary general meeting was held at River Plate House, Finsbury Circus, London, on Thursday, December 6th, Sir John Denison-Pender, G.B.E., K.C.M.G., presiding.

The chairman said: To comply with the conditions of the merger scheme, the outline of which you have doubtless followed in the Press, it was incumbent upon us to close and balance our books on March 31st last. Thus, the accounts in the report cover only nine months business, instead of that of a full year. For the nine months under review, we have paid our usual dividend at the rate of 10% per annum, free of tax, and have a surplus of £479 418, including last year's carry forward, which your directors have transferred to the general reserve fund.

When we met last year, the topic of the day was the competition between cables and wireless, and what it might lead to. You may remember that I concluded my address by giving it as my opinion that the co-operation of the two means of communication should be brought about in the interests of all concerned, the Government, the public, and the companies themselves. It was possible by March last to announce in the Press that an arrangement had been provisionally arrived at for a fusion of interests.

The altered state of affairs in telegraph communication caused by the beam did not only affect the Cable Companies, it also gave the British Government and the Dominions cause for uneasiness. Over sections of Empire communication served by both the Government cables and the beam there was serious loss to contend with, owing to the difference in rates, although the Associated Cable Companies, as I stated at the Eastern Telegraph Co.'s general meeting in July last, continued to carry much the larger bulk of the traffic, in spite of their high rates. It was a very important problem to solve, and a Conference, consisting of representatives from Great Britain, Canada, the Commonwealth of Australia, New Zealand, the Union of South Africa, the Irish Free State, India, the Colonies and Protectorates, sat in London under the chairmanship of a member of the Cabinet, Sir John Gilmour, Bart., to study the question from all standpoints. This Conference opened in January, and by July was able to present a report to Parliament. I quote a paragraph in the Conference's report :—" To sum up, therefore, it may be said that wireless offers a cheap service, but not all-sufficing. It remains important for commercial and other purposes that the majority of the cables should be kept in operation." The Conference presented to Parliament their recommendation of a plan of action which to them "seemed to form the basis of a permanent settlement of the problem which had been referred to them." Their recommendation, discussed in the House of Commons on August 2nd, was to amalgamate as far as possible in one undertaking all the cable and wireless communications, so as to secure unity of control and unity of direction.

Only very lately in America a similar fusion has taken place between three very large similar undertakings, the International Telegraph and Telephone Corporation, the Commercial Cable Co., and the All America Cables Inc., which doubtless you saw announced in the Press in the early part of this year. There are persistent rumours of another American combination, the powerful Western Union Telegraph Co., as well known in Europe as it is in America, taking concerted action which will in future prevent unreasonable competition. In France, the French Radio and Cables, up to now competing organisations, are, I am informed, making arrangements to combine, and the German Radio and Cables have already, through a newly-formed financial company, arrived at the same result.

As you are no doubt aware, the Bill which was introduced by our Government to confer power on the Pacific Cable Board to sell its Pacific cables and West Indian system, and to enable the Post Office to sell its transatlantic cables, was read a second time in the House of Commons on November 21st, and I understand it is now the wish of the Government that it should be carried through its remaining stages as rapidly as possible. The documents necessary for the formation, under the names of the Merger Co. and the Communications Co., are as far advanced as is possible at the moment. They cannot be completed until the terms of, at all events, the more important of the agreements with the Government—those which will affect the constitution of the new companies—have been settled. I understand the drafts of these agreements are well advanced and that we may receive them from the Government at an early date. I am sorry I am not to-day in a position to give you the general terms of the offer, which cannot be made until after the Merger Co. has been registered, and then it will have to be made simultaneously to all the shareholders concerned in the Eastern, the Eastern Extension and Western Telegraph Companies.

The report and accounts were adopted and the dividend of 7½%, tax free, for the said nine months approved.

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# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

EMBURY, H. AND K., Kingskerswell, electricians. £15 os. 7d. November 1st.

FELIX, Mr. L., 57, Warminster Road, South Norwood, electrical specialist. £14 3s. 10d. October 25th.

HODGKINS, Mr. L. M., 1, Clarendon Square, Leamington, radio engineer. £14 4s. 7d. October 20th.

JAUNDRILL, Mr. A., 21, Duke Street, St. Helens, wireless dealer. £16 6s. 8d. October 19th.

NANTWICH ELECTRIC CO., Church Lane, Nantwich, electrical factors. £19 12s. 6d. October 31st.

NEWSOME, T. B., AND CO., 138, Fitzwilliam Street, Huddersfield, wholesale wireless manufacturers. £11 10s. 2d. October 25th.

REED, Vernon (trading as E. REED AND CO.), 10, Chapel Road, Easton, Bristol, electrical engineer. £21 3s. 7d. June 12th.

SWEET, Mr. R. C. (trading as LONDON RADIO STORE), 107A, High Street, Uckfield, wireless and electrical engineer. £15 2s. 3d. October 26th.

SMITH, Joseph L., 62, Queen's Road, Peckham, electrical engineer. £14 15s. 6d., October 29th; and £15 16s. 2d., October 23rd.

WESTBURY AND CO., 146, Lichfield Street, Walsall, electrical engineers. £14 6s. 7d. October 25th.

WHITE, Mr. R. E., 8, Bath Hill, Keynesham, radio dealer. £15 17s. 10d. October 31st.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

BARNETT (C.), LTD., London, E.C., wireless accessory dealers.—Registered November 30th, £500 debenture, to Miss D. Harper-26, St. Petersburgh Place, Bayswater; general charge.

LANDIS AND GYR, LTD., London, W., electrical engineers.—Registered November 26th, £15 000 and £5 000 mortgages, to Sir H. J. Hope, 14, York House, York Street, Marylebone, and others, and Hon. H. Legge, Tixall Lodge (Staffs), and another; charged on Elgee Works, Victoria Road, Acton. *Nil. January 4th, 1928.

LEATHERHEAD AND DISTRICT ELECTRICITY CO., LTD., London, E.C.—Registered November 30th, £20 000 debentures, part of amount already registered; general charge. *£71 550. March 29th, 1928.

PARK WIRELESS, LTD., Birmingham.—Registered November 27th, £100 debenture, to R. Wade, Elmscote, Castle Bromwich; general charge.

### Satisfactions.

ELECTRON CO., LTD., London, W.C., electricians, etc.—Satisfaction registered December 1st, £100, £700 and £600, parts of amounts registered October 5th, 1925, February 16th, 1926, and February 24th, 1926.

## Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

DUFF BROS., LTD., dealers in electrical wire, etc., Rangoon Street, London, E.C. In pursuance of the provisions of the Companies Act, a meeting of the creditors was held on December 10th, when the liquidator, Mr. W. Cranstoun Todd, C.A., 3, Cannon Street, E.C., reported that the liabilities amounted to £2 424, while the only assets were book debts of £512. The company was formed on January 12th, 1925, with a share capital of £2 100, and took over the business then carried on by Mr. Duff, who was acting as an agent to a firm dealing in electrical wire in America. The company took over by agreement £2 100 worth of stock, which was paid for in shares. No arrangements were made for the transfer of any other assets, and the company's business was continued on the same lines as before. In February 1928, Mr. Duff lent the company £400, of which £100 had been returned. Shortly before the company went into liquidation, one of the creditors levied execution. They had seized a stock of wire amounting to about £300, but some of that had been claimed by the Equitable Trust Co., of New York, who held a trust receipt signed by the company. The Equitable Trust were creditors for £160. Dealing with the trading, Mr. Todd said that in the first year, the company sustained a loss of £496, that sum including Mr. Duff's drawings of £275. For the year 1926/27, there was a loss of £629, Mr. Duff's drawings being £917. In the following year, the loss was £911, including drawings of £891. The creditors resolved to confirm the voluntary liquidation of the company with Mr. Todd as liquidator, and nominated a committee of inspection. The following are creditors:—Maring Wire Co., £1 500; Hackney Wire Co., £262; Hawkins Bros., Ltd., £421; Linklater and Paynes, £20; Van Dam, A., £12; Equitable Trust Co., of New York, £160.

## London Gazette, etc.

### Company Winding-up Voluntarily.

WEDMORE ELECTRIC LIGHT AND POWER CO., LTD. By special resolution, November 2nd, confirmed November 21st, A. Gates, of Messrs. Christy Bros. and Co., Ltd., Chelmsford, appointed as liquidator.

### Bankruptcy Information.

ANDERSON, R., electrical engineer, Talbot Street, Grangemouth. Estates sequestrated on December 3rd. First meeting, Monday, December 17th, in the Procurator's Library, Sheriff Court House, Falkirk, at 3 p.m.

BENNETT, Leslie Norman, 113, Croydon Road, Caterham Valley, Surrey, radio engineer. Receiving order, December 3rd. Debtor's petition.

MARCHANT, Charles Henry, electrical engineer, 9, South Street, Tarring, Worthing. First meeting, December 14th, 12.15 p.m., Official Receiver's Offices, 12a, Marlborough Place, Brighton. Public examination, January 16th, 11 a.m., Court House, Church Street, Brighton.

PRICE, Fred, TARVER AND CO., 15, Working Street, Cardiff, electrical engineers. Receiving order, December 4th. Creditor's petition.

WILLS, Thomas Trenaman, 16, Turret Grove, Plymouth, wireless apparatus vendor. Receiving order, December 7th. Debtor's petition.

WILSHAW AND SHARPE, 320, Padiham Road, Burnley, electrical dealers. Receiving order, December 3rd. Creditor's petition. First meeting, December 18th, 3 p.m., Official Receiver's office, District Bank Chambers, Blackburn. Public examination, January 15th, 11 a.m., County Court House, Bankhouse Street, Burnley.

## Bankruptcy Proceedings.

COHEN, George, electrical engineer, 49, Newman Street, London, W. The debtor attended in the London Bankruptcy Court on Wednesday of last week for his public examination on a statement of affairs in which he has returned his liabilities at £4 445, of which £3 282 are expected to rank, and valued his assets at £296 net. It appeared that for some nine years before 1910 the debtor carried on business as an electrical engineer, latterly in the Hampstead district, and having incurred losses through bad debts he was provided with the necessary funds by his uncle to pay a composition to his creditors. Their claims amounted to some £1 500. He then continued his business in the Golders Green Road. From 1914 until 1917 he was engaged in ambulance work, and his business was conducted under management until June 1917 when he joined the Army, and sold his business for about £300. In April 1919, shortly after his demobilisation, he began an electrical engineer's business in King Street, Cheapside, under the style of the RELIANCE ELECTRIC AND MAINTENANCE CO. and in this he had a partner between June 1919 and May 1920. After buying out his partner for £50, the debtor continued the business alone, removing in 1921 to 59, Queen Victoria Street, City. At a later date he acquired a 21 years' lease of 40, Newman Street, W., and expended about £400 in fitting up the premises and to that address he removed his stock valued at £1 200. In April last, a partnership was registered between himself and a minor. In September 1922, the debtor had acquired a 21 years' lease of two shops in the Golders Green Road which he fitted up at a cost of £600. He sub-let one of them and carried on business at the other as an electrical engineer until April of last year when he closed the business. The debtor attributed his failure and insolvency to bad trade, to heavy overhead expenses, to loss on the transfer of assets to the partnership, to bad debts, and to law costs.

HANBURY, Cyril Kay, electrical engineer, Padiham Road, Burnley. At Burnley Bankruptcy Court this debtor, whose statement of affairs showed a deficiency of £170, attributed his failure to the sickness of wife, and self and to bad trade. He said that in 1925 a company known as C. K. Hanbury, Ltd., was formed, but went into voluntary liquidation in 1926. He bought from the liquidator part of the stock and fittings at 20, Padiham Road, for £30, and commenced business on his own account. He first became aware of insolvency about August.

SMITH, Frederick Walter, 45, Browning Street, Leicester, electrical engineer. At his public examination at Leicester this debtor stated that he had done jobbing work, and would have been able to carry on had a firm not put in a writ in the slack season. He returned a statement of affairs showing liabilities of £121, against assets of £26. The examination was closed.

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# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

300 927 L. Mellersh-Jackson. (Siemens and Halske A.-G.). Fire alarm systems and apparatus. (18/5/27.)
301 097 J. L. Baird and Baird Television Development Co., Ltd. Television apparatus. (26/5/27.)
301 101 D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. Electrical switchgear of the metal-clad type. (25/7/27.)
300 930 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Preparation of laminations for transformers and the like. (13/8/27.)
300 937 H. R. P. Tolley. Warning devices for electrical appliances. (19/8/27.)
301 008 A. West and Co., Ltd., and V. Breeze. Retarding devices of the dash-pot type. (23/8/27.)
301 103 Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). Electrical controllers. (23/8/27.)
301 110 Callender's Cable and Construction Co., Ltd., P. V. Hunter, and H. J. Allcock. Flexible electric conductors. (26/8/27.)
301 115 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone systems. (26/8/27.)
301 116 A. W. Whistlecroft. Radio direction-bearing indicators and the like. (26/8/27.)
301 118 Standard Telephones and Cables, Ltd., A. M. Searle, L. P. Lowry, J. R. Gould and E. F. Bates. Fire alarm systems. (29/8/27.)
301 123 S. T. Hosken. Electrical and wireless testing apparatus. (31/8/27.)
301 124 E. M. Johnson and Metropolitan-Vickers Electrical Co., Ltd. Radiators or cooling devices. (31/8/27.)
301 125 Imperial Chemical Industries, Ltd., and J. H. Paterson. Arc-welding tools. (1/9/27.)
301 127 Barr and Stroud, Ltd., and J. W. French. Electrical apparatus for the transmission of data over long distances. (2/9/27.)
301 134 J. Macwilliam and E. J. Long. Tuning and like coupling-coils for wireless telegraphy and telephony. (6/9/27.)
301 140 C. J. Barnett. Automatic electric lifts. (14/9/27.)
301 143 General Electric Co., Ltd., and F. J. G. Van Den Bosch. Manufacture of gasfilled electric incandescent lamps. (17/9/27.)
301 144 British Thomson-Houston Co., Ltd., and H. S. Holbrook. Methods of and means for protecting electric distribution circuits. (21/9/27.)
291 774 Siemens and Halske Akt.-Ges. High-frequency induction furnaces. (10/6/27.)
301 163 Siemens Bros. and Co., Ltd., and C. Lambert. Terminal assemblies for telephone exchanges. (12/10/27.)
301 173 E. S. Elliott. Accumulators. (26/10/27.)
301 174 F. S. Smith. X-ray system. (27/10/27.)
301 181 M. C. Spencer. Slow-speed synchronous motors for driving phonographs, clocks, and other slow-moving apparatus. (7/11/27.)
280 550 F. Meyer and H.-J. Spanner. Incandescent cathode rectifiers. (15/11/26.)
301 190 Siemens Bros. and Co., Ltd., and C. L. Peters. Automatic and semi-automatic telephone systems. (15/11/27.)
301 203 J. A. Baker. Automatic signs for tramcars, trolley buses, railway and the like vehicles. (30/11/27.)
301 216 F. Berg. Suspension device for overhead conducting wires for electric railways. (14/12/27.)

## Applications for Patents.

### November 12th.

33 066 F. G. Arkell and British Thomson-Houston Co., Ltd. Electric-acoustic devices.
33 090 E. Asch. Thermionic amplifiers. (10/11/27, Germany.)
33 113 Associated Telephone and Telegraph Co. Telephone systems. (2/12/27, U.S.)
33 069 J. A. Bower. Electric light fittings.
33 065 British Thomson-Houston Co., Ltd., and H. Trencham. Electric switches.
33 111, 33 112 S. G. S. Dicker (N. V. Philips' Gloelampenfabrieken). Thermionic amplifiers.
33 119 C. L. and R. H. Dixon. Wireless cabinets, etc.
33 079 Electrolux, Ltd. (Inventia Patent Verwertungs Ges). Brushes for small electric motors.
33 063 H. H. Henning. Electric heating apparatus.
33 072 Holophane, Ltd. Advertising devices, etc.
33 114 Igranic Electric Co., Ltd. Sound reproducing apparatus.
33 115 Igranic Electric Co., Ltd. Loud speakers.
33 064 International General Electric Co., Inc. Protection of electric conductors. (11/11/27, Germany.)
33 016 R. J. Jones and S. D. White. Electrolytic rectifier.
32 972 W. Nicol. Electric lamp bulbs, etc.
32 971 E. H. Otty. Thermionic valves.
33 083 R. J. Pick, Siemens-Schuckertwerke A.G. and P. Stern. Thermo-electric switches.
32 980 H. W. Pickering. Shunt for thermionic valve circuits.
33 091 Servo-Frein Dewandre Soc. Anon. Electrical control system for servo motors. (6/8/28, Belgium.)
33 025 Siemens-Schuckertwerke A.G. Enclosed switchgear actuated by compressed air, etc. (2/12/27, Germany.)
33 082 Siemens and Halske A.G. Current generators with rotating permanent magnets. (9/12/27, Germany.)
33 048 Standard Telephones and Cables, Ltd. (Western Electric Co.) Telephone systems.
33 078 W. D. Verschoyle. Electric lamps for production of ultra-violet rays.
32 978 F. Whipp and Whipp and Bourne, Ltd. Automatic devices for maintaining constant electrical pressure.

### November 13th.

33 248 Automatic Telephone Manufacturing Co., Ltd. and J. E. Ostline Telephone systems.
33 250 J. R. Barden. Electrical extension lead.
33 154 T. A. Biddington and R. Field. Wireless receiving apparatus.
33 247 J. Boot and Siemens and General Electric Railway Signal Co., Ltd. Electric signalling systems.
33 182 G. A. Cox. Apparatus for maintaining pre-determined speed of d.c. motor.
33 246 P. W. C. Hollowell. Wireless telegraphy receiving apparatus.
33 188 International General Electric Co., Inc. Arc extinguishing chambers. (17/11/27, Germany.)
33 189 International General Electric Co., Inc. Current regulating machines for vehicles. (21/11/27, Germany.)
33 162 E. Kaempf and Standard Telephones and Cables, Ltd. Electric communication cables.
33 176 T. S. L. Mann. Wireless rectifying apparatus.
33 209 C. O. Marklund. Fire alarms.
33 179 H. S. Prince. Pole connectors for heavy discharge batteries.
33 180 H. S. Prince. Production of plates for storage batteries.
33 181 H. S. Prince. Accumulator casings.
33 124 A. H. Richardson. Inductance coils for wireless receiving apparatus.
33 213 R. A. Rothermel. Volume control for wireless receiving apparatus.
33 214, 33 217, 33 218, 33 219 R. A. Rothermel. Electrical pick-ups.

### November 14th.

33 386 E. A. Beer. Wireless aerials.
33 353 British Thomson-Houston Co., Ltd and J. C. Read. Vapour electric rectifiers.
33 354 British Thomson-Houston Co., Ltd. and F. P. Whitaker. Vapour electric rectifiers.
33 381 H. C. Channon, H. J. Garnett and W. S. Smith. Insulating materials. (2/9/27.)
33 320 L. F. Gardner (Bing Werke vorm. Geb. Bing A.G.). Electric lamp holders.
33 392 E. Hausdorf. Telephones. (15/11/27, Germany.)
33 383 Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric and Manufacturing Co.) Control systems for elevators, etc.
33 325 Siemens-Schuckertwerke A.G. Arrangement for switching off loads on h.t. nets. (24/11/27, Germany.)
33 312 P. G. A. H. Voigt. Condenser microphones.
33 391 Western Electric Company (Bell Telephone Laboratories, Inc.). Sound reproducers.
33 382 Westinghouse Lamp Co. Vacuum electric tube. (16/11/27, U.S.)

# METAL AND CHEMICAL PRICES.

Tuesday, December 11th

| | Price. | Inc. | Dec |
|---|---|---|---|
| *Copper*— | | | |
| Best Selected .. .. .. per ton | £72 10 0 | — | 10s. 0d. |
| Electro Wirebars .. .. „ | £75 5 0 | — | — |
| H.C. Wires, basis .. .. per lb. | 10⅝d. | — | — |
| Sheet .. .. .. .. „ | 10½d. | — | — |
| *Phosphor Bronze*— | | | |
| Wire (Telephone) basis .. per lb. | 1s. 1⅛d. | — | — |
| *Brass* 60/40— | | | |
| Rod, basis .. .. .. per lb. | 8½d. | — | — |
| Sheet „ .. .. .. „ | 10½d. | — | — |
| Wire „ .. .. .. „ | 10½d. | — | — |
| *Pig Iron*— | | | |
| Cleveland Warrants .. .. per ton | £3 8 6 | — | — |
| Galvanised Steel Wire, basis 8 S.W.G. .. .. .. „ | £14 15 0 | — | — |
| *Lead Pig*— | | | |
| English .. .. .. per ton | £22 10 0 | — | 10s. 0d. |
| Foreign or Colonial .. .. „ | £21 5 0 | — | 10s. 0d. |
| *Tin*— | | | |
| Ingot .. .. .. .. per ton | £225 15 0 | — | £16 0 0 |
| Wire, basis .. .. .. per lb. | 3 11½ | 1od. | — |
| *Aluminium Ingots* .. .. per ton | £95 0 0 | — | — |
| *Spelter* .. .. .. .. „ | £26 10 0 | 7s. 6d. | — |
| *Mercury* .. .. .. per bottle | £22 8 6 | — | — |

*Sulphur*—Flowers, Ton £12 0 0 *Copper Sulphate*—Ton £25 to £25 10 0
„ Roll, „ £10 15 0 *Boric Acid* (Crystals) „ £30
*Sulphuric Acid* (Pyrites, 168°) Ton £6 15 0 *Sodium Chlorate*—Per lb. 2½d.
*Sodium Bichromate*—Per lb. 3½d.
*Rubber*—Para fine, 10½d.; plantation, 1st latex, 8½d.
∴ The metal prices are supplied by British Insulated Cables, Ltd.

## LEAD MARKET REPORT.

The lead market last week, according to James Forster and Co., declined, and prices closed at the lowest. The American price was advanced to 6·50 cents on December 3rd.

Closing prices on December 7th were £21 2s. 6d. for December, £21 6s. 3d. for January, £21 8s. 9d. for February, and £21 11s. 3d. for March, a fall of 13s. 9d. to 10s. on the week, according to position.

# Coming Events.

### Friday, December 14th.

Physical Society.—Imperial College of Science, Imperial Institute Road, South Kensington. Lecture by Dr. E. Griffiths, F.R.S., on "A Survey of Heat Conduction Problems." 5 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. T. H. Lockett on "The Applications of Electricity in the Printing Industry." 7 *p.m.*

Birmingham Electric Club.—Grand Hotel, Colmore Row. Annual meeting, 7 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—College of Technology, Manchester. Faraday Lecture by Mr. Ll. B. Atkinson on "How Electricity Does Things." 7.30 *p.m.*

### Saturday, December 15th.

Association of Mining Electrical Engineers (Western Sub-Branch).—60, Wind Street, Swansea. Paper by Mr. E. W. Davies on "Some Electrical Tests."

### Monday, December 17th.

Electrical Association for Women.—Visit to the new electricity showrooms of the Battersea Borough Council, Lavender Hill. 3 *p.m.*

Croydon Wireless and Physical Society.—5, Altyre Road, East Croydon. Lecture by Mr. R. W. Minter on "The Neutrodyne Receiver." 8 *p.m.*

### Tuesday, December 18th.

Institution of Electrical Engineers (Students' Section of the North Western Centre).—Engineers' Club, Albert Square, Manchester. Paper by Mr. E. Tatton on "Power Station Sites." 7.15 *p.m.*

Paisley Association of Electrical Engineers.—Town Hall, Paisley. Lecture by Mr. A. W. Johnston, "Some Notes on Pulverised Fuel." 7.30 *p.m.*

Electrical Association for Women (Manchester District Branch).—Lighting Service Bureau, 4, Fountain Street, Manchester. Lecture by Mr. A. Hall on "Electricity and Musical Reproduction," with demonstration. 7.30 *p.m.*

### Wednesday, December 19th.

Overhead Lines Association.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Paper by Mr. C. W. Marshall on "Insulators." 5.30 *p.m.*

Scottish Electric Lighting Service Bureau. Lecture before the British Optical Association on "Modern Lighting and Eyesight." 7.30 *p.m.*

### Thursday, December 20th.

Electrical Association for Women.—46, Kensington Court, London. Social Sub-Committee "At Home." 3 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Swan Celebration. Lecture by Mr. J. Swinburne on Swan's work. 5.30 *p.m.*, followed by a paper by Messrs. E. B. Wedmore, W. B. Whitney and C. E. R. Bruce on "An Introduction to Researches on Circuit Breaking.

### Friday, December 21st.

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Hire and Hire Purchase in Electrical Development Schemes." Speaker, Mr. J. E. Tapper. 7.30 *p.m.*

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# THE ELECTRICIAN

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**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Christmas Greetings.

We come again to the pleasant task of conveying, on behalf of the proprietors, editor, and publisher of The Electrician, their individual and collective good wishes for Christmas and the New Year to all members of the electrical industry, not forgetting those electrical engineers who are of the industry but, while actively pursuing their electrical calling, are not at present directly associated with the industry. We also like to include at this time, even though the message may reach some of them under a grilling tropical sun some weeks hence, our many readers overseas, and, last, but not least, those of the profession and trade who lack the means to obtain the little luxuries in which we customarily indulge at this season. At Christmas we give donations for many purposes—some deserving, others not. We must not forget to round off our Christmas benefactions by sending a donation to the Electrical Trades Benevolent Institution. The year which is now closing has not been uneventful, and though, viewed in perspective, it has not entirely fulfilled the expectations of a year ago, notable progress has been made in more than one direction, and development has been general, though not very marked as a rule. There has at any rate been progress, and its speed must surely be vastly accelerated in the coming year. The large scale advertising of electrical Christmas gifts undertaken by several manufacturing firms, backed up by general E.D.A. propaganda along the same lines, bids fair to make this Christmas a record one for sales of domestic electrical appliances. Pausing to remind ourselves of the great boon that we, as an industry, have conferred upon the many thousands of families that now assemble round the electric fire to eat the electrically-cooked turkey, we may pause for a few hours to participate in the greatest of domestic festivals. Following our usual custom, we have provided in this issue a little of the lighter fare which many readers seem to prefer at this season to the annual report of the Electricity Commissioners, which, it may be remembered, appeared last year just before Christmas.

## Our Overseas Trade.

As will have been gathered from the preliminary figures taken from the Board of Trade returns and given in our last issue, our overseas trade during November received a slight set-back compared with the figures for the same month last year. If, however, we compare them with those for October, 1928, our foreign trade during last month cannot be regarded as unsatisfactory. In the first place it should be borne in mind that November had one working day less than October, which in itself must account for some decrease in exports. The import side, increased by £4 210 574 during November, but an analysis of the figures shows that this increase was largely due to raw materials. An even better index of our trade position is gained from the figures for the eleven months, for these not only show a falling-off of imports as compared with 1927, but they also indicate an improvement in export business of over £12 000 000. In so far as these figures concern the electrical industry, it will be understood, from the details published elsewhere in this issue, that whereas our exports for November showed a decline of some £121 381 in comparison with the same month last year, the fall was largely due to submarine cables and telegraph instruments, which between them accounted for £152 549. On the other hand, one item of machinery alone showed an improvement of £37 520, while the item classified as electrical goods and apparatus, all other sorts, increased by £24 495. The total electrical exports for the whole of last year amounted to something over eighteen and a half millions, whereas our present total, for eleven months only, is slightly under £17 000 000. The difference between total exports and imports last year amounted to £12 738 227, whereas even with one month in hand the present difference is £11 081 293 as compared with £11 858 553 at the same period of 1927. The indication is, therefore, that so long as we maintain our present excess of exports over imports the current year will close showing a further excess of something over £200 000.

## Electricity *versus* Petrol.

If we do not always find Italy a model to follow, it would be a good thing if our Government would emulate the Italian Government in its reported decision to exempt from taxation for five years all electrically-driven road vehicles. This exemption will not only encourage the construction and more extensive use of battery-propelled vehicles, but will help to level the peaks on the load curves of the big Italian water power stations, and, incidentally, reduce petrol imports. The merits of the electrically-propelled vehicle for the comparatively short journeys involved in our big cities and towns are so conspicuously apparent that some exemption from taxation would act as a great incentive to the use of these cleanly and silent means

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of transport. As a purely health measure an increase of electric vehicles on the road would soon show interesting results. The supply industry as a whole has not, so far, shown much enthusiasm in providing charging facilities for the small number of existing electrics, but some substantial increase in the numbers of vehicles in use would soon put this right. When it is remembered that more than sixteen years ago a representative of THE ELECTRICIAN took part in a passenger electric vehicle run from Scotland to London—taking advantage of ordinary charging facilities on the way—it is obvious that the set-back to electric road traction caused by the war has not yet been overcome, and that some unusual stimulus—such as tax exemption—would seem to be a necessary preliminary to further developments on a large scale.

## Electric Signs and Advertising.

MUCH has been written about electric signs, but the paper on this subject read by Mr. H. LINGARD at the last meeting of the Illuminating Engineering Society was exceptionally comprehensive. The author attempted to make definite recommendations on such matters as letter-height, influence of background, and the effects of irradiation—points that have often been referred to in general terms, but rarely dealt with in such a practical manner. Such a paper should be of considerable interest to sign-makers. A feature of the paper was the display of modern types of signs using incandescent lamps, some of them of a highly effective and ingenious nature. With such a wealth of material available it certainly seems a pity that so many ill-designed and unsightly signs should still be seen. The problem of reconciling the claims of publicity with æsthetic considerations is not an easy one, but there is no doubt, as the author suggests, that criticisms of illuminated signs on the ground of offensiveness would be much less frequent if types were more judiciously selected according to locality, and some of the more glaring errors in construction avoided. It should also not be overlooked that advertising is now only one amongst many functions of illuminated signs. They have proved their value for giving information on the railways, and their use as an aid to the guidance of traffic seems likely to become very extensive in the future. Like Mr. LINGARD we look forward to a time when every house will be equipped with an illuminated number—a practice which we understand is obligatory in some cities abroad. The same idea might well be applied to indicate the nature of many buildings of importance, though we fear that in some cases the conditions of the lease would prove an obstacle.

## A New Solder for Electrical Apparatus.

SOLDERS used for electrical apparatus generally consist of alloys of lead and tin, the most common having equal parts. All lead-tin solders have the common feature that they start to melt at a temperature of 183 deg. C., and this means, of course, that a joint soldered with any of them will soften and fail if heated to this temperature. A solder having a higher melting point is very desirable for many kinds of electrical apparatus, where the service is severe and where, consequently, high temperatures are encountered. Attempts have, naturally, been made to replace the lead-tin solders with other alloys, but it is believed that prior to the present development none has been successful on a practical scale, due to the fact that severe requirements must be met by a solder to be used in electrical apparatus. We understand that a new solder, having a melting point of 304 deg. C. has recently been developed in the U.S.A. and Canada, and has proved very successful in cases where trouble has been experienced with the old solders. The new solder consists of lead as the base metal to which certain percentages of silver and copper have been added. The soldering operation is practically the same as that required with the ordinary lead-tin solders, the only difference being that the soldering iron must be heated to a higher temperature. No special flux is required, and the non-corrosive fluxes which are ordinarily employed in the soldering of electrical apparatus are also used with the new solder. The first practical application of the new solder was in the motors of the powerful new electric locomotives of the Virginian Railroad. Later it was used in other railway motors, in mine motors and in other electrical apparatus, where trouble with the old lead-tin solders had been experienced. The results have in all cases been reported as being very satisfactory.

## Trade Advertising

MR. SELFRIDGE'S sweeping condemnation, at an I.S.B.A. dinner, of the typography and illustrations of advertisements in the trade and technical press surely indicate that he has never examined the advertising pages of this and a number of other engineering journals. Those who study advertising display in a variety of fields are invariably impressed in the most favourable way with the generally high standard attained by the advertisers of British electrical goods in the electrical Press. We do not for one moment suggest that further improvement is impossible, for developments in the specialised art of appealing successfully to a technical, as opposed to a lay public, are constantly being made. We do suggest, however, that electrical advertising is sufficiently good to stand as an example to many trades in which the problems of combining technical information and sales arguments are not nearly so difficult.

## Birmingham Fair Prospects.

PROSPECTS for the success of the forthcoming British Industries Fair seem to be more encouraging than ever, for according to Mr. D. H. HACKING, Secretary of the Department of Overseas Trade, the whole of the available area of 200 720 sq. ft. at Birmingham has already been let, and the authorities are now forming a further temporary section to accommodate additional new exhibitors. The rapid development of the Birmingham Section of the Fair and of the representative collection of electrical exhibits which are now so prominent a feature, is simply amazing by comparison with the displays of five or six years ago, and though some of us may still adhere to the view that February is not the ideal time to hold such an exhibition, it is at least sufficiently good to command the active support of an increasingly large number of British electrical manufacturing firms. From advance details which we have received, the Electrical Section of the Birmingham Fair will provide the first public view of a number of advances in machinery and finished electrical products, and will well repay inspection. To overseas readers who journey so many miles to see the old-established continental trade fairs we would extend a very special invitation to come and see the British electrical products displayed, so to speak, on the very doorsteps of the factories where they are made.

## Affairs at Newport, Mon.

WE are glad to learn that a conclusive reply to the Adamson Report—details of which were given in THE ELECTRICIAN of November 9th—has been made by Mr. N. J. YOUNG, the general manager, and Mr. A. NICHOLS MOORE, borough electrical engineer and tramways manager, pointing out that the statements made in that report are not justified. The Electricity and Tramways Committee has resolved that copies of the reply be sent to all members of Council, and has decided to continue the administration of the Department as at present, ignoring the suggestions of Mr. ADAMSON. The reply of Mr. YOUNG and Mr. NICHOLS MOORE, and its acceptance by the Electricity and Tramways Committee, thus appear to bring to a conclusion an attack which reason cannot justify. The reply, details of which will be given in our next issue, is most lucid in its explanations, and deals with the criticisms of the report point by point in such a way that there can be little doubt that electrical affairs at Newport are all that they should be.

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# THE RATING OF ELECTRICAL MACHINERY.

## The Best Compromise—Popularity of Continuous Maximum Rating—Constructive Work of the B.E.S.A.—The Psychological Aspect.

By WALLACE FORD, Wh.Sc., A.C.G.I., B.Sc., D.I.C.

ANY statement as to the capacity for doing work of a piece of machinery, however expressed, is valueless unless one knows the basis upon which the capacity is determined. The rated capacity of any electrical machine, whether given in horse-power, kilowatts or kilovolt-amperes must be computed on a definite basis before the statement of the rating is of practical use.

Practically all machines are capable of doing a greater amount of work when new than when they have been in service for a year or two. This particularly applies to electrical machinery; the insulating materials deteriorate due to the effects of heat and vibration, and there are the added effects of worn bearings, clogging of ventilating ducts, etc., in rotating machinery. Of course, the greater the temperature of the windings of an electrical machine, the faster is the deterioration of the insulation; and the winding temperature depends upon the output of the machine. For any given machine, the greater the load demanded from it, the shorter will be its useful life.

The rating of an electrical machine should therefore effect the best compromise between long life and economy of materials, and it is the aim of the designer to produce a machine of as compact a size as possible, and with an efficient ventilating system, using the minimum amount of copper and insulating material, and yet ensuring reliability and long life in service.

From the above it is easy to understand why temperature has been universally adopted as the basis for the rating of electrical machinery. If a machine performs the duty for which it was designed, without its windings being heated above a prescribed temperature limit (depending upon the type of insulation), then it should give safe and reliable service for a great many years.

Further, temperature-rise above the temperature of the cooling air—the ambient temperature—has been adopted as the rating basis almost universally, in preference to the maximum temperature attained. For all values of cooling-air temperature it can be said that similar loads produce similar temperature-rises in a given machine, so that the use of temperature-rise as a rating basis practically limits the legitimate loading of the machine. If, however, maximum winding temperature were adopted as the basis, the maximum capacity of the machine could be increased by decreasing the ambient temperature; this would upset the working characteristics of the machine.

### Main Rating Types.

In so far as electrical machinery is concerned there are two main types of rating—continuous and short-time, and the continuous rating is adopted for the great majority of machines; only motors which are subjected to intermittent loads, such as railway traction motors, are rated on a short-time basis, and it is quite usual practice to quote both the continuous and the short-time rating for railway motors.

If the continuous-rated output of an electrical machine is given it infers that that machine will operate at its continuous-rated load under the prescribed conditions as to voltage, current and speed, until it settles down to steady conditions as regards winding temperature, without the temperature-rise of its windings exceeding a certain predetermined value.

Similarly, if a machine is assigned a certain rating on a 1-hour basis (which is the usual short-time basis) it infers that the machine will develop its full rated load for one hour under prescribed conditions without the winding temperature-rise exceeding a predetermined amount.

There are two types of continuous rating. First, the continuous maximum rating, for which the machine reaches its highest permissible temperature-rise at rated full load, thus leaving no margin for overloads; secondly, a "continuous rating permitting overloads" provides a lower rating with a lower temperature-rise, but gives a margin for overloads.

In modern British practice the tendency to use the continuous maximum rating is increasing, and this rating is now established in instances where the conditions of the working of the machine are definitely under control. This occurs in large generating stations where the load on the alternator is controlled by an operator, and the temperature of the cooling air is almost constant; the need for overload capacity is therefore nil. In years gone by, however, when the average power station contained one or two generators supplying almost a purely lighting load, the rating of the generators had to allow for an evening peak load—hence a continuous rating permitting overloads was adopted, and the maximum temperature-rise of the windings at rated full load was restricted to 40 deg. C. (for fibrous insulation) thus giving ample overload capacity to take care of peak conditions.

### Wide Use of C.M.R.

When the conditions of operation can be controlled and there is no need for overload capacity, the continuous maximum rating (allowing 55 deg. C. for temperature-rise of fibrous insulation) is becoming widely used, but where the load demand from a machine is uncertain, and where operating conditions are likely to vary, then it is considered better to adopt a rating which represents the average demand on the machine and leaves a margin for overloads.

A machine, having been designed and constructed, is tested to prove its rating. It is run under prescribed conditions as regards voltage, current, mechanical or electrical output, etc.; if the rating is on a continuous basis, the machine is fully loaded for a time such that there is ample evidence to show that it has reached a condition of equilibrium in temperature, and the temperature-rise is then measured to discover whether it is within the permissible amount; if the rating is on a 1-hour basis the temperature-rise is ascertained after an hour's run at rated full load. These tests are normally carried out on a test bed; the machine is in normal running order with all its parts in place and any cooling system arranged as in service.

The British Engineering Standards Association issued in 1917 the second edition of British Standard Specification No. 72, which provided for the rating of electrical machinery (excluding traction motors) on the basis of a continuous maximum rating or a short-time rating, and ignored the "load-plus-overload" rating. Consequently, except for generating machinery in large power stations, the Specification was not adopted into general practice.

Now the B.E.S.A. has withdrawn Publication No. 72 and has replaced it by a series of Standard Specifications, each of which deals with a definite type of electrical machinery, and for each of which the most suitable rating basis has been adopted. In all these Specifications, however, there is now a tendency to adopt the continuous maximum rating wherever possible, and only in cases where a lower rating is of distinct advantage is it included in preference to the C.M.R. Many of the Specifications provide also for a short-time rating.

Except in the instance of turbo-generators and some large slow-speed generators, the continuous maximum rating does not represent service conditions, but if all machinery were rated on a continuous maximum basis, a uniform basis for comparison for all motors and generators would be attained. A purchaser should know what size of motor, rated on a C.M. basis, to instal for any particular job.

The controversy about "continuous maximum rating" and "continuous rating permitting overloads" is perhaps best illustrated by the methods of rating ordinary industrial motors. The loading of these motors cannot usually be controlled, and the conditions as to temperature of cooling air and cleanliness are very variable. It was, and is, general in this country therefore to adopt the load-plus-overload rating for such motors, and consequently B.S.S. No. 72, which provided for continuous maximum rating, was not worked to. The B.E.S.A. therefore issued B.S.S. No. 168-1923, which replaced, for industrial motors, B.S.S. No. 72. B.S.S. No. 168 provided for a load-plus-overload rating—i.e., the full-load temperature-rise for continuous working was limited to 40 deg. C., and the specification required that the motors should withstand a 25 per cent. sustained overload for two hours. This Standard rating agreed with current practice; industrial motors may have to work in places where the ambient temperature is comparatively high, and where the ventilating ducts are liable to become clogged with dirt and

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dust, and the load-plus-overload rating provided for a possible margin on temperature-rise due to these conditions, as well as for an overload capacity.

When B.S.S. No. 168 was revised and re-issued in 1926 the load-plus-overload rating basis was retained, but it is significant that the requirement for the 25% two-hour overload is not included in the new specification; it is mentioned, however, in an appendix on "Service Conditions." Apparently both manufacturers and purchasers are agreed that a motor designed so as to fulfil its rating and the associated conditions in accordance with the Specification will have sufficient inherent overload capabilities for all practical requirements.

## Load-plus-Overload.

The usefulness of the load-plus-overload rating for industrial motors is very widely recognised, and is very great in so far as export work is concerned. On this basis a 10 H.P. motor designed for this country may still be regarded as a 10 H.P. motor if it is installed in the tropics, although its overload capacity will be smaller, since with a higher ambient temperature the safety margin to cover overloads and uncertainties in operation is reduced.

Nevertheless, if industrial motors—and all other types of electrical machinery—were rated on a continuous maximum basis we should have some standard of comparison throughout the industry. The aim of Standard Specifications is to aid simplification; besides, standardisation and simplification nearly always bring in their train economy, and always clarity. At present we have six ratings endorsed by the B.E.S.A.—continuous maximum, service, (see B.S.S. No. 225—the service rating indicates the load at which the alternator attains maximum efficiency), continuous rating permitting overloads, and three short-time ratings, the one-hour, half-hour, and quarter-hour (the latter only for fractional-horse-power motors). And in addition some form of intermittent rating is being sought for machinery having periodic loading, e.g., lift motors, tramway and railway motors, etc.

Is it not possible to rate all electrical machinery (including transformers) on a continuous maximum basis? Except in such instances as turbo-generators in large installations which are rated on a C.M.R. basis, all the ratings mentioned above are arbitrary—they do not really represent service conditions; why not retain one arbitrary basis for all machines?

The Continental attitude may be summed up as follows: the main object of an agreement as to rating is to provide a common basis for the comparison of similar types of machines; this basis can quite as well be provided by the continuous maximum rating as by a rating permitting overloads.

The modern tendency—firmly established on the Continent—is to make more use of the continuous maximum rating. This movement is shown in the later publications of the B.E.S.A. which deal with electrical machinery, and which are mentioned later in this article.

From the rating point of view, three other B.S. Specifications are very similar to B.S.S. No. 168–1926. These are B.S.S. No. 169–1925, for large electric generators and motors (excluding turbo-alternators), B.S.S. No. 170–1926, for fractional horse-power motors, and B.S.S. No. 172–1927, for rotary converters; the continuous rating permitting overloads is adopted, since this rating is the current British practice, and provides for sustained overload characteristics.

Since, however, large machines, other than the turbo-type, may often be used in power stations where no overload capacity is required, they can, in such cases, be rated on a C.M.R. basis. Hence the B.E.S.A. has issued a "sister" Specification to No. 169—B.S.S. No. 226–1925 for large generators and motors with continuous maximum rating.

Small motors must be considered as working under uncontrolled conditions, and hence require overload capacity. Rotary converters have to carry any load demanded from them, and this load demand is subject to heavy fluctuations. It is, therefore, suitable to adopt the load-plus-overload basis for the rating, although, since the actual demand is more or less known, and since any excessive overloads are likely to be only of short duration, the continuous maximum rating could be used.

The Specification for Transformers, B.S.S. No. 171–1927, adopts continuous maximum rating. In a way, this shows lack of consistency with the British practice of standing by the load-plus-overload rating, since, for the majority of cases, transformers require overload capacity. A transformer, if used with an alternator, a motor or a rotary converter, must take the same rating; continuous maximum rating is suitable for a transformer used with a turbo-alternator, but in the instance of transformers for rotary converters, there is some inconsistency; B.S.S. No. 171 provides C.M.R. for transformers and does not recognise a short-time rating, while B.S.S. No. 172 provides both load-plus-overload rating and a short-time rating. There is not, of course, much practical difficulty involved in this difference in the methods of rating a transformer and convertor which are to be used together. But if C.M.R. can be used for transformers, the conditions of operation of which are normally very similar to those of the industrial motor, then the same rating could be used for other types of machines which, at present, are rated on a load-plus-overload basis.

In B.S.S. Nos. 168 and 170, a short-time rating is also provided for, and with the same permissible temperature-rise, it will be appreciated that the short-time rating is larger than the continuous rating.

The latest of the series of Rating Specifications issued by the B.E.S.A. is B.S.S. No. 173–1928 for D.C. Series-Wound Traction Motors. This is a revision of No. 173–1923. As stated before, the old B.S.S. No. 72 definitely excluded traction motors, as it was recognised that they presented a different problem. With traction, service conditions are very different indeed from the conditions which obtain when the motor is tested at the works. On the test-bed the motor is steadily loaded, and the only cooling is that by radiation from the cases, and that due to any cooling system incorporated in the motor design. In service the load is applied to the motor intermittently when the train is in motion, and cooling periods occur after the train has reached its maximum speed and is coasting, during braking, during station stops and while laying-over at the termini.

It will be noticed in B.S.S. No. 173–1928 that the permissible temperature-rises exceed those allowed for other types of electrical machinery. This is because the motors are much more efficiently cooled in service than on the test-bed.

B.S.S. No. 173–1928 requires a traction motor to be given two ratings—a continuous maximum rating and a one-hour rating. It is obvious that both these ratings are arbitrary—neither bears any real relation to service conditions. It may so happen, however, that in comparing two motors, their one-hour ratings may be similar, while their service performances are totally dissimilar—in that case the continuous ratings of the two motors would not agree. If, however, two motors have similar continuous and short-time ratings, it can reasonably be expected that they will perform similarly in service.

It would appear that any two ratings would be suitable for the purpose of comparing two traction motors, and the adoption of the C.M.R. by the B.E.S.A. is not necessarily an admission that it is the best basis. It is probably adopted merely to fall into line with Continental practice, and to secure an international agreement in the rating basis. The use of C.M.R. for traction motors is not inconsistent with the use of load-plus-overload rating for industrial motors, though it will be obvious that C.M.R. more nearly represents service requirements for motors in fixed positions than for motors mounted on a vehicle.

## A Pretty Problem.

The use of mercury arc rectifiers for railway traction substations is increasing, and the development of this apparatus is rapid. The time is not yet ripe for the preparation of a standard specification for them, but the rating will produce a pretty problem.

It is at present usual to adopt a 1-hour rating basis; the local heating of the anodes really determines the rating, and these get very hot with sustained load. Rectifier units are capable of very high momentary overloads, and will stand 300 per cent. momentary overcurrent, without distress—many manufacturers will guarantee at least 100 per cent. overload for 20 seconds each minute. It will be obvious that any continuous rating would be almost meaningless—if rated on a C.M.R. basis the possible momentary overloads would be of the order of 500–700 per cent. If and when it is published, a British Standard Specification for mercury arc rectifiers will be an interesting document.

In summing up the ratings adopted for British Standard Specifications, load-plus-overload rating is used where that rating represents the average load requirements of the machine and an allowance for overloads is required. The only point in favour of adopting continuous maximum rating in these cases is the attainment of uniformity throughout all rating specifications. It is, however, well understood by engineers that the electric motor possesses a characteristic not found

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in other sources of motive power—i.e., the inherent capacity to withstand sustained overloads. The principle of load-plus-overload rating is a recognition of this quality, and British engineers prefer the rating permitting overloads for this reason. However desirable it may be from a uniformity standpoint, it is probable that the electrical industry in this country will never accept continuous maximum rating for industrial motors and machines operating under similar conditions.

The above is an attempt to make clear the method of rating electrical machinery. Very many other problems are bound up with the rating, but these have not been dealt with here. In passing, however, perhaps, most discussion centres around the methods of measuring the temperature rise of the windings, and since temperature rise is the criterion of rating, its importance will be realised.

Enough has been said to make the reader realise that the rating of electrical machinery is an important problem, and that in any attempt to gain uniformity in the rating of particular types of machines in all countries, still more to get international agreement to one system of rating all electrical machines, the technical side of the problem must not obscure the psychological aspect. In conclusion, electrical engineers in this country owe a great debt to the British Engineering Standards Association for the great work it has just completed in publishing the series of Rating Specifications.

## BOOK REVIEWS.

**The Spectroscopy of the Extreme Ultra-Violet.** By THEODORE LYMAN, Ph.D. (London: Longmans, Green and Co.). Pp. vii+160. 10s. 6d. net.

This second edition reveals to what a tremendous extent investigations have been able to bridge the gap existing between electro-magnetic radiations in the ultra-violet and soft X-rays; in fact, the author shows that the gap no longer exists and that the extreme ultra-violet region of the spectrum is now a well recognised and important part of the spectrum.

The work is fully up to the standard of the other monographs on Physics edited by Sir J. J. Thomson and Dr. Frank Horton, in collecting within the confines of a book all the valuable references of a particular field of work, and presenting the subject in a lucid and authoritative manner.

Those familiar with the first edition of the work will readily recognise the tremendous amount of additional information given, the data provided being of especial interest to research workers in photo-electric, photo-chemical and photo-abiotic work, since the tables given supplement the spectroscopic data found in the ordinary reference tables.

Not the least valuable part of the book is the careful criticism of the methods employed in the spectroscopy of this region and the very practical comments made on the apparatus used.

From an engineer's point of view the subject is at present of comparatively little importance, but represents a contribution to exact knowledge, ready to be used at some later date.

To works physicists or students, however, the treatise is one which can be looked upon as a standard work of reference in the spectroscopy of a hitherto little known field, and forms a guide to further investigation of the subject. It should certainly find a ready place on the shelves in every scientific library.

W. J. JONES.

**Television.** By ALFRED DINSDALE, with a Foreword by Dr. J. A. FLEMING, F.R.S. (London: Television Press.) Pp. xx+180. 5s net.

This is a second and enlarged edition of a book on the same subject, written by the same author, but with a new publisher. In the foreword, Prof. Fleming states that in 1928 television is very much in the same stage of progress as wireless telegraphy was in the year 1900 or 1901, but that it may not take nearly so long to bring it to practical perfection, because many of the problems involved have already been solved.

In saying this, however, Prof. Fleming does not attempt to deal at all with the chief problem in television at present requiring solution, namely, the difficulty of dealing, by purely mechanical methods, with the transmission or reception of any but the simplest forms of images that can be split up into a comparatively small number of elements, such as single human faces; so that pictures of any complexity, requiring hundreds or thousands of elements, are altogether beyond the reach of the method.

Prof. Fleming is also careful to state that he writes purely from a scientific point of view, and is not to be taken as expressing any opinion that practical commercial achievement will necessarily follow on the lines indicated.

The book itself deals chiefly with the Baird system, which is probably described in greater detail than ever before; but also gives some information on the mechanical methods of television used in the Bell Telephone Laboratories, and by Francis Jenkins and Dr. Alexanderson in America; by Belin and Holweck, in France; by Mihaly, in Vienna; and by Szczepanik, the Pole. The book, however, does not give nearly as much information of all the work that has been done on the subject, as is contained in "La Télévision Electrique," a very erudite and impartial, and at the same time concise account, published by Dr. A. Dauvillier in the "Revue Générale de l'Electricité," of Paris, in its issue for January 7th, last; nor does it point out that there is really very little new in modern television methods, most of which are many years old, and have been described over and over again.

Though the cathode-rays method of receiving, due to Rosing and Holweck, is described in some detail, there is only a bare mention of Campbell Swinton's suggested use of cathode rays, both for receiving and transmitting, before the publication of the method by anyone else, and no account is given of the complete cathode-ray method described and illustrated by Mr. Swinton in his detailed papers in 1908, 1911 and 1924; while, though Mr. Zworykin, of the American Westinghouse Co., is mentioned and illustrated as the inventor of a photo-electric valve, no allusion is made to his patent of 1925, nor to that of the Frenchman, E. G. Schoultz, whose patent is of 1921, both of whom elaborated Mr. Swinton's cathode-ray method in considerable detail.

The book cannot, therefore, be described as a complete account of the subject, though no doubt it contains a large amount of interesting matter, much of it written and presented in a clear, attractive and popular manner.

T. B.

## BOOKS RECEIVED.

"Co-operation and Private Enterprise." By H. Clay. (London: Ernest Benn, Ltd.) Pp. 32. 6d. net.

"Wireless, the Modern Magic Carpet." By Ralph Stranger. (London: S. W. Partridge and Co.) Pp. viii+312. 3s. 6d. net.

"Alkaline Accumulators." By J. T. Crennell and F. M. Lea. (London: Longmans, Green and Co.) Pp. x+132. 10s. 6d. net.

"Heaviside's Electrical Circuit Theory." By Louis Cohen. (London: McGraw-Hill Publishing Co.) Pp. ix+169. 12s. 6d. net.

"Journal of the Institution of Electrical Engineers." Vol. 66, No. 383. (November.) (London: E. and F. N. Spon.) 10s. 6d. net.

"Definitions and Formulæ for Students (Electrical)." By P. Kemp. (London: Sir Isaac Pitman and Sons.) Pp. vii+37. 6d. net.

"Der Einflutz des cos $\phi$ auf die Tarifgestaltung der Elektrizitätswerke." By Hans Nissel. (Berlin: Julius Springer.) Pp. 54. 4.50 marks.

"Definitions and Formulæ for Students." (Heat Engines.) By Arnold Rimmer. (London: Sir Isaac Pitman and Sons.) Pp. v+32. 6d. net.

"Automaton, or the Future of the Mechanical Man." By H. Stafford Hatfield. (London: Kegan Paul, Trench, Trübner and Co.). Pp. 100. 2s. 6d. net.

"A Course in Electrical Engineering." Vol. II, Alternating Currents. By C. L. Dawes. (London: McGraw-Hill Publishing Co.) Pp. xvii+618. 20s. net.

"The A.B.C. of Storage Battery Measurement." By E. C. McKinnon. 2nd Edition. (Manchester: Chloride Electrical Storage Co.) Pp. 121. 3s. 6d. net.

"Electric Lines and Nets: Their Theory and Electrical Behaviour." By A. E. Kennelly. 2nd Edition. (London: McGraw-Hill Publishing Co.) Pp. viii+426. 25s. net.

"Electric Wiring: A Handbook for the Use of Wiremen and Students." By W. C. Clinton and E. H. Freeman. 8th Edition. (London: John Murray.) Pp. ix+260. 4s. 6d. net.

"Life and Work of Sir Norman Lockyer. By T. Mary Lockyer and Winifred L. Lockyer, with the assistance of Prof. H. Dingle. (London: Macmillan and Co.) Pp. xii+474. 18s. net.

"Wave Mechanics and the New Quantum Theory. By Prof. A. Haas. Translated from the German edition by L. W. Codd. (London: Constable and Co.) Pp. xviii+124. 7s. 6d. net.

"Manual of Electrical Undertakings and Directory of Officials, 1927–1928." Vol. XXXI. Compiled by Emile Garcke. Edited by F. C. Garrett. (London: Electrical Press.) Pp. 2005. 35s. net.

"Science Abstracts." Sections A and B. Vol. 31, Part 11, No. 371. (November.) Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single number, 3s.; annual subscription, 30s., or 50s. for both sections.

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# THE ATTENUATION OF WIRELESS WAVES OVER TOWNS.*

## Results of Experimental Work on London Broadcasting Station—Considerable Local Variations—Selective Absorption—Losses in Vertical Conductors—General Conclusions.

By R. H. BARFIELD, M.Sc. (Eng.) A.M.I.E.E., and G. H. MUNRO, M.Sc.

A PAPER was recently published dealing with the attenuation of wireless waves over land. The present paper is concerned with the absorption of wireless waves produced by their passage over a town.

The first section of the paper consists of a description of

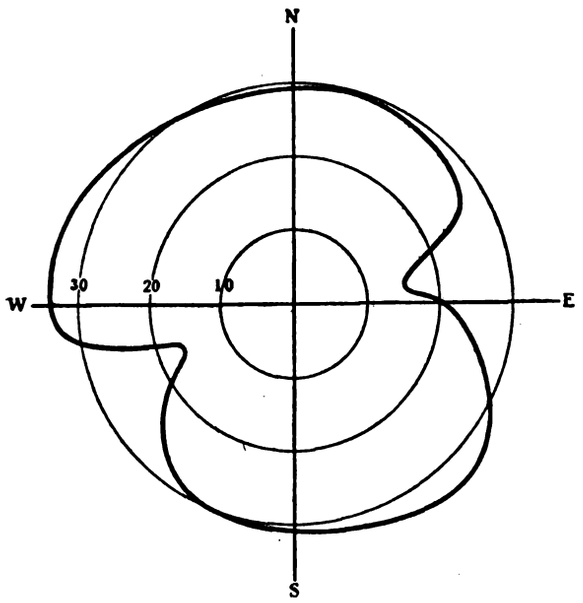


**Fig. 1.—Polar curve of signal strength of 2LO at 10 km. from transmitter (March 1927); intensities in millivolts per metre.**

experimental work. In determining the polar curve of 2LO, the London broadcasting station, an apparatus convenient in crowded districts was desirable. The receiver was therefore set up in a motor van with a frame coil fitted on top as a receiving aerial.

Fundamentally the method consists in comparing the strength of the received signal in the coil aerial with that of the signal from a local source, introduced into a dummy circuit having the same constants as the coil aerial. In the original paper the arrangement of the circuits is illustrated and described.

### Effect of Telephone Wires.

In order to obtain a polar curve of 2LO, observations were taken on sites on a radius of approximately 10 km. from the receiver. Readings were taken at intervals not greater than 10 deg. Local variations were considerable, in one case, at North Bromley, amounting to as much as 40% in two miles on an arc. Some experiments on the effect of trees, telephone wires, etc., were made. In one case, the minimum was more than 50% of the strength of the maximum beneath a set of telephone wires. In most cases the proximity of such objects had a flattening effect on the minimum. The polar curve of 2LO thus obtained is shown in Fig. 1. Marked diminutions in intensity are evident at positions slightly north of East, and slightly south of West.

Experiments to ascertain the change of attenuation with wave-length were also made, and in the original paper the results are illustrated by several graphs.

An extremely rapid falling-off in intensity with decrease in wave-length of the order of 4 : 1, for a wave-length change of 20 %, was noted. When the transmission is wholly over a dense town area there is a very marked increase of attenuation with frequency. Also when the transmission is over well-populated suburban areas there is evidence of selective absorption, apparently due to the number of receiving aerials all tuned to 361·4 m., the wave-length of the London broadcast station, 2LO.

The authors also include in the paper a theoretical discussion of results, such points as dielectric losses, selective absorption, energy absorbed by a mass of tuned aerials and shadow effects caused thereby, being dealt with. The appendix contains an experimental confirmation on short wave-lengths, of the phenomenon of selective absorption, and emphasises the difficulty of calculating the resultant field strength in a region influenced by re-radiation from receiving aerials.

The general conclusions arrived at by the authors are summarised as follows :—

The experimental results described have shown clearly that the attenuation of waves over a large town is different from the attenuation of waves over the country.

### Two Distinct Effects.

There appear to be two distinct effects, according to the nature of the surface which the waves traverse. Over the town itself the attenuation is determined by the absorption of energy in the vertical metal conductors, such as pipes of all kinds, electric wiring, steel frames, etc., and possibly by the dielectric losses in the bricks, cement, stone and woodwork. The particular feature of the attenuation is that it increases very rapidly with the frequency of the waves. Thus, when the amount of town traversed is of the order of 3 miles or more, the signal strength decreases as the fifth power of the wave-length over the range dealt with in these experiments (roughly the broadcast range). From a theoretical investigation, based on an extension of Sommerfeld's theory, this rapid change appears to be consistent with the assumption that the losses occur in vertical conductors.

It appears that tuned aerials occurring in the dense part of the town do not affect the attenuation, the energy they absorb being negligible compared with that absorbed by the masses of other conductors. This is no doubt due to the fact that such aerials are usually very inefficient and heavily screened.

Over the suburbs, however, the extra rapid rate of change of attenuation with wave-length disappears, but if there are aerials tuned to the same wave-length these play an important part.

The experiments show that a comparatively small area of about 5 km² may produce a selective decrease of signal strength to half its normal value, and that the wave-length for lowest signal strength is slightly below the wave-length to which the aerials are tuned. The actual position of the minimum appears to vary with the number of aerials traversed. An explanation of this effect is obtained by considering the shadow effect produced by the aerials as well as the energy they absorb, and a calculation based on rough estimates of the density of distribution and constants of typical aerials confirms that they should produce an appreciable effect.

The results can be used to a certain extent to discuss the effect of towns in connection with proposed schemes of broadcasting. Suppose a transmitter T is situated just outside a large town and works on two wave-lengths, 440 m. and 260 m. respectively. Consider two receivers "A" and "B," say 30 km. distant from the transmitter, one "A" placed so that the waves have to travel right across the town, the other "B" so that the waves travel free of the town. Assume that at "B" the intensity on 440 m. is 6 mV/metre, then at the same point, and with the same power radiated, it will be about 2 mV/metre on 260 m. At "A" the experiments show that on the higher wave the strength will be about the same as at "B," whereas on 260 m. it will drop to about 0·4 mV/metre.

In other words, it seems that, at the upper limit of the broadcasting range, towns have little effect, whereas on the lower range they cast a very decided shadow. Again, assuming now that the two wave-lengths were only about 20 m. apart, the field strength on the lower one might be appreciably affected by the aerials tuned to the upper wave-length, but that of the lower one would probably not be influenced to any great extent by any of the tuned aerials.

The work described was carried out as part of the programme of the Radio Research Board, and is published by permission of the Department of Scientific and Industrial Research.

* Abstract of a paper read before the Institution of Electrical Engineers.

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# ELECTRICAL EQUIPMENT OF X-RAY APPARATUS.*

## Developments in the Last Ten Years—Induction Coil Requirements—Points in Transformer Design—Use of Half-Wave Rectification.

By L. G. H. SARSFIELD, B.Sc. (Eng.), A.M.I.E.E.

DURING the past ten years the application and use of X-rays, not only in medical and surgical practice, but also in connection with scientific and industrial problems, has developed rapidly. A comprehensive research on the subject was inaugurated at Woolwich in 1917. The present range of X-ray equipment extends from the diminutive dental outfit through the many types employed in medical diagnosis and deep therapy to those designed specially for the examination of various materials and the inspection of finished articles. In the last category perhaps the highest achievement is the penetration of 4½ in. of steel, which has been performed by means of a powerful set in the Radiological Research Department, Woolwich.

The necessity for the co-operation in this field of medical men, physicists and electrical engineers was demonstrated at a joint meeting of the Institution, the Röntgen Society, and the Royal Society of Medicine in 1920.

In the next section of the paper the author discusses the necessary equipment. He points out that the gas tube has been largely superseded by the Coolidge type for X-ray work. The source of high potential may be either an induction coil or a transformer. The induction coil still finds favour for many forms of medical work, but there have been few developments in design during recent years. The transformer when first introduced was not popular, but can now be used with as much success as the induction coil, provided attention is paid to certain essential features in the design. A small transformer now commonly serves as the heating agent for the Coolidge tube, which in general requires a hot anode. The lower-voltage parts of an a.c. wave are of little value from a radiographic standpoint. Hence equipment is often so designed that only the region near the peak is utilised, or condensers are utilised to give a voltage which is substantially uniform.

The author briefly discusses the requirements of an induction coil for X-ray work. Sets are best worked from accumulators, and a form with a normal input of 1 100 W is described. Sets may, however, be adapted to work off the electricity supply mains. A peak output voltage near 100 000 V is usual. Specially constructed induction coils were, however, used by Coolidge with cascade connected cathode-ray tubes, working at 900 000 (peak) voltage.

As yet there is no British standard method of rating X-ray transformers. The necessary output depends on the capacity of the X-ray tube supplied. A universal medium focus Coolidge tube may be run at 140 000 V (peak) and 5 mA continuously, but will carry 20 mA for short periods. The deep therapy model is rated at 200 000 V (peak) and 50 mA. Rating also naturally depends on whether transformers have to operate intermittently or almost continuously during the day, as is the case in metallography and some other industrial applications.

Single-phase transformers are usually applied to X-ray work. Core type designs are most usual, though the shell type is also suitable in cases where the secondary winding is earthed at one end and where the p.d. is of the order of 100 000 V. Secondary windings applied for rectification, etc., and earthed at mid-point are conveniently divided into two halves.

### The Dessauer Principle.

The Dessauer principle has been applied to X-ray transformers made by one Continental firm. The primary windings, being supplied at low voltage, require no special precautions as regards insulation from the core, but an earthed shield between the primary and the secondary is advisable. The primary winding may also be earthed through a bank of lamps.

One German method of construction involves an air-insulated and air-cooled primary winding, and a secondary in oil. Primary taps are sometimes provided to permit voltage variation or to compensate for difference in line voltage. Variation in secondary voltage is usually effected by altering the voltage supplied to the primary, either by aid of an auto-transformer or a series resistance.

The author discusses in some detail methods of insulation, but remarks that the temperature of transformers used for X-ray work never reaches values which are usual for power transformers. Problems involved in the design of the secondary winding are discussed in detail, one point of interest being that it is a difficult matter to dry out a transformer with "wax-wound" coils, owing to the tendency of the wax to soften. X-ray transformers, being always cool, cannot be kept dry as easily as power transformers—hence the need for the use of thoroughly dry materials in construction. Diagrams are presented in the original paper showing typical methods of arranging coils and illustrating the temperature-rise of wax-wound coils. Reference is also made by the author to problems involved in "bushing," and to the selection of transformer coils. A section is also devoted to the design of filament heating transformers, suitable for the filaments of X-ray tubes, which require up to 5 A at 12 V, and rectifying valves which generally work at 7-10 A for the same drop of potential.

### Rectification.

The next section of the paper is devoted to rectification. Where cold-anode self-rectification is not relied upon, the rectifier is an important intermediary between the high voltage transformer and the X-ray tube. Valve tubes are now extensively used for X-ray work. Gas discharge tubes, though much cheaper, have given place to the hot cathode type, which are much steadier in action. Many of these tubes are rated to carry a maximum current of 100 mA and will withstand 100 000 V peak inverse—or even 150 000. One very recent model is rated for 200 mA, and 200 000 V (peak). For most purposes half-wave rectification is sufficient, but whole wave rectification with twice the number of valves is adopted on some outfits.

## THE DISCUSSION.

The paper was discussed at a joint meeting with the British Institute of Radiology, when Dr. G. W. C. KAYE, dealing with the trend and development of X-ray equipment, remarked upon the predominance of the self-protected hot cathode tube and the relative insignificance of the gas tube. Another point was the almost universal use of the hot cathode valve and the virtual disappearance of the mechanical rectifier for high tension rectification. High tension valve rectification, curiously enough, was almost unknown in the States. Another point was the insignificant position of the induction coil as compared with a few years ago. There were, of course, still a great many induction coil outfits in use, particularly in this country, but such a thing was never seen now in the States. Apart from this, the induction coil still had its uses for specialist purposes. He concluded by referring to two big international steps which were taken at Stockholm. One was the adoption of international protective recommendations. It had been possible to get all the nations to agree on common measures of protection of an X-ray unit of intensity. That was also agreed upon internationally. As regards this country, the National Physical Laboratory hoped shortly to be in a position to calibrate ionisation chambers and X-ray dose meters in the new unit, which was very appropriately christened after the great discoverer, Röntgen.

Mr. B. J. LEGGETT expressed the opinion that the British apparatus is very sound, but he thought that many of the transformers—at least those of which he had seen the inside—would horrify a transformer designer. Standardisation, which helped in mass production, did not exist in the X-ray world. A manufacturer produced a screen stand for one doctor; the next doctor came along and wanted something altered, and a third doctor came along and did not like it. So the poor manufacturer had very little chance of producing economically and, therefore, of doing any research work. Again, unlike normal commercial work, there was very little credit given in the X-ray trade, which again took away funds for research work. The author was not a metal tube advocate, but he

* Abstract of a Paper read before the Institution of Electrical Engineers.

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would like to see more work done at the Royal Arsenal on metal tube work, for the reason that the metal tube revolutionised the manufacture of X-ray apparatus.

Mr. H. B. GOUGH said the question of production of high voltages had received a good deal of attention and manufacturers were now producing a good apparatus suitable for all types of work. The time had come now to turn attention to the question of what might be called safety apparatus. In practically all X-ray departments somewhere or other it was possible to touch a high tension lead probably carrying anything up to 50 000 or 60 000 V. The problem was being tackled in several ways. First, the X-ray tube was being immersed in the same tank as the transformer. That was excellent, but it only went a short way. A second method was to enclose the X-ray tube in such high tension leads as was possible with an earth metal grid. This was a cumbersome apparatus and tended towards difficulties in the way of radiography. A third method, by which probably we should find the eventual solution, was in the protection of the X-ray tube, for example, the Phillips portable tube. That tube was fully enclosed in metal and earthed, and was an absolutely safe installation.

## Manufacturers and Efficiency.

Mr. R. S. WRIGHT said the author rather attacked manufacturers for neglecting efficiency, on the score that the X-ray tube is so inefficient that the efficiency of transformers did not matter. He did not think the author was quite fair there, and he had not heard any responsible manufacturer put that forward as an excuse. As a matter of fact, the author was speaking of things as they were, and not as they are, and it could be said with confidence that X-ray manufacturers attached importance to efficiency as soon as efficiency became of real importance. The author had referred in his paper to a mechanical rectifier with a rubber contact. That might be beautiful in Woolwich Arsenal, with an expert staff of engineers always looking after their plant, but putting such a rectifier into an average hospital, where the plant was expected to run every day and be attended to about once in two years, those mechanical brushes would be soon worn out, and we should come back to spark gap rectification after all.

Mr. C. H. HOLBEACH considered that an induction regulator, far from being clumsy, was rather fast in operating when one had to gear the control so as to produce an even variation in the filament circuit of an X-ray tube, and there was no question that the induction regulator was a far better instrument electrically than a resistance, because a resistance, however well designed, introduced variables in the way of rubbing contacts, oxidising surfaces, and so forth. With reference to the rating of transformers, he entirely agreed with the author that it would be of no value to rate transformers merely electrically on the transformers alone, and it was essential when comparing one transformer against another to incorporate the electrifying system of an X-ray tube. A given transformer would have totally different characteristics on different types of rectification systems.

Mr. A. C. GUNSTAN made a claim on behalf of the British industry. The author had pointed out that one German firm used oil-filled insulators, but for five years we had used oil-filled porcelain insulators in this country with complete success. Further, in this country we had confined ourselves to metal tubes for the last two years. The question of a time switch was interesting, but the type shown in the paper was hardly what was wanted, the problem being to erect a set which would allow current to pass for $\frac{1}{10}$ second, or thereabouts, switching off at the end of that time.

Mr. L. G. H. SARSFIELD, in a brief reply, said it was clear that the point of view of the metal radiographer and the point of view of the medical radiographer at present did not coincide. At Woolwich they would be very glad if they could get metal tubes for high voltages, so that they could use them on metal examination problems. Time switches had been mentioned. He had shown a picture of a time switch now in operation on an industrial equipment, and arranged for long periods. Short period time switches were already available, but there was an absence of long time period switches. The Warren synchronous motor offered a solution to this, and he himself had obtained one solution in an instrument that he had designed, and now had in operation.

ART IN ADVERTISING.

*THE phrase "Art in Advertising" too often means the use of a pretty picture which adds nothing of value to the advertisement which it illustrates. The truer art, in which a product is shown in its natural surroundings, is well exemplified in this picture of the Philips all-electric receiver, which we reproduce by the courtesy of Arks Publicity, Ltd.*


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# INVEST IN YOUR BUSINESS.

## How Electrical Engineers Can Profit from Study of the Financial Side of the Industry—Excellent Facilities for Noting Promising Developments—Some Practical Examples—Hints to the Engineer-Investor.

(BY AN ELECTRICAL ENGINEER)

ENGINEERS, in common with other studious persons, have the reputation of being oblivious of such practical matters as current literature, politics, legal and international outlooks, and, in particular, financial affairs. It is with the last point that this article is intended to deal.

The engineer entrusts his brains to the electrical industry, and from day to day he is constantly improving the technical and economic position and prospects of that industry. He is continually adding to his own store of valuable knowledge, a highly specialised knowledge which many experienced Stock Exchange operators long for in vain. Why should not the engineer use his opportunities for his own financial benefit instead of "grousing" about low salaries, high cost of living, etc. ?

This can be done individually and collectively, and for the information of readers who may be interested, the following suggestions are the outcome of actual experience of the writer, who long ago realised that to be "technical" only, one would secure but a part of that "reward that sweeteneth labour." The said writer therefore devoted much spare time to the study of the financial side of the electrical industry, with very profitable results.

Take up the study of logic ; follow this up with a course of economics. This can be easily done in any large town, but those individuals who are not conveniently situated in this respect may do much by intelligent perusal of the printed word. As the student progresses he must acquaint himself with accountancy (in order to facilitate the reading of balance-sheets), company law, and general Stock Exchange procedure.

The foregoing may appear to be an unnecessarily long list of qualifications to have before "commencing to deal," but it must be distinctly understood that this knowledge must be acquired, or failure is almost inevitable.

Some people imagine that they have a "flair" for doing the right thing at the right time, especially in connection with Stock Exchange securities ; but alas ! how seldom is success to be obtained in this way. This will be confirmed by any experienced operator, banker, or stockbroker.

Correct reading of the "signs of the times" is a habit to be cultivated. As an example one may look at the inception of automatic telephony, and the Strowger system in particular. Installations were made at Epsom and other places ; then came a period of quiescence while the system was on trial in this country. The Post Office had some of their most brilliant men on the job, whilst the A.T.M. Co. and others were working hard on improvements, and beginning an intensive training of staff to deal with the new industry. Then came the Leeds exchange, which was at that time the largest installation in Great Britain. The progress and success of automatic telephony is now a household word. It must be emphasised that the foregoing is merely given as an example ; and it is suggested that A.T.M. shares should have been bought as a lock-up immediately the Leeds installation was ordered, or, for the less courageous spirits, as soon as its success was known.

### North Wales Power.

Let us now look at a few examples in the electricity supply industry itself, ancient history being eschewed as it is of little practicable value at the present time. During 1927 the writer visited North Wales on holiday bent, and was greatly impressed by the possibilities of the North Wales Power Co., and by the new work in progress which was visible to the trained eye. Conversation with all sorts of people left no doubt as to the success awaiting the company. On returning to office life it was an easy matter to look up and tabulate all issued details of the company's affairs, description of its area, power plant, etc. It then became obvious that the company's securities offered scope for early improvement. This is still the case, and the recent official opening of "Maentwrog" should be another "sign of the times" to the man-in-the-street, as well as to the regular Stock Exchange operator. My point is that the trained and synchronised brain of the engineer should have realised these possibilities earlier, with resulting financial benefit.

Many similar instances could be quoted to-day of undertakings with excellent prospects. It may be taken as a general rule that technical progress, combined with honest financial administration, should characterise the concerns which offer the greatest opportunities to the engineer investor.

Definite instances may be given, e.g.—

(1) The Newcastle Electric Supply Co., with its low-temperature carbonisation experiments, and its truly wonderful area.

(2) The Scottish Power Co., now getting into its stride with its water power project.

(3) Those selected stations which the trained engineer will see must expand in connection with the "grid," by reason of their geographical position, water, coal supply, load proximity, and, most important of all, their location to the junction points of the grid lines. In this category there are still some small companies so placed which must benefit for the reasons named, or, what is far more likely, their larger neighbours will cast longing eyes upon their undertakings and eventually pay a good price to secure control. This, in other words, means a "plum" for the shareholders of the small companies. A typical example of this kind may be seen in the Northampton Electric Light and Power Co.

### Manufacturing Opportunities.

The manufacturing section of the electrical industry also offers great opportunities to the discriminating engineer-investor, who can note the orders secured, general efficiency and progress made by the various firms. Special attention may be directed to the cable manufacturing companies, and the most successful firm of boilermakers.

So far, the writer has dealt with some possibilities open to the individual, but let us now look at the infinitely greater prospects that open when the engineer-investor learns to pool his knowledge with his confrères.

He should be able to get timely hints of increasing or decreasing trade ; learn if the business in hand is of a profitable kind, or merely taken to keep the workshops employed ; hear of new inventions, processes and their probable effect on the companies' finances ; get early tidings of contemplated amalgamations with other firms ; hear of probable changes to be made in dividends ; and discuss possible alteration of a firm's financial fortunes caused by the death or loss of some valuable employee or member of the firm.

All the above advantages can usually be enjoyed by the intelligent engineer, and are legitimate tools to use for his own betterment, provided always that he has sufficient confidence in his own judgment.

In conclusion, the would-be successful engineer-investor must use his scientific training to enable him to buy or sell according to merit every time. But—always buy shares through a bank or from an authorised member of the Stock Exchange ; never be tempted to gamble by dealing in options, margins, etc. ; and never have any dealings with a "bucket-shop."

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### PUBLIC LIGHTING ENGINEERS.

At a recent meeting of Council of the Association of Public Lighting Engineers, the death of Mr. Noah Wright (president-elect) was reported. Steps were taken to fill the vacancy, the choice falling unanimously on Mr. S. B. Langlands, of Glasgow.

The Council also considered afresh the invitation received at the Sheffield Meeting from the Bournemouth Corporation for the Association to hold its annual meeting (1929) in their town, in view of the then president-elect being their officer. As the result of communications with the Corporation, the Council has decided to hold its next annual meeting and conference there under the presidency of Mr. Langlands ; also to hold an exhibition of Public Lighting Appliances from September 9th to 12th.

In connection with the Exhibition of Public Lighting Appliances, those firms wishing to participate should notify Mr. W. J. Liberty, 68, Victoria Street, London, S.W.1.

The Council decided to hold a general meeting of the Association at the British Industries Fair at Birmingham during the third week in February, 1929. Particulars of this meeting will be issued later.

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# DOMESTIC ELECTRICAL & RADIO APPLIANCES.

## Some of the Appliances and Fittings which Have Recently Been Placed on the Market—Many New Cookers and Fires—Items for the Wireless Stockist.

A NEW fire which is being marketed under the trade name "Rippleray" by BEST AND LLOYD, LTD., Handsworth, Birmingham, incorporates several noteworthy features. The makers have got away from the customary method of imitating live coals, using a large glass screen at the rear of the fire to convey the abstract qualities of heat by means of a glowing

A cluster of icicle shades by H. G. Ascher, Ltd., further details of which are given on the next page.

flame-like pattern, always moving and changing. This is achieved in an ingenious manner by the use of what is termed a pulsemeter. The pulsemeter consists of two glass bulbs partly filled with water and hermetically sealed, being connected by a short glass tube. This is suspended by means of two spring clips above a 30 W metal filament lamp. The water is agitated by the difference in temperature between one bulb, which is heated by the lamp, and the other bulb which is cooled by an upward current of air. The light from the lamp passes through the bubbling water in the first bulb, and the broken up image of the filaments is projected on the glass screen, where it shows as a system of flame-like lines. The effect is heightened by moulded ripples on the surface of the glass and further by reflection from the facets of sheet metal which form the back of the fire. The water does not boil, and the action is constant so long as the lamp is alight. The pulsemeter is easily accessible and so are the lamp and heating elements. The fire is ventilated in such a manner that the handle and the whole of the rear portion can always be touched in comfort. The fire is designed on bold modernist lines in two styles, venetian bronze and armour bright.

PHILIPS LAMPS, LTD., of Charing Cross Road, W.C., whose candle-shaped Christmas tree lamps have in the past provided a good selling line at this season of the year, have now supplemented them with a set of olive shaped lamps. These are packed in colourful and attractive boxes, designed so as to lend themselves to the correct Yuletide atmosphere in those shop windows in which they are displayed. The lamps are supplied in sets of 9 and 18, one spare being included with the small set, and two with the large set. A supply of flex is provided, and the lamps are wired in series. The small outfit is suitable for 100–130 V circuits and the large outfit for 200-260 V circuits. Among the uses for this type of lamp at Christmas time may be mentioned Christmas tree decoration, lighting the home, and shop window decoration. Bakelite holders are provided and lamps in six different colours are available.

DOMESTIC ELECTRIFICATION, LTD., of Townsend House, Greycoat Place, London, S.W.1, has placed on the market an ornamental electric fire which can be used to replace the ordinary coal or gas fire in already existing fireplaces. This fire can be supplied in ten different finishes to harmonise with any desired scheme of room decoration and is listed as type R.F.C. The heating elements employed are the same as those used in the company's two and three kW general utility fires and they consist of resistance coils made of nickel chrome wire on a fireclay base resting on a series of refractory supports, so arranged that there is free radiation of the coils on each other as well as direct radiation from each adjacent coil. The radiant heat emitted is reflected over a large area by a polished reflector. A detachable ornamental fender with a polished top gives a very pleasing reflection of the firebars.

Among the latest cookers to reach the market is the model No. 505 of the JACKSON ELECTRIC STOVE CO., LTD., of 143, Sloane Street, London, S.W.1. This cooker, known as the "Jackson Junior," is designed to cook a meal consisting of a joint, two vegetables and sweets at a consumption of 2½ units. The loading of the combined grill-boiling plate (9 in. by 7½ in.), giving a grill space of 10 in. by 8 in. is 1 800 W; that for the oven is 1 360 W, giving a total loading of 3 160 W. The makers state that the oven will cook a 5 lb. leg of mutton and a pudding at the same time, on account of the fact that the heating elements are so arranged as to give a maximum cooking space of 10 in. by 13 in. by 13 in. The grill-boiling plate, which, it will be understood, operates independently of the oven will, it is claimed, keep four large saucepans boiling, and toast and grill at the same time. The complete cooker may be stood upon a low bench or, if desired, a set of cast legs, including a shelf forming a pot rack, may be obtained. The overall height of the cooker is 22½ in., or 39½ in. with legs, while the width and depth are 19½ in. and 15½ in respectively.

Two important additions have recently been made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C., to the wide range of "Magnet" industrial cooking appliances. One of these is a small pattern double oven range. It is a complete cooking outfit suitable for a small boarding house or restaurant, where a limited number of meals are provided. The body of the oven is constructed of sheet steel, double cased and lagged with heat-resisting material, the doors, door-frames, hob-table, mountings, etc., being of cast iron. Each oven is fitted with suitable grid shelves, drip pans, etc., and lined plain sheet steel or vitreous enamel as desired. On the hob-table over the ovens are fitted boiling plates and a griller-toaster. The overall dimensions are 48 in. by 33 in. by 22 in. Each oven measures 19 in. by 15 in. by 15 in., and is loaded to 3·2 kW. The hob-table carries two 12 in. by 8 in. plates, each loaded to 3·2 kW, and two 8 in. by 6 in. plates each loaded to 1·6 kW. These plates are of the totally enclosed high temperature pattern. The ovens and plates are arranged for three-heat control by means of suitable switches mounted on the front. The griller-toaster measures 21 in. by 10 in. It is loaded to 3·6 kW, and arranged for single heat only. The total loading is 19·6 kW. The other addition to the "Magnet" range is an electric scone plate. This plate has been designed for the purpose of baking scones and similar work. It is built in cast and wrought iron, has totally enclosed elements, and is arranged for three-heat control. The overall dimensions are 5 ft. by 2 ft. 6 in. by 2 ft. 11 in., and the loading is 12 kW.

The unusual but attractive electric lighting fittings of H. G. ASCHER, LTD., of 4/8, Acomb Street, C.-on-M., Manchester, are designed for use collectively or individually as desired. The icicle shades, as the name implies, resemble icicles of glass, and with the different sizes available there appears to be a wide range of effects which may be obtained; for instance, the 24 in. icicle shade surrounded by icicles of the smaller sizes makes an attractive centrepiece for dance halls, theatres, etc., while the icicle ceiling bowl with three, or perhaps four, of the small icicles makes a dainty fitting for a drawing room. Another combination which suggests itself is a silk shade in the centre surrounded by icicles of different sizes, for private lighting, the tensity of the light giving varying effects. The same fittings also suggest themselves for use as window lighting units, the weather conditions at this time of the year

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lending themselves to wintry trims, where both the icicle shades and bowls would be of considerable assistance. On the other hand coolness may be suggested by the same means during the summer months. In spite of the fact that the shades resemble ice, the effect produced by a suitable lamp is distinctly pleasing. By the introduction of coloured light all manner of attractive schemes can be evolved for both the lighting of the home or of public halls. The icicle shades are made in four different lengths, namely, 9½ in., 14 in., 18 in. and 24 in., while the ceiling bowls are made in diameters of 10 in., 12 in. and 14 in. The fittings for both types of shade are finished in oxydised copper and silver. The London showrooms are at Messrs. PLOWMAN AND BLACKETT, 40/44, Holborn Viaduct, E.C.1, and in Glasgow, Messrs. EDWARD A. CHISHOLM, 16A, Princes Square, C.1.

An electric fire for which 68% radiation efficiency is claimed, has been introduced by FERRANTI, LTD., Hollinwood, Lancs. The model which is made in four different designs, employs two bar elements with a full loading of approximately 2½ kW. Two-heat control is fitted and a chromium plated reflector is common to all models. A special model of the same fire is also available for use in a hearth recess.

An interesting machine for hotel and domestic use, which has been put on the market by the WASHING-UP MACHINE CO., LTD., 34, Fulham Road, London, S.W.3, is the "Silent Gem" washing-up machine. This is an electrically-driven appliance built of polished rustless silveroid with plated castings, fitted with a motor of well-known make, for the express purpose of washing dishes. Wherever desired electric water heaters may be fitted. The height of the machine is 2 ft. 3 in., the width with trays folded in is 2 ft., while the depth from back to front is 1 ft. 2 ins. From the illustration which we give on page 712, the compact and serviceable appearance of the machine will be readily appreciated.

All the latest designs are incorporated in the range of electric floor standards offered by JOSEPH TOMKYS AND SON, Walsall Street, Wolverhampton. Some particularly attractive selling lines are in Jacobean oak or mahogany. Each article is supplied complete with switch holder and flex, and the standards are well made. Attractive wooden candlesticks, electrically fitted, are also offered, and the range of shades includes artistic designs in Liberty satin and plain silk, with plain border; some Jap silk designs, with bead trimmings and very novel plain and fancy panel effects with bullion trimmings. All are made in 20 in., and any colours can be supplied.

The UTILITY ELECTRICAL CO., Grosvenor Street Works, Wolverhampton, is now manufacturing a two-cell focussing searchlight torch, No. 4, which has many advantages over the general run. The torch is provided with a strong switch which can be operated by one hand, for momentary and permanent lighting, while the means for focussing is provided by turning in either direction the threaded fitting immediately above switch. An octagonal lens ring prevents rolling. A bevelled plate glass lens is fitted, together with a silver-plated reflector. The solid drawn (seamless) brass body with brass fittings throughout, gives provision for carrying one spare bulb. The torch is heavily nickel-plated and polished. Other lines by the same company include all-brass cycle and inspection lamps including rear lamps for cycles and motor cycles, with powerful red lens, weatherproof switches and twin flex, and connections suitable for either strip or screw battery terminals. The all-brass inspection or reading lamp is on similar lines, but provided with button hook attachment. Battery containers in leather or waterproof fabric are supplied for these lamps.

Those electrical contractors who have hitherto experienced difficulty in bending close-joint conduit, will be interested in a device obtainable from the SPLITUBENDER CO. (L. W. Hipwell), 73, Kingston Hill, Surrey, which, it is claimed, will bend ⅜ in. split tube without damage. The bender provides for the seam of the tubing to lie on the outer curve of the bend, thus permitting wires to be pulled through without damage to the insulating covering. The former is grooved to accommodate the tube to be bent and is fitted with an adjustable stop which can be set to allow the angle of the bend required. A slide-in locking clamp is provided for holding the tube in the correct position, and "loading coils" are inserted in that portion of the tube to be bent. A distance gauge for positioning the coil is also provided. The illustration which we give on page 721 indicates how the device is used.

We have received from Mr. H. F. MONDAY, of 113, Clarendon Park Road, Leicester, the manufacturer, details of the "M of L" tongue splitter. This tool has been designed to split the tongues of floor boards without loss of time and without marking them, and is intended to replace the chisel or pad saw method. The tubular steel body of the tool has cross handles and a steel breast plate for applying pressure, while a circular knife is fitted to the brass head which is inserted between the boards. The workman using the tool is required to apply slight pressure to the breast plate while his assistant turns the circular knife by means of a separate handle fitted with a universal joint. We understand that the tool makes a clean cut of the tongue. If necessary one man can work this tool, but it is easier if the handle is turned by a second person. The agents for London and overseas are H. H. WILLIAMS, LTD., 79, Queen Victoria Street, London, E.C.4.

The industrial double oven range of the General Electric Co., Ltd.

A G.E.C. scone plate which has also been designed for industrial purposes.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C., has drawn our attention to a range of new modern style electric light fittings recently introduced. Many of these new designs are of specially striking appearance, a number of them are constructed of the new Perlique form of pressed glassware, while others are fashioned from etched and tinted glassware with appropriate and well-finished metal mounts. Details have also been received of a range of new wrought-iron metal work and etched glass pendants. These strike a new note in modern fittings design and since the metal work is oxidised it possesses rust resisting properties. A new range of wrought-iron floor standards has also been introduced. These are of particularly handsome design and finish.

Following on the designs of Andia loudspeakers which took the form of ornaments, such as birds, children, dwarfs, etc., the ARTANDIA CO., LTD., 38, Bedford Street, London, W.C.2, has now introduced a range of instruments which takes the shape of table lamp standards. These are now being demonstrated at one of the London stores and make an attractive instrument. The lamp standards, fitted, of course, with lamps for connection to the supply mains, are of the ornamental type and contain the loud speaker unit. The sound-producing portion is fitted with a small hood and over this the shade of the lamp is hung. Another novel design which these instruments take is that of a waste-paper basket, and though at the moment a moving coil drive is not incorporated in any of the designs, we understand that a suitable model to carry the necessarily bigger sound-producing unit, is under consideration.

PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, have just place on the market a two-valve receiver, which has been designed to operate from a.c. mains, h.t., l.t., and grid bias being taken therefrom. Although the receiver is primarily intended for local station reception it will, under favourable conditions, "bring in" other stations. A special detector and Pentode valve are incorporated.

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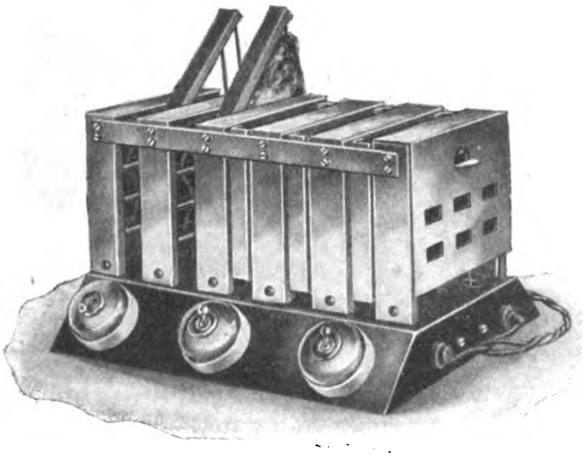
Inductance coils which have been specially designed for incorporation in the "Mullard Master 3" and "Furzedown Four" wireless receivers have been placed on the market by GENT AND CO., LTD., Faraday Works, Leicester, under the name of "Tangent C.W." coils. These are wound on bakelite formers and cover (in one coil) 250 to 550 meters and 1 000 to 2 000 meters, the necessary change over being accomplished by means of a switch which may be located on the front of the panel. Adequate reaction effects are provided on each winding. We understand that other coils, such as the so-called Reinartz aerial coil, which is now so popular, and split primary high-frequency transformers are in course of production.

Among the latest products of E. R. MORTON, LTD., 117, Charlotte Street, London, W.1, is a static arrester for use in connection with domestic wireless installations, known as the "Wirt" arrester. This is a simple device which, while affording direct aerial and earth connections to the set also provides without switches a low resistance circuit to earth for high pressures. The static passage to earth is through an air gap, which, by virtue of the inductance in the aerial circuit, will generally be taken by atmospheric discharges. The air gap is enclosed in a bakelite moulding, protected with a large petticoat; a galvanised bracket is provided for fixing. The device appears to be more fool-proof than most of those appliances incorporating switches and designed for the same purpose. It resembles somewhat the arrester used in commercial installations.

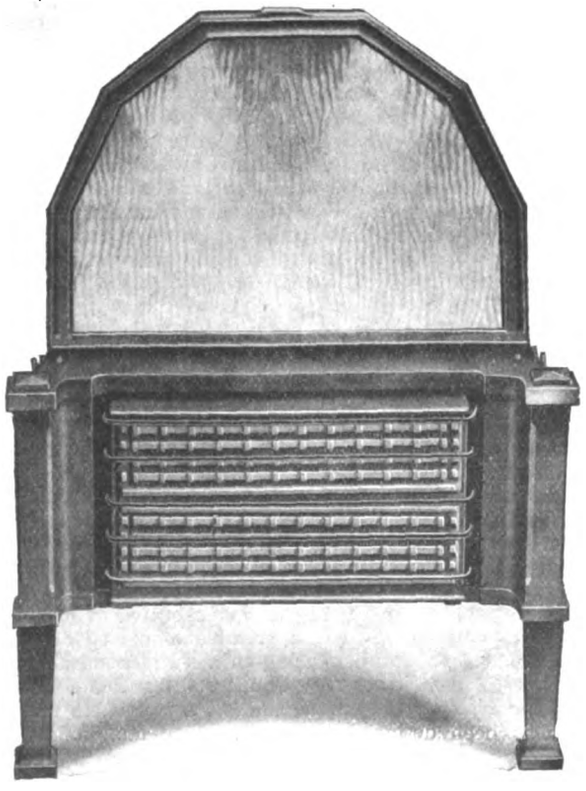
We have received from SOLDERING FLUIDS, LTD., of Baythorne Street, London, E.3, a sample tin of "Bon" which is a colourless liquid and provides a simple means of soldering without fluxes. It is, we are informed, a British product, and in a number of practical tests with wire, sheet metal, etc., it behaved in accordance with all that is claimed for it. Its simple use should appeal to radio enthusiasts and all those whose soldering experience is confined to small work. The liquid is also suitable for big jobs, and we understand that some of the users of Bon include shipping companies, electricity works, municipalities, instrument makers, and the like.

L. MCMICHAEL, LTD., of London, have developed a new portable equipment which is of Christmas interest, while to the home constructor the binocular type h.f. chokes will make appeal. McMichaels have developed a number of new lines of a type suitable for presents, many of them being subsequent to the National Radio Exhibition. The CELESTION RADIO CO., Victoria St., S.W., also offer equipment for Christmas trade, in that the range of loud speakers available covers practically every need. No new models have been introduced since the Olympia Show, present designs satisfying the present demand.



The "M 6" toaster by the Electrical Utilities Co., Ltd.

The tongue splitting tool for floor-boards by Mr. H. F. Monday.



The "Ripperay" fire by Best and Lloyd, Ltd.

The washing-up machine introduced by the Washing-up Machine Co., Ltd.

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# POWER FACTOR TARIFFS.

## Problems Discussed at I.E.E. Informal Meeting.

AT the informal meeting of the Institution of Electrical Engineers held in London on December 10th, Mr. W. E. Rogers in the chair, Mr. E. W. Dorey opened a discussion on "Power Factor Tariffs and Methods of Metering."

Mr. Dorey said the improvement of power factor is to-day receiving more consideration than ever, but it is very desirable that some unanimity of opinion be arrived at as to the most suitable form of tariff and the best method of metering for it. Up and down the country all imaginable forms of tariffs for power loads are in operation, and it is difficult to understand why an industry of the importance of electricity supply cannot devise methods of charging that are more uniform and intelligible to the consumer.

Power factor tariffs in force in Great Britain may be divided into two main classes :—

CLASS I.—A two-part tariff incorporating a monthly, quarterly, or annual charge per kVA of maximum demand, or an equivalent tariff based on kW demand, adjusted to kVA in accordance with the power factor of the load.

CLASS II.—A tariff incorporating a power factor bonus and penalty clause forming an addition to any standard two-part or flat rate tariff.

Under these two classes an extraordinary number and variety of scales of charges were instanced. Mr. Dorey thought that many supply undertakings had evaded the problem of power factor, and would have been compelled to operate more efficiently if they not been in more or less sheltered positions. Admittedly, the consumer is responsible for the low power factor, but it is not reasonable that the absence of a power factor bonus or penalty clause should permit the offending consumer to penalise the whole undertaking.

Mr. Arthur Wright said that it had been found that where a bonus was given for good power factor on maximum demand it induced users to put in correctors for the peak and to disconnect when not on maximum demand, with the result that the power factor was generally bad and the whole undertaking suffered. It would seem that good average power factor was required, but this was very obscure.

In the U.S.A. they were becoming perplexed by the multitude of tiny motors in refrigerators. It was not possible to put in two meters for a load of this nature, and the speaker wondered if a remedy was the kilovolt amperehour meter.

Mr. E. W. Hill said that, in a sense, the consumer was innocent, and it was not his fault that the supply gave him energy which he did not make use of. We should avoid the psychological effect of the term "penalty," and stress the inducements to good power factor.

Messrs. J. R. Bedford, D. J. Bolton, A. F. Harmer, W. Holmes, H. H. Jaques, A. G. Kemsley, A. N. D. Kerr, W. E. Lang, G. D. Malcolm, W. E. Rogers, J. F. Shipley, G. F. Shotter and S. P. Squire also spoke.

# CHRISTMAS GREETINGS.

THE following are among the early Christmas greetings received from friends in the industry :—

An attractive card, tied with ribbon in the regimental colours, from Lt.-Col. C. H. S. Evans and the officers of the 27th (London) A.A., Battalion, R.E. (T.A.). Inside the card is a picture of the inspection by H.R.H. the Duke of York at the opening of the Battalion's headquarters last June.

A card, personally signed by Lord Bective and Mr. Hulance, from the Bective Electrical Co., Ltd. On the outside is a drawing of Leeds Castle, one of the firm's 1928 installation contracts, and inside, in addition to the normal greetings, is the following :—

"May the bells slip-ring merrily in every ohm from pole to pole.

"May there generate a positive good Christmas feeling to negative the working load.

"May feeders plug-in with knife switch to joints and lead, on to a blow-out of current fare ;

"May there be a bus-bar for liquid starters with full capacity for single and double poles ;

"May Milli-Ampere (*v*) amp. Farad in a frequency of pressure, and may Henry both take Meg-ohm and give Sal-Ammoniac a step-up ;

"May the juice flow in continuous series, and watt is more, may we even arc the daily herald angels sing ;

"But should your circuit breaker trip with the high tension try frigidaire and avoid reaction."

# SALES DEVELOPMENT.

## Rôle of Advertising in Developing Distribution and Consumption.

SIR ERNEST BENN was the principal guest at the December luncheon of the Engineering Section of the Incorporated Society of British Advertisers, held at the First Avenue Hotel, London, on December 14th, Mr. J. Taffs in the chair.

Sir Ernest BENN, dealing with "The Possibilities of Advertising," pointed out that with improved facilities for education the population of this country was prepared for a better standard of living. The work of the I.S.B.A. was to give a practical answer to the demand for better things which this standard demanded. For many years we had been developing the art of production. Now we had reached a stage where we knew almost too much about it, and our productive facilities threatened to become embarrassing. The immediate and future task was, therefore, to develop the business of distribution and consumption ; and in this development advertising was destined to play a vital part.

One of the mistakes of the past century was the false value that had been assigned to the part that labour played in the production of wealth. It was necessary to realise that exchange was the most important part of wealth, and that without official sales organisations the labour put into a product was virtually useless. If the general public could be made to realise this they would then perceive that advertising was not merely a "trimming" for which the consumer paid, but rather a virtual necessity in the proper distribution and exchange of commodities and wealth.

We suffered to-day from the prevalence of the idea that advertising was a stunt which only the merchant princes could afford, and while this view persisted advertising could not take its proper place in the normal life of the people.

Sir Ernest doubted whether a business could be found which was even 30% developed. If this were true, advertising must hold tremendous possibilities. The possibilities of retail advertising were almost immeasurably great.

There was talk of over-trading, over-production, and overstocking, but the fallacy of this notion was obvious, if we could only realise that every little bit of business done by anyone, anywhere, at any moment, inevitably led to another business transaction by someone else.

In the discussion, Mr. F. W. GOODENOUGH agreed that we were suffering from under-selling. Mr. J. TAFFS said Sir Ernest Benn's remarks provided food for serious thought, particularly towards appreciation of the great constructive force of advertising. Other speakers included Messrs. Dadd, Harker, Luke, Morris, Rivington and Commander Ellis.

# THE NATIONAL REGISTER.

## Applications Accepted at December Meeting of Executive.

AT the December meeting of the Executive Committee of the National Register of Electrical Installation Contractors, held on December 14th, at the Institution of Electrical Engineers, twelve applications for registration were accepted. At the same meeting six applications were declined. It is understood that there is still a large number of applications undergoing investigation by the Local Advisory Committees.

The names and addresses of the newly registered contractors are as follow : Bristow, L. and E., Ltd., 40, Sloane Street, Knightsbridge, London, S.W.1 ; Camidge, A. R., and Co., 11, Church Street, Stoke Newington, London, N.16 ; Cotton, George A., Market Street, Hebden Bridge, Yorks ; Cresswell, Frank, Toothill Lane, Mansfield, Notts ; Hough, Norman, 34, Buller Road, Longsight, Manchester ; Jennings, Fred H., 74, Cinderbank, Netherton, Dudley, Worcs. ; Napier, F. L., and Co., 5, Carrington Lane, Ashton-on-Mersey, near Manchester ; Richardson, Thomas A., 2, Park Terrace, Ferrybank, Arklow, co. Wicklow ; Santone Electrical Co., 10, Mill Hill, Boar Lane, Leeds ; Silcox, George, 64, Merrion Street, Leeds ; Watt, George, 5, North Street, Saville Row, Newcastle-on-Tyne ; Wilson, A. J., and Sons, 44, St. James Street, Calverley Street, Leeds.

We are informed by the Secretary that there has already been a large demand from registered contractors for copies of the attractive pamphlet "Hidden Risks," which the National Register has produced for public distribution. Supplies of the pamphlet are obtainable from the National Register, at 12s. 6d. per 500, or £1 3s. per 1 000 copies.

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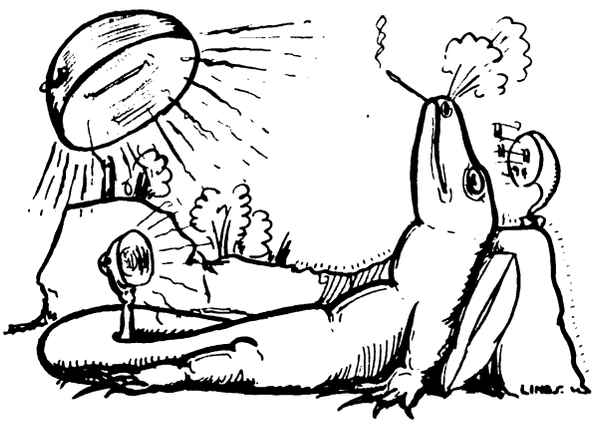
# A VERY SHORT CIRCUIT.

## A New Electrical Fairy Story Specially Devised for Christmas Consumption.

THE Christmas party was in full swing, but either I was getting too old, or a long spell abroad had put me out of touch with them. I felt out of it, and was preparing to disappear, when my sister caught me.

" Jack," she said, " Do be an old dear, and tell the children a story. They've just finished games, and the little dev——, I mean, they are wondering what to do next. I'm told you've



". . . a live dragon. They have artificial sunlight baths, and the rocks are electrically heated."

quite a reputation as storyteller at the Club, so run along now."

Obediently I strolled along towards a group of children, who had apparently been warned of the impending infliction.

* * *

" Now children," I said, " Gather round, and I'll tell you a story." Silence reigned, and I switched on.

" Once upon a time there was a big dragon." " I've seen a dragon," shouted my nephew James, " And so have I," chipped in another infant, with a knowing look in his eyes— " In the Zoo."

" Ah ! " I replied, " but this was a *real* dragon, complete with claws and scaly armour." " But so was this," replied the youngster, " A live dragon. They're really giant lizards you know—from Komodo—but they live in the Zoo now. The tropical climate has been reproduced, and the rocks are electrically heated."

" And they have Artificial Sunlight baths " added Charles, " *and* they're quite harmless."

Dragons shares fell 6 points, and the demand slackened.

" Don't let's bother about dragons," I said hastily, " but let me tell you the true story of Aladdin and his Lamp."

" Aladdin discovered a wonderful lamp—" " He patented it, I suppose," said the infant. " Yes ! in five different places four times. That is where he had the wicked uncle beaten, and that was the beginning of the Magic Ring, which is another story."

" Wasn't he the fellow who gave new lamps for old, unc ? " asked Charles. " He was, said I. " What was the gag ? " asked Charles. " I know," chipped in the bright infant. " Old Stinks told us the other day. Old electric lamps have pure platinum in—new ones haven't ; Aladdin collected the old ones for the platinum."

" Quite right," I said. " You win. Let us try another story."

" Oh, come off it, unc," cried my nephew Charles, " Here I've told them all that you are the Chief Engineer of an Electric Power Station, and you try and push this Aladdin and Dragon stuff on to us."

" Charles," I cried, " My apologies,—Here is a real hundred per cent. modern Christmas Story."

* * *

The Chief Engineer of the Ram Shack Power Company sat in his office after a hard day's work. It was the end of a red-letter day—a length of cable had been replaced—the first of a series of replacements for which we had striven long and wearily. Cable over forty years old was to be renewed at last.

A short piece of the old cable lay on his desk in front of him—cable that had been laid with an ample margin to meet future developments—as they appeared at the time. It had stood well, overload upon overload, until it could no longer be asked to carry on.

The chief engineer gazed with interest on this relic of the early pioneer days. He had a mind to section it,—to read a paper on its history before a learned Society, for, like most engineers, he liked a little fun now and again.

And so he idly rubbed the copper conductor, playing with the thought, when suddenly a mysterious figure appeared, like an overgrown outsize germ, enlarged ever so many times. It looked a kindly sort of thing, hovering there—like the germ of an illness which means a week in bed with a good supply of buns and ginger beer, and plenty to read.

" Thanks for releasing me," said the Spirit, in a voice pitched between Klaxon F. and time signal D. " Don't mention it," replied the engineer, who, being an engineer, was surprised at nothing that happened. " Now I can haunt you," continued the Spirit, " I was getting tired of chasing round that old circuit."

" Oh ! but you mustn't do that; I can't have you floating round here all the time." " I'm not going back under the same conditions," replied the Spirit. " The place is getting too hot for me. " I've had enough—I meet with resistance everywhere. Make my path easier and I'll go back."

" Easier ! " exclaimed the Engineer, " If I could, I'd remove all resistance from your path—at least in conductors."

" Enough ! " cried the Spirit. " What the Sahib says is so," and with a flash, like a short-circuit between two gas meters on a frosty morning, it was gone, and from that second not one metal had the slightest electrical resistance.

* * *

" Queer," said the engineer, " I could have sworn I saw a ghost. I must go steadily—this hot weather is the deuce.

" A little music won't do any harm," he said, switching on the powerful wireless set, but nothing happened. " Queer," he murmured, as he twiddled the knobs round, " it was right last night ;" but not a sound came.

It was dark, so he switched on the light, or at least tried to—but nothing happened.

Now, vaguely alarmed, he picked up the 'phone, a private line to the power station—nothing but a continued shriek came in his ear.

Now, thoroughly alarmed, he ran out and sprinted across to the station. It was in complete darkness—men were running about aimlessly, not knowing what to do. Sets were limping round as though on a heavy load—but what the load was could not be seen. Breakers had tripped—and were held in. Ammeter needles were bang across the scale—but not a fuse blew.

The emergency battery was put on the line—but nothing happened again, except that the battery discharged at a high rate. Section after section was cut off in the hope of isolating the fault—but still the lights were off—the load on.

"'Now I can haunt you,' said the Spirit. 'I was getting tired of chasing around that old circuit.'"

Portable battery lamps were produced, but would not light—there was no electric light except the glimmer of a neon night-light in the night nursery at home.

Heating, cooking, lighting, were all mysteriously inactive — although the current still flowed in the circuit—as several people quickly found out.

An army of professors worked like trojans—each one convinced that he alone had found some wonderful new property—a metal without resistance—each one mentally adding F.R.S. after his name, and erasing it as, one by one, they found that no metal had any resistance—not the slightest—all were perfect conductors—all were—perfect short-circuits.

The wish of the Spirit of Electricity had come true !

But whilst chaos reigned in the World, so were the effects

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in the inner Electric World equally confusing and equally unexpected. Families brought up from childhood to take the path of least resistance — now recklessly rushed round circuits —scorning the advice of old experienced electrons to drop a volt here and there— they abandoned themselves to excessive consumption of amps— slid down circuits without even dropping one volt.

"'Enough! Enough!' cried the Spirit. 'Give me back my resistance.'"

Their path was easy. Filaments no longer warmed to greet them — shunts were not shunts — and resistances had no value. The circuits were cool. The path of the current was easy — as the Spirit had asked — there was no resistance.

Although the world knew and wondered—what could be done? No resistance—no control—confusion everywhere. Station attendants stared dully at ammeter needles which just jammed across. Lamp makers worked at filaments which remained cool—long transmission lines had no resistance—but were useless.

Engineers were in despair, when the engineer of the Ram Shack Power Station, sat in darkness, put his hand in his pocket, and unconsciously touched the core of the old cable. Like a flash the Spirit appeared again—but what a changed Spirit. Thin and worn, weary, fatigued, and sad.

"Enough! Enough!" it cried, "Take back my wish. No longer am I able to wander leisurely round—I must hurl at breakneck speed, round and round. No longer is the circuit warm and aired, but chilly and cold. I am worn out, I cannot rest; give me back my resistance."

The Engineer stared. "Then it was not a dream," he said, "I was a fool to think it was—I was a fool ever to say I wanted no resistance. Have your resistance, and never darken my Station again. Begone!"

And the Spirit, gently crooning "Ohm Sweet Ohm," was gone.

Slowly the station started up again—lamps lit—radiators glowed—valves rectified, and telephones varied their resistance.

Then the Engineer of the Ram Shack Station made a long journey to the top of a bottomless pit, and taking one old piece of cable, dropped it to the bottom—a thing no one but an engineer could do.

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# AMPLIFICATION: OR HEY PRESS-TO!

SCENE: *The office of the Chief Engineer of the H.T. Power Station. Samples of rotary convertors, spare amps. and volts lie about in confusion. The Chief sits at a massive desk studded with sections of cable and littered with papers. In a basket marked "Important" a newspaper shows the latest Test Match score.*

*He is puffing a huge Corona de Flake. His brows are beetled (whatever that is).*

*There is a knock at the door; he presses a button and the door flies open, projecting into the room a man with a prominent nose and notebook. He carries a pencil, apparently to write notes in the note-book. He is a reporter!*

*The Chief looks up, short-circuits a snort, and speaks.*

CHIEF: "Well?"

REPORTER: "The 'Daily Buzzard' would like your views on the new electrical developments. We are devoting more and more space to present-day problems and developments, and are running a few specials."

CHIEF: "What do you want to know?"

REPORTER: "Well, we've given a good deal of space to this new amplification process. Can I have your views on how it will influence the present position."

CHIEF: "Don't know anything about it. If it works well, we'll all be out of work."

REPORTER: "Do you think the grid system will reduce the price of electricity?"

CHIEF: "Yes, in certain districts."

REPORTER: "Just one more question. When I was being shown over the boiler house, one of the stokers told me he had an idea that eventually the boilers would be heated by electric fires, and so make an all-electric station. I can see a great future in that. This is confidential, because the man said he hadn't brought the idea to you because it might mean he would lose his job as a stoker."

CHIEF: "Probably he would."

REPORTER: "Thanks very much for the information. My paper is very keen on developing the use of electric power, and so helping industry."

CHIEF: "Right. Good-bye."

[*Exit Reporter.*]

* * *

(*Extract from the front page of the "Daily Buzzard" next day.*)

CHEAPER ELECTRICITY.

WONDERFUL INVENTION BY WORKING MAN.

All-electric Super Electric Power Stations to Cover the Country.

(Special interview by "Daily Buzzard" Commissioner.)

Although the prices charged for electricity are steadily falling, due to the persistent campaign of the "Daily Buzzard," a further sensational drop is predicted by our own special investigator, who tells his story below.

"Electricity will soon be cheap enough to pour down the drain. I am convinced, after my personal investigation, that the next reduction in price will be drastic, greater even than that advocated by the "Daily Buzzard," who have already been responsible for the remarkable drop in prices.

"Yesterday I personally visited one of the largest electric power stations in the country, and viewed and analysed every process in the manufacture of electric currents.

## The Intelligent Stoker.

"In the stokehold I discussed stoking with a cheery stoker of remarkable intelligence, a reader of the 'Daily Buzzard,' who propounded to me one of the most astounding and revolutionary ideas it has ever been my privilege to bring to light, even for the benefit of 'Daily Buzzard' readers.

"As my stoker friend rested on his spade, sweat pouring from his brow, he sugguested that the boilers should be fitted with electric fires. With choice adjectives he explained the trouble and time it would save, but with the conservatism of the British workman, so often commented on in the 'Daily Buzzard,' he said he felt that if he suggested the idea to his chief he would lose his job as a stoker.

"Later when I mentioned the matter to the Chief Engineer, he vigorously agreed. Naturally, no stokers would be required and the fires would simply be switched on. Even if the Electricity Co. sold themselves electricity at ½d. per unit there would be a tremendous saving. The amount of coal saved would be stupendous, and it would be available for low-temperature carbonisation, as advocated by the 'Daily Buzzard.'

"As a contrast to the remarkably progressive thought in the stoke-hold, I was surprised to find the Chief Engineer ignorant of the latest developments of science.

"The new system of Amplification (first announced by the 'Daily Buzzard') was unknown to him, and he even appeared to doubt its efficiency; in any event, his plant was working on the old system without it.

"I saw huge heavy flywheels which could have been made of the new metal lighter than aluminium and (as announced in the 'Daily Buzzard') almost lighter than air. Hundreds of horsepowers used to overcome friction could be saved, to say nothing of many barrels of oil.

"Until we get men at the head of affairs who are alive to the very latest developments, electric power stations can never reach their highest efficiency, and brilliant ideas such as the stoker's scheme will remain unexploited.

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" The ' Daily Buzzard ' demands that the Electricity Commissioners do their duty and equip the power stations with the most modern machinery, and bring down the price of electricity so that it will be on tap to the man in the street at less than a farthing a unit. The ' Daily Buzzard ' has shown that this can be done. It remains for the Commissioners to act.

[SCENE: *The office of the Chief Engineer. The Chief sits, still frowning, over an edition of the " Daily Buzzard." His brow is still beetled as he scowls at the paper and reads :— " AUSTRALIANS' FINE PERFORMANCE.—362 for 2 Wickets. Larwood fails to find the wicket. Only a sudden collapse can save the match."*]

## IN LIGHTER VEIN.

" Is Frank a member of the Institution of Electrical Engineers ? ", I asked.

" Yes," said she. " At least, I *think* so, he's got the cufflinks."—" The Zodiac."

* * *

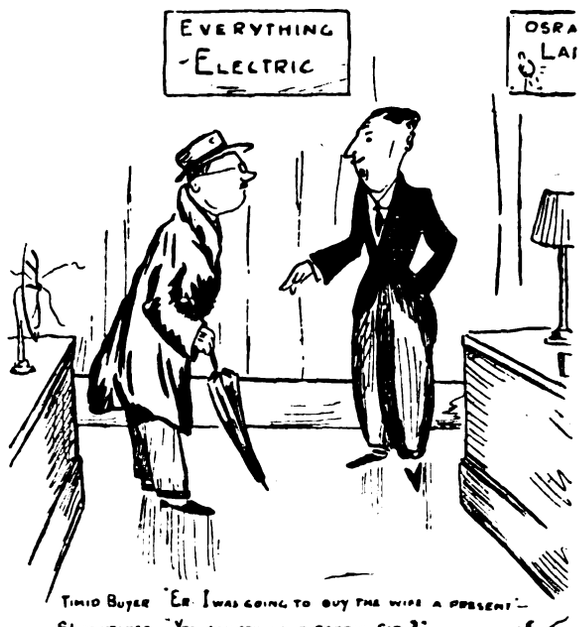
The following touching account is taken from the works magazine of The Universal Electrifyall Co.

FAREWELL TO MR. S. W. G. KINKLESS.

One sad evening during the past month, we parted from our old and esteemed colleague, Mr. Kinkless. For the benefit of the new-comers in our midst, it should be explained that Mr. Kinkless held a position unique both to the works and to the electrical industry in general. At an early age, while still an apprentice in the coil department of the old factory, he showed an astonishing aptitude for unravelling jumbles of wire—and this with the insulation and other qualities unimpaired. Ultimately the firm appointed him to the responsible position of Official Unraveller, and it is estimated that during the many years he has so faithfully served the company he has been instrumental in saving many thousands of pounds.

When, last month, Mr. Kinkless retired from active participation here, a farewell meeting was organised in the canteen. The managing director, on behalf of all the works staff and employees, presented Mr. Kinkless with the parts for a supersonic wireless set, and also a presentation copy of the I.E.E. Wiring Rules. When Mr. Kinkless, visibly affected, rose to respond, the applause was deafening, and continued for several minutes. Speaking with great emotion, Mr. Kinkless gave us an absorbing résumé of his career in the works, and recalled some of his greatest and most intricate feats of unravelling.

Acknowledging the gifts, he said that the radio components and the Wiring Rules appeared a deadly combination (laughter) and it looked as though his retirement would be in the nature of a busman's holiday (more laughter). In closing, he suggested that with more and more wireless there would appear less scope for his unique faculty of unravelling wires—so it was time he did retire. (Cries of " shame," laughter and cheers.) The meeting terminated to the singing of " For he's a jolly good unraveller."

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* * *

A valued correspondent sends us the following extract from the " Afternoon News and Echo," Mudtown :—

ACTION AGAINST JOURNALISTS' ACADEMY.

Great interest is evinced locally in an action, which is being brought by a young journalist, against the B. Slick Academy of Journalists. It appears that he recently passed with honours the final examination of the Academy, and, shortly afterwards, managed to secure a position on a local newspaper (not this one). One day he was sent to report on a conflagration which occurred at the residence of the gas engineer. In his report he said the fire was *undoubtedly due to the fusing of an electric wire.*

Unfortunately he had jumped somewhat hastily to a wrong conclusion. He had, it is true, seen evidence of electrical wiring in the smouldering remains. The gas engineer, however (for reasons which will be apparent) at once hastened to to point out that his house had been lighted with *gas*—though previously wired—that when he bought the house he had had gas installed and the electric supply instantly cut off.

This announcement caused the budding journalist to lose his position on the newspaper, and he has felt impelled to take action against the Academy on the plea that his training was not sufficiently thorough. He had, of course, been instructed to regard the electrical installation of a house as the cause of any fire, should no other clue be particularly apparent. In this case, however, he would have displayed more acumen had he advanced the theory that there had been a static discharge from the wireless aerial.

* * *

A reader afflicted with Limerikitis sends us the following :—

Said a witty consumer, " I learn
That I pay for the current I burn,
But would it be fair
And leave us all square
If you credit me what I return ?

We are bringing this suggestion to the notice of the Electricity Commissioners and a number of central station engineers.

## BIRMINGHAM ELECTRIC CLUB.

### Annual Report Shows Continued Progress—Membership Now Over 200.

THE annual report of the Birmingham Electric Club records the fact that good progress continues to be made, the membership now totalling 224. During the current year six addresses have been delivered, including the address of the president, Mr. T. H. Varcoe, on January 20th last.

The seventeenth annual dinner was held on March 23rd, in the Grosvenor Room at the Grand Hotel, and some 225 members and friends were present. The annual summer outing was a trip to Clifton Junction, near Manchester, to visit the workshops of the Chloride Electrical Storage Co., Ltd.

That ever popular social function the " Ladies Night " was held on October 19th, in the Grosvenor and Windsor Rooms at the Grand Hotel, some 307 members and friends attending. In the snooker handicap the prize winners were: FIRST PRIZE: Mr. J. Entwistle; SECOND PRIZE: Mr. G. R. Stone; HIGHEST BREAK: Mr. C. H. Panting; and HIGHEST SCORE: Mr. H. Bowker. The following new members have been elected: Messrs. H. P. Allen, H. C. Beeston, A. F. Bock, G. S. Buckingham, S. W. Butler, H. L. M. Blanchette, W. E. Clark, J. T. Claridge, T. E. Davies, R. S. J. Dagnall, A. W. Gamble, W. E. Groves, H. S. Goostry, H. Grubb, E. J. Holdin, F. Horrocks, G. A. Lewis, C. H. Newey, S. Phillips, G. Rogers, J. L. Rowbotham, G. B. Richards, J. W. Treece, E. J. Wilcock, M. D. Walker, L. G. Watts, F. H. Wilkes.

The statement of accounts shows that a very satisfactory balance at bank is still being maintained.

In Mr. Frank Forrest, the chief assistant engineer to the Birmingham Electric Supply Department, the Club has a popular new president.

The principal officers of the Club were elected as follows :— Senior vice-president, Mr. D. G. Brooks; junior vice-president, Mr. F. W. Martin; hon. sec., Mr. J. Entwhistle; hon. treas., Mr. J. M. Dunkley; social sec., Mr. F. Hughes-Cayley.

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# NEW SHOWROOMS.

## B.T.-H. Co.'s Demonstration Facilities in Aldwych Premises.

THE new B.T.-H. demonstration rooms at Crown House, Aldwych, W.C.2, opened to the public on December 6th, provide a brilliant and instructive example of the dominating part played by light in the modern electrical display.

The main showrooms of the British Thomson-Houston Co. are at Mazda House, Newman Street, Oxford Street, and the Crown House demonstration rooms have been opened to provide more conveniently-situated facilities for electrical contractors and their customers in the Aldwych and Kingsway district, which is rapidly becoming the hub of the British engineering world. At Crown House, all kinds of lighting, radio and domestic electrical appliances will be exhibited and operated under working conditions by skilled lady demonstrators.

The latest ideas and most up-to-date practice in electric lighting equipment, gramophone-radio apparatus, electric heating and cooking appliances, refrigerators and other electrical labour savers will be adequately represented at Crown House.

There are two extremes in fittings displays. One is to crowd the ceilings and walls until the visitor is bewildered by a forest of fittings in which detail is irremediably lost; the other is to exhibit single fittings in model rooms. At Crown House, the happy medium has been achieved, and while a great number of fittings are seen, they are, nevertheless, arranged not only with a view to obtaining a good general effect, but also in such a manner as to permit the proper appreciation of any particular article in which the customer may be interested. Among the items of special interest in the showroom display are a number of modern decorative lighting fittings.

The effect of any style of fitting or reflector can be ascertained in a few seconds, for the ingenious ceiling and wall attachments which are a feature of the showroom, enable fittings to be changed in a moment, whether they are fixed on wall or ceiling.

At the entrance to the demonstration rooms there are two model shop windows wherein the most varied and beautiful colour effects can be shown at a moment's notice, the changing intensity and quality of the illumination being controlled either automatically by motor-driven dimmers, or by hand switching. Other examples of the use of colour lighting are demonstrated in the entrance and throughout the showroom itself by the spectacular illumination of glass skylights. Lighting units equipped with colour attachments situated above the skylights are employed to obtain some delightful effects.

**A view of the new B.T.-H. showrooms at Crown House, looking towards the entrance.**

A section of the showroom is devoted to a display of B.T.-H. radio apparatus, including the latest developments in gramophone-radio practice, to which the B.T.-H. Co. has largely contributed.

One of the most interesting items to be seen in the new demonstration rooms is the B.T.-H. refrigerator, which has just been placed on the market. This refrigerator has several novel features in its design. In the first place, both the motor and the unit are fixed outside the refrigeration chambers, unlike many other refrigerators at present on the market. The advantages of this method of construction are obvious.

In the basement below the showroom there is a trade counter with a special entrance in Drury Lane. The counters are conveniently arranged so that transactions can be made with the utmost rapidity. Stocks of all materials ordinarily called for over the counter are arranged in bins behind the counter, while larger quantities or special articles can be very quickly obtained from the adjacent stores, or in exceptional cases, from the principal stores at Wenlock Road, N.1.

**Another view of the Crown House, London, showrooms of the B.T.-H. Co.**

# N.W. AREA WHITLEY COUNCIL.

## Annual Conference of Authorised Undertakers and Election of Employers' Representatives.

THE annual conference of Authorised Undertakers in the N.W. Area for the purpose of electing employers' representatives for the year ending November 8th, 1929, was held at Manchester on December 11th. Ald. T. E. Higham (Accrington) chairman of the District Council, presided and was assisted by Ald. C. Higham (Blackburn), chairman of the District Board. The proceedings were interesting, in view of the retirement of Mr. Robert Blackmore in consequence of his having been appointed the district engineer for the Central Electricity Board in connection with the N.W. England and N.Wales Scheme.

The chairman paid tribute to the work which had been done by Mr. Blackmore on the Council and Board since their creation ten years ago, and moved the following resolution, seconded by Mr. C. D. Taite, and supported by Ald. C. Higham:—

"That this Conference of Authorised Undertakers in the North Western Area place on record their appreciation of the valuable services rendered by Mr. R. Blackmore to the Employers' representatives on the District Council and the District Joint Board since their establishment, more particularly in the capacity of chairman of the Employers' Executive Committee which position he has occupied with distinction during the past eight years. That the Conference express the hope that Mr. Blackmore may be happy and successful in the important duties which he is about to undertake."

The resolution was carried unanimously.

There were two vacancies to be filled, namely, caused by the retirement of (1) Coun. A. E. Heaney (Preston) and (2) Mr. R. Blackmore. These vacancies were filled by the appointment of (1) Coun. H. Shepherd (Oldham) and (2) Mr. B. T. Hawkins (Wallasey) respectively.

The reports on the work during the past year were adopted.

The re-elected and newly elected members for the District Council are: GROUP A.—Mr. H. C. Lamb, Manchester, Mr. P. J. Robinson, Liverpool, Ald. C. Higham, Blackburn, and Coun. H. Shepherd, Oldham; GROUP B.—Ald. T. E. Higham, Accrington, Mr. B. T. Hawkins, Wallasey, and Mr. F. V. L. Mathias, Warrington; GROUP C.—Ald. E. Boothman, Nelson, and Mr. C. L. E. Stewart, Rawtenstall; GROUP D.—Mr. A. J. Hutchinson; GROUP E.—Mr. C. D. Taite and Mr. W. Fennell.

The representatives of the District Board are the same as above, but with the substitution of Coun. J. Hanson for Mr. P. J. Robinson and Coun. J. H. Lund for Mr. A. J. Hutchinson.

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# NEWS IN BRIEF.

## Warning to Wireless Users—Electric Traffic Control—Rural Electricity Supply in U.S.A.—Telephonic Conference Facilities in Germany—Telephony between Europe and Argentina.

ELECTRIC lighting is to be substituted for gas in the engine shed at Pontypool, for the G.W. Railway.

The annual dinner of the North Western Centre of the I.E.E. will be held on January 23rd, at the Midland Hotel.

Wireless users who have eliminators are being advised to apply to the Blackburn electricity manager concerning dangers they run with sets not properly constructed.

Exeter has adopted the electric automatic system of traffic control.

By the use of electric heating, a Chicago lumber firm can dry its lumber in two days without damaging the wood.

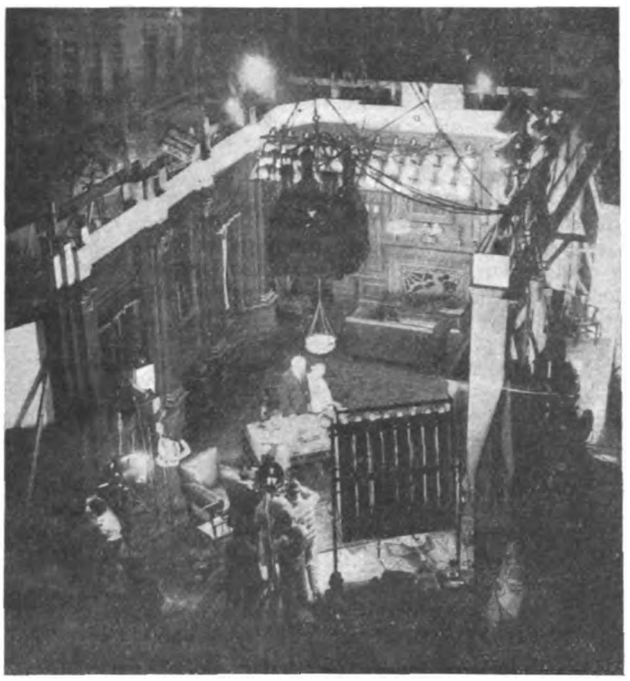
Axminster Board of Guardians has decided to adopt electricity for the illumination of the Poor Law Institution.

Wakefield Electricity Committee has appointed a special Committee to investigate the matter of showroom accommodation.

Members of the South Midland Students' Section of the I.E.E. held a carnival at the Imperial Hotel, Birmingham, on December 12th.

The Gatineau Power Company will, by the end of the month, have a total installed capacity of 436 000 H.P. in its plants at Farmer's Rapids, Chelsea and Paugau Falls.

At the end of 1926, a survey of the United States showed that approximately 227 500 farms in 27 states were supplied with electric service, as compared with 122 000 in 1923, an increase of 86·6%. During 1927 an additional 21 217 farms were connected.



*MOST of the success and increasing popularity of British films are due to the technique of production. This, apart from good direction and acting, is largely assisted by the lighting facilities which the electrical industry has developed for that class of work. Quick to recognise in electric lighting the best means of floodlighting a "set" for "sharp" pictures, the British International Picture Studios, at Elstree, have installed one of the most comprehensive equipments in the film industry.*

There is a vacancy for an assistant power station superintendent in the Government of Ceylon's electricity department.

Funds to the extent of £250 are being raised to convert the lighting of All Saints Church, Oakham, Lincs, from gas to electricity.

A resident assistant engineer and clerk of works, to take charge of power station, is wanted at the Severalls Mental Hospital, Colchester.

The Commercial Cable Co. is offering special facilities at reduced rates for the transmission of Christmas and New Year greeting messages to places other than North America and Mexico.

It is reported that the German postal authorities are experimenting with apparatus to enable private and commercial telephone subscribers to be connected for the purpose of a general discussion.

West Ham Electricity Committee has agreed to receive a deputation from the Electrical Trades' Union to discuss the question of establishing an installation department and also the subject of direct employment of labour in connection with the electricity undertaking.

Plans for extension and improvement of the Southern Railway's telephone system at Waterloo and at important stations and depots all over the south of England are under consideration. The work will make all the sub-exchanges, which are in direct touch with headquarters, into automatic exchanges. The Waterloo exchange is already automatic, but most of the others are manual exchanges. If the changes now proposed are effected the cost will be nearly £100 000.

Bournemouth Corporation requires an electrician for the new pavilion.

The managers of the Church of England School, Sandown (Isle of Wight) have decided to adopt electric lighting.

A telephone service between Buenos Ayres (Argentina) and Berlin, Frankfort and Hamburg was opened for public use on December 12th.

There is a vacancy for a shift charge engineer in the Dover electricity works.

Plymouth Electricity Committee has obtained a site at Milehouse for a substation.

Almost one-half of all the copper consumed in the United States, during 1927, was used by the electrical industry.

The total production of electrical energy in Sweden during the past year increased by about 10% and amounted to 4 385 million kWh.

Broadcasting between India and the United States will be attempted in the early morning of December 26th, by the stations at Schenectady and Calcutta.

The Watching and Lighting Committee of the Aberdeen T.C. is considering a proposal to instal at busy street crossings electric traffic control signals, such as are in use at Edinburgh.

Preparation of the overseas advance catalogue of the London section of the British Industries Fair has been completed, and 10 000 copies will be ready for despatch to overseas buyers only, on New Year's Day, seven weeks before the opening of the Fair.

Tenders have been accepted by Wimbledon Corporation for the erection of sub-stations in Conduit Road, New Malden, and in Strathmore Road.

At a meeting of Glasgow Corporation on December 13th, the Tramway Committee's recommendation to purchase foreign made v.i.r. cable from Felten and Guilleaume was adopted. The foreign offer was £242, and the lowest British offer was £367. Fourteen British firms sent in offers varying only a penny or two from £576 0s. 4d.

A lecture on "Light and the Shopkeeper" was given by Mr. A. J. Bridge, publicity and development manager, Western Electricity Supply Co., Ltd., to the Cirencester Traders' Association on December 3rd.

Mr. J. Huxley, of the General Electric Co., Ltd., last week gave a lecture at the Birkenhead Corporation electricity works, in which he demonstrated the outstanding advantages of electric baking ovens, compared with fire ovens.

A film illustrating the construction of the Babcock boiler was shown before members of the Womens' Engineering Society on December 5th, when Mr. P. Rycroft delivered a lecture upon the subject. Miss E. M. Kennedy was in the chair.

Manchester Watch Committee recommends that the police box system be extended to the C division, at an initial cost of £2 000, the estimated cost of upkeep being £914, against which there will be a saving of £619 per annum through the closing of the sub-stations and a potential saving of £2 600 on repairs to and modern equipment for the disused sub-stations, while an ultimate decrease of 21 men will result in an annual saving of £5 500.

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# PERSONAL.

MR. P. W. Bancroft, at present chief clerk in the department, has been appointed tramways manager at Derby.

Barrow Tramways Committee has appointed Mr. Thomas Smalley, manager of Leigh tramways, as manager of the Corporation tramways and motor-bus undertakings, at a salary of £550 per annum.

The engagement is announced between Denis, youngest son of Dr. S. Z. de Ferranti, F.R.S., and Mrs. S. Z. de Ferranti, of Baslow Hall, Bakewell, and Elizabeth, youngest daughter of Mr. and Mrs. Charles Allen Thomson, of Belleville, New Jersey, U.S.A.

Kirkwall Town Council on December 11th appointed Mr. H. Ford manager of the electricity undertaking, in succession to Mr. W. C. Roy, who has received an appointment at Wick. Mr. Ford was selected out of a short leet of six, and altogether there were 90 applicants for the post.

Sunderland Corporation has decided to advertise for a successor to the late Mr. A. R. Dayson, general manager and engineer of the Corporation tramways, at a salary of £800 per annum. The Council has granted Mr. Dayson's widow £403 10s., equal to six months' salary of her late husband.

Glasgow Electricity Committee has placed on record appreciation of the services rendered by Mr. George Morgan, assistant engineer, in carrying out the duties falling to be performed by the general manager during the period between the resignation of the previous manager and the appointment of Mr. Bell, and has recommended that Mr. Morgan be granted an honorarium of £100.

Tunbridge Wells T.C. has granted the following increases of salary :—Mr. J. E. Pownall, chief assistant electrical engineer, from £599 18s. 2d. to £650 per annum; Mr. W. Matthews, mains superintendent, from £417 16s. 1d. to £452 10s. 5d.; Mr. E. Woolgar, station superintendent, from £324 7s. 11d. to £351 7s. 5d.; Messrs. R. A. C. Baldwin, D. Lewis, and J. Lonie, charge engineers, from £303 4s. 1d. to £318 12s. 4d.; and Mr. A. H. Abrahams, junior charge engineer, from £215 0s. 10d. to £231 5s. 1d.

# BUSINESS ITEMS.

THE THAMES VALLEY ELECTRIC LIGHT CO. gave prizes for the Henley-on-Thames shopping week,

The works of the LONDON ELECTRIC FIRM, Croydon, and the branch works, the ELECTRIC HEATING CO., of 6a, George Street, Croydon, will be closed for the holidays (three days), but a small staff will be kept in attendance to deal with urgent business.

In the description of the large induction regulators which Messrs. SWITCHGEAR AND COWANS, LTD., Old Trafford, Manchester, have shipped to New Zealand (THE ELECTRICIAN, December 7th, 1928, p. 651) the motor driving the rotor was stated to be of 12½ H.P. This should read 2½ H.P.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and the METROPOLITAN-VICKERS ELECTRICAL EXPORT CO., LTD., advise us that on December 28th they will be moving from 4, Central Buildings, Westminster, to offices in Bush House, Aldwych, W.C.2. The Home Sales Department of the Metropolitan-Vickers Electrical Co. at present in Metrovick House, Charing Cross Road, will move into Bush House on January 7th, but Metrovick House will remain the headquarters of METRO-VICK SUPPLIES, LTD. The new telephone number at Bush House will be City 1 230 (ten lines) and the telegraphic address "Multophase, Estrand, London."

ELDER DEMPSTER AND CO., LTD. have given orders for their ships "Adda," "Accra," "Apapa," "Appam" and "Abinsi," to be fitted with Marconi direction finding apparatus, and the work of installation will proceed as the ships become available. The MARCONI INTERNATIONAL MARINE COMMUNICATION CO.'s direction finder type 11G, is the latest design of marine direction finder, and uses high frequency amplifying valves of the screened grid type. These are enclosed inside the instrument case which is of metal construction and which is divided into separate compartments effectively shielding the circuits from each other and from external interference. By this means the possibility of error being introduced by local electrical apparatus is reduced to a minimum. Another feature of this instrument is the introduction of two calibrated dials in the direction finder unit. One is fixed, and the bearings indicated thereon are relative to the ship's head. The second dial is rotatable and on being set to the ship's true course will indicate true bearings that need no correction, providing the ship is on her course when the bearing is taken.

# OVERSEAS TRADE.

## Electrical Exports for Eleven Months Over £11 000 000 in Excess of Imports.

EXPORTS of electrical machinery, apparatus and materials shipped from the United Kingdom during November last amounted to £1 649 597 as compared with £1 770 978 for the same month last year, representing a decline of £121 381. The total value of exports of British electrical goods for the eleven months of this year amounted to £16 898 185, representing a decline of £221 707 when compared with the total of £17 119 892 for the corresponding period of 1927. Imported electrical goods and machinery during November last amounted to £659 783, which when compared with the figures for the same month of 1927 shows an increase of £56 803. For the eleven months of this year the total electrical imports amounted to £5 816 892, or £555 553 more than for the same period last year. These figures indicate therefore that the electrical exports for November exceeded imports by £989 814, while for the eleven months the excess is £11 081 293.

Items which have contributed to the falling off of export trade during the month are submarine telegraph and telephone cables, decline £58 553, and telegraph and telephone instruments and apparatus, other than wireless valves, decline £93 996. On the other hand, motors and generators, other than railway and tramway motors, have improved by £37 520, and various electrical goods by £24 495.

We give below detailed figures for November, 1928, and for the eleven months of the year, contrasted with those for the corresponding month and period of last year.

| | Month of November. | | Eleven Months. | |
|---|---|---|---|---|
| | 1927. | 1928. | 1927. | 1928. |
| IMPORTS. | £ | £ | £ | £ |
| Electrical Machinery | 127 645 | 135 988 | 1 450 145 | 1 573 049 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 13 479 | 21 153 | 118 600 | 172 774 |
| Insulation other than rubber (not being Telegraph or Telephone Wires and Cables) | 45 424 | 58 076 | 553 250 | 548 346 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 17 792 | 1 782 | 96 971 | 68 219 |
| Submarine Telegraph and Telephone Cables | 56 | — | 129 | — |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 62 766 | 99 048 | 426 969 | 622 535 |
| Carbons, Electric | 8 931 | 15 641 | 84 598 | 118 476 |
| Electric Lamps and parts thereof— | | | | |
| Electric Glow Lamps | 53 183 | 23 460 | 377 437 | 402 273 |
| Arc Lamps and Electric Searchlights | 350 | 256 | 7 918 | 6 095 |
| Parts thereof (except Carbon Rods) | 2 754 | 2 578 | 25 193 | 28 621 |
| Batteries and Accumulators (including parts) | 90,656 | 111 358 | 666 683 | 662 439 |
| Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters, and scientific | 28 212 | 22 144 | 259 080 | 255 634 |
| Switchboards, other than Telegraph and Telephone | ,22 | 651 | 1,180 | 1,588 |
| Electrical Goods and Apparatus, all other Sorts | 151 710 | 167 648 | 1,192 886 | 1,356 843 |
| Total of Electrical Goods and Apparatus | 602 980 | 659 783 | 5 261 339 | 5 816 892 |
| EXPORTS. | £ | £ | £ | £ |
| Electrical Machinery— | | | | |
| Railway and Tramway Motors | 37 952 | 36 252 | 487 059 | 458 205 |
| Other Motors and Generators | 215 044 | 252 564 | 2 156 588 | 2 258 579 |
| All other sorts | 365 381 | 303 424 | 3 571 922 | 3 474 929 |
| Electrical Wires and Cables, Insulated— | | | | |
| Rubber Insulated (not being Telegraph or Telephone Wires or Cables) | 148 912 | 144 615 | 1 324 494 | 1 286 060 |
| Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables) | 125 766 | 148 136 | 1 467 667 | 1 360 505 |
| Telegraph and Telephone Wires and Cables (not being Submarine Cables) | 107 230 | 77 608 | 885 002 | 798 827 |
| Submarine Telegraph and Telephone Cables | 71 687 | 13 134 | 530 021 | 579 164 |
| Telegraph and Telephone Instruments and Apparatus (except wireless valves) | 281 659 | 187 663 | 2 402 979 | 2 410 547 |
| Carbons, Electric | 3,573 | 545 | 23 978 | 13 315 |
| Electric Lamps and Parts— | | | | |
| Electric Glow Lamps | 52 988 | 50 392 | 539 255 | 485 204 |
| Arc Lamps and Electric Searchlights | 410 | 1 336 | 14 243 | 11 921 |
| Parts thereof (except Carbon Rods) | 193 | 1 271 | 6 237 | 6 987 |
| Batteries and Accumulators (including parts) | 88 140 | 83 167 | 1 144 069 | 1 005 111 |
| Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including ammeters, voltmeters, etc.), house service meters and scientific | 41 295 | 37 338 | 340 693 | 356 251 |
| Switchboards other than Telegraph and Telephone | 8 027 | 4 936 | 66 670 | 67 140 |
| Electrical Goods and Apparatus, all other Sorts | 222 721 | 247 216 | 2 152 015 | 2 325 443 |
| Total of Electrical Goods and Apparatus | 1 770 978 | 1 649 597 | 17 119 892 | 16 898 185 |

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# PORTISHEAD EXTENSIONS.

## Contract for 50 000 kW Set Placed by Bristol Corporation.

THE Bristol Corporation Portishead power station is to be advanced a stage further in its development by the addition of a 50 000 kW turbo-alternator set which, together with extensions to boiler plant, switchgear and transformer equipment, has just been ordered from the Metropolitan-Vickers Electrical Co., Ltd. The new set will consist of a 51 250 kW turbine driving, at 1 500 r.p.m., a main alternator of 62 500 kW and a house service alternator of 1 560 kVA. The turbine will be a two-cylinder machine designed for the existing steam conditions of the station. The condenser will be of the Metropolitan-Vickers central flow, type divided to permit one half of the tubes to be withdrawn for cleaning while the other half is in operation under light load. The supply of circulating water will be taken from the existing system, which is one of the most interesting features of the station. The water is taken from the Severn by means of four culverts 7 ft. 6 in. in diameter and 700 ft. long. The circulating pumps are arranged in a pit 97 ft. below the floor level of the station, so as to be below the lowest recorded tide level, and are driven by motors on the turbine basement about 80 ft. above the pumps. The condenser is mounted at such a height as to take full advantage of syphonic action. The new steam-raising plant for the extensions includes two water-tube boilers, each of 80 000 lb. per hour normal capacity, together with stokers, forced and induced draught plant, economisers, air heaters and steam and water pipe work.

The contract also includes extensions to the switchgear and transformer equipment, both at the Portishead station and at the Feeder Road station at the other end of the 33 000 V transmission lines. The new transformers for Portishead will consist of a 62 500 kVA, 11 000/33 000 V, three-phase bank of single-phase units, and three 1 800 kVA three-phase units for station lighting. The new transformer equipment for Feeder Road will consist of a 25 000 kVA, 33 000/6 600 V, three-phase bank in single-phase units. The new equipment at both stations will include oil-cooling and handling plant.

The equipment is being supplied to the specification of Mr. H. Faraday Proctor, chief engineer and general manager of the electricity department, who is responsible for the scheme.

# "INDIVIDUALIST" LUNCHEON.

## Sir William Bragg on the Individualism of Science.

AT the twentieth "Individualist" Luncheon, at the Hotel Cecil, on December 12th, an address was delivered by Sir William Bragg, F.R.S., director of the Davy-Faraday Research Laboratory of the Royal Institution. The chair was occupied by Lord Ullswater.

Sir William Bragg indicated that he proposed to show how science had an outlook which was thoroughly individualistic. This notion was perhaps supported by modern physical research, especially that on the unitary nature of energy and electricity, as shown by work which had been done on the quantum theory and on electrons. He proceeded to indicate the nature of the scientific outlook and the part which it was playing and trying to play. In the older scientific period (about 300 years ago) the work of Newton, Galileo, Boyle and others showed men that they were a small part of a large universe. He instanced Faraday as a man who had shown how individual work could be applied to the discovery of things. Faraday believed in the unity of Nature and thought that Nature had laws which hinged upon one another. This led him to look for connections between natural phenomena such as electricity and magnetism. His discovery of a connection in this particular instance had laid the foundation of electrical engineering and the great modern electrical industry. This and other work had shown that Nature was one. Sir William referred to the Department of Scientific and Industrial Research, pointing out that its existence showed that the Government realised that if we were to get on as a nation we must think. In the laboratories of the research association, and in such institutions as the National Physical Laboratory, research workers were to a large extent left free to work in their own way.

The toast of "The Individualist Bookshop" was proposed by Sir Douglas Newton, M.P., and Sir James Fortescue Flannery replied.

# LEGAL INTELLIGENCE.

## Continued Hearing of Brown *v.* Lektophone Cone Loud Speaker Case.

THE hearing was continued on December 11th of the Chancery action by the Lektophone Corporation of Jersey City, U.S.A., against S. G. Brown, Ltd., wireless appliance manufacturers, of Victoria Road, Willesden, for an injunction restraining alleged infringement of a patent for improvements in loud speakers, the complaint being that the defendants had sold a "Mascot" loud speaker which the plaintiffs said was an infringement.

Dr. Eccles, the first witness for the plaintiffs, who had been in the box since December 6th, concluded his evidence on December 11th.

He was questioned at great length regarding prior specifications and his lordship said he understood that the difference between the alleged infringement and the patent was that the cone in the latter was plano-conical, while in the former it was conical only.

Sir Duncan Kerly, K.C., at the end of a long cross-examination, suggested that not one of the loud speakers he had put to the witness as having been made under the plaintiffs' licence was made according to the description of the patent in the specification.

Dr. Eccles said some of them infringed and some were on the border line.

In re-examination, he said it was quite unknown at the date of the patent (1914) that with a large diaphragm or cone one could get low notes more easily. The general nature of the discovery of the original patents (Hopkins) was that to get loud reproductions by coned diaphragms, the edge must be constrained so that it did not vibrate locally, but more as a whole. That was the principle employed by the loud speaker that had been put to him.

Mr. Hubert Alexander Gill, a patent expert, on December 12th, said he had examined a number of loud speakers produced in court and most of them embodied the principle of the plaintiffs' patent in that they had a cone, the edge of which was prevented from vibrating.

In cross-examination he said Mr. Brown's invention of the telephone earpiece was a great improvement on what had preceded it. The introduction of the thermionic valve and the amplifier had provided any amount of power for the hornless loud speaker, but he did not agree that amplification for loud speakers was introduced by Mr. Brown. He invented and introduced the reed supporting the diaphragm, which was part of the alleged infringement, but not an essential part.

Mr. William A. Dubuisson, assistant secretary of Standard Telephones and Cables, Ltd., gave figures of the sales by wireless manufacturers under patents held jointly by his company and the plaintiffs. In 1927 the sales of Graham Amplion Ltd. were 43 108, in nine months of 1928, 26 342; the General Electric Co., Ltd., 5 450 in 1927 and 7 866 for 9 months in 1928; and the Celestion Radio Co., 9 432 from July, 1927, to July, 1928.

Mr. Trevor Watson summed up the case for the plaintiffs, and the hearing was adjourned.

Sir Duncan Kerly, K.C., in his opening statement for the defence on December 13th, said the case had been presented for the plaintiffs as if the patent in question had had a great commercial vogue, whereas the fact was that it was "dug up" in this country about 1927, and had never been heard of here before that. The plaintiffs were trying to cover the whole field for cone loud speakers, the introduction of which was not due to their invention.

After evidence had been given by Mr. J. Swinburne, the hearing was adjourned until December 19th.

### LIVERPOOL HARMONIC SOCIETY.

Members of the Liverpool and District Electro-Harmonic Society were guests of the Manchester Electro-Harmonic Society on December 14th, at a hotpot supper and smoking concert. The chief speech of the evening was that of Mr. J. A. Robertson, who remarked on the importance of the city of Manchester in matters electrical. In a reminiscent passage, he referred to his apprenticeship days with the Liverpool Electric Supply Co., Ltd., before that concern was taken over by the Liverpool Corporation. Mr. R. Pulford, of Liverpool, who replied on behalf of the Liverpool guests to the speech of welcome, said that Mr. Robertson joined the Liverpool Electric Supply Co. at the time when his (Mr. Pulford's) father had just completed his apprenticeship.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

CLYDEBANK CORPORATION, December 21st.—Electric lighting installation at Maternity and Child Welfare Centre. Specifications from the Town Clerk.

FALKIRK AND DISTRICT INFIRMARY, December 22nd.—Electric lighting installation in connection with erection of new infirmary at Gartcows, Falkirk. Applications for specifications must be sent to Mr. Duncan Kennedy, hon. secretary, Bank Street, Falkirk, by December 22nd. Applicants will be informed when deposit is required.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc., from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

MIDDLESBROUGH EDUCATION COMMITTEE, December 31st.—Electric lighting installation of ten Council schools and the Stockton Street Practical Instruction Centre. Specification, etc., from the Borough Electrical Engineer.

SOUTHEND CORPORATION, December 31st.—Supply of 3 000 joint boxes, for the light railways and electricity department. Full particulars from Mr. R. Birkett, Electricity Works, London Road, Southend-on-Sea.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

LAMBETH (LONDON) GUARDIANS, January 3rd.—Twelve months' supply of incandescent electric lamps. Forms of tender, etc., from the clerk, Mr. J. L. Goldspink, Board Room and Offices, Brook Street, Kennington Road, S.E.11.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

SALFORD CORPORATION, January 4th.—Supply of e.h.t. and l.t. paper insulated, lead covered and armoured cables. Particulars from the City Electrical Engineer, Frederick Road, Salford.

BELFAST CORPORATION, January 7th.—Manufacture, delivery, and erection of h.t. armour-clad switchgear. Specification (No. W. 76) and form of contract from Mr. F. H. Whysall, city electrical engineer and general manager, Electricity Department, East Bridge Street, Belfast; deposit £2 2s.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 14th.—Maintenance of electric lighting, heating and power installations (section L) and supply of electric lamps (section S) for twelve months. Forms of tender from Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

STOKE-ON-TRENT CORPORATION, January 16th.—Supply and erection of an electrically-driven air compressor at the central power house, Hanley. Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

STOKE-ON-TRENT CORPORATION, January 16th.—Supply of low tension d.c. switchboard for electricity sub-works, Bagnall Street, Stoke-on-Trent (contract 2 836); and supply of e.h.t. ironclad type switchgear at Central power house, Hanley (contract 2 839). Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300 V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Supply of cables; electricity meters; terminal, service, network and fuse boxes; oil circuit breaker switches; electrical sundries; wires; lamps; transformers, etc., for one year. Specification from the Town Clerk.

WEST RIDING EDUCATION COMMITTEE, January 19th.—Electric light installations in Norton New School and in Glass Houghton Ashton Road Council School and caretaker's house. Specification, until January 14th, from Education Department, County Hall, Wakefield.

ESSEX COUNTY AND COLCHESTER HOSPITALS COMMITTEE, January 21st.—Internal electric wiring of Brentwood Mental Hospital, with fuseboards, motors, etc. Specifications, etc., from Mr. H. H. Gepp, 66, Duke Street, Chelmsford; deposit £5 5s. Only registered contractors are invited to tender.

## Overseas.

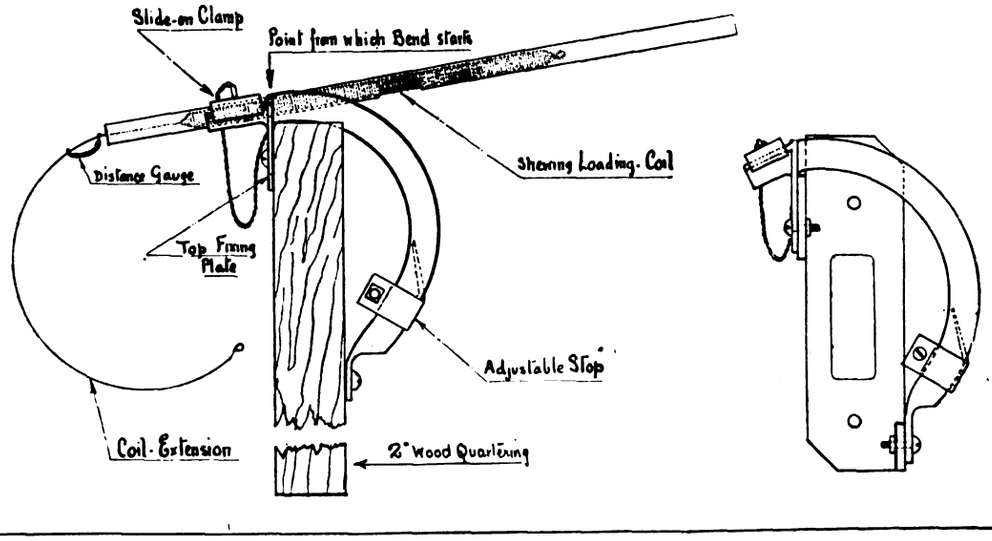
UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52) 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

STATE ELECTRICITY WORKS, MONTEVIDEO, December 22nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of two hydraulic pumps and electric motors. (Reference A.X. 7 150.)

*ILLUSTRATING, on the left, the normal method of mounting the "Splitubender" former for bending close-joint conduit, details of which will be found on page 711. On the right is shown an alternative method of mounting.*

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EGYPTIAN STATE RAILWAYS, January 3rd.—Telegraph and telephone wire (approximate cost £E3 600 to £E4 400). Specification will be issued to firms on the Administration's official list. Further information from Chief Inspecting Engineer, 41, Tothill Street, London, S.W. (Ref. E.S.R. 7 903.)

JOHANNESBURG MUNICIPALITY, January 3rd.—Electricity meters and time switches. (Reference B.X. 4 945.)

TURKISH DIRECTION-GENERAL OF POSTS, TELEPHONES AND TELEGRAPHS, January 5th.—Supply of 60 000 porcelain insulators and 15 000 swan neck fittings. (Reference B.X. 4 904.)

INDIAN STORES DEPARTMENT, January 8th.—Three oil engine driven 12½ kW generator sets (order No. N/9248). (Reference B.X. 4 956.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of protective apparatus for telephone equipment, including fuses, heat coils and arresters (schedule C. 380). (Reference B.X. 4 881.)

## Automatic Telephone Equipment.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of switching equipment and relays, for use in automatic telephone exchanges (schedule C. 381). (Reference B.X. 4 880.)

SOUTH AFRICAN RAILWAYS AND HARBOURS (extension of date), January 10th.—Supply of five electrically-driven traversers and one 5-ton hand-operated crane (tender No. 1 344.) (Reference A. 7 023.)

VICTORIAN ELECTRICITY COMMISSION, January 14th.—Supply of 11 000 V transformers and spares (specification No. 29/1). (Reference B.X. 4 900.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 15th.—Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 15th.—Supply of vitreous enamel indicating plates. (Reference B.X. 4 927.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Telephone transformers (schedule C. 383.) (Reference B.X. 4 878.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Supply of loading coil pots. (Ref. B.X. 4879.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Supply of timing clocks (schedule C. 382). (Reference B.X. 4 905.)

TURKISH DEPARTMENT OF POSTS, TELEGRAPHS AND TELEPHONES, January 16th.—Supply of underground telegraph cable, and accessories. (Reference B.X. 4 942.)

VICTORIAN RAILWAY COMMISSION, January 16th.—Rotary converter or rectifier set, for Glen Waverley sub-station. (Reference B.X. 4 893.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 17th.—Air compressor, arc welding set, electrically-driven wheel lathe, motor-driven foundry sand and loam mill, motor-driven rattler and motor-driven stone crushing machine (tender No. 1 367.) (Reference A.X. 7 226.)

GRAHAMSTOWN MUNICIPALITY, January 22nd.—Supply of cable, transmission lines and transformers (contract C. 1 928). (Reference B.X. 4 913.)

GRAHAMSTOWN (SOUTH AFRICA) MUNICIPALITY, January 22nd.—Supply and erection of centrifugal pumps, motors and cable (Contract B. of 1928). (Reference A.X. 7 187.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Supply of telephonists' telephones. (Reference B.X. 4 888.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Telephone transmitters and associated parts (schedule C. 386.) (Reference B.X. 4 889.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Telephone receivers and associated parts (schedule C. 387). (Reference B.X. 4 890.)

EGYPTIAN MINISTRY OF THE INTERIOR, January 24th.—Supply and installation of electric system for Beba. (Reference B.X. 4 916.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, January 24th.—Supply of telephone switchboards (tender No. 143). (Reference B.X. 4 912.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 24th.—Supply of two small d.c. generating sets, running on crude oil, for Maquassi. (Reference B.X. 4 943.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 29th.—Accumulator batteries and counter E.M.F. cells (schedule C. 390). (Reference B.X. 4 906.)

WAIRARAPA (N.Z.) ELECTRIC POWER BOARD, January 29th.—Supply of 15 sets of earth leakage protection equipment (contract No. 78). (Reference B.X. 4 950.)

EGYPTIAN MINISTRY OF THE INTERIOR (SECTION DES MUNICIPALITIES ET COMMISSIONS LOCALES), January 31st.—Diesel engine driven generator set, d.c. rotary balancer, and accessories, for Kafrel Zayat electric station. (Reference B.X. 4 931.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 31st.—Supply of electrically driven locomotive turntable (tender No. 1 386). (Reference A.X. 7 253.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 11 000 V switchgear, in connection with the Yallourn power station extensions. (Specification No. 29/5). (Reference B.X. 4 897.)

VICTORIAN ELECTRICITY COMMISSION, February 4th—Supply of 22 000 V switchgear and accessories, for Richmond Terminal Station. (Reference B.X. 4 901.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 11 000 V switchgear, for installation in the Richmond Terminal Station (specification No. 29/3). (Reference B.X. 4 898.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of pillar insulators, with metal parts, for use on 132 000 V outdoor circuits. (Reference B.X. 4 921.)

INDIAN STORES DEPARTMENT, NEW DELHI, February 5th.—Supply of turbo-alternator, boiler, economiser, switchgear and cables. (Reference B.X. 4 944.)

EGYPTIAN STATE RAILWAYS, February 9th.—Electrification and equipment of Heluan line, including equipment of power station, overhead transmission lines, track bonding, motor and trailer coaches, etc. Tenders to General Manager, Cairo Station.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, February 12th.—Supply of v.i.r. wire (No. P and T. 151/1184). (Reference B.X. 4 951.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 14th.—Supply of 15-ton electrically driven portal titan crane (tender No. 1366). (Reference A.X. 7272.)

INDIA STORE DEPARTMENT, February 15th.—Supply of hydro-electric plant, comprising four 12 000 kW water-wheel driven alternator sets, auxiliaries and spares (schedule 4). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW SOUTH WALES DEPARTMENT OF PUBLIC WORKS. Extension of date.—February 18th. Supply and erection of hydro-electric generating plant for Burrinjuck development. (Reference 4 938.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, February 19th.—Supply of 120 000 galvanised steel spindles for insulators. (Reference B.X. 4 948.)

WHANGAREI (N.Z.) HARBOUR BOARD, February 28th.—Supply of one 15-ton electrically-operated level luffing gantry crane (contract No. 35). (Reference A.X. 7 263.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.—Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Reference B.X. 4 873.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 19th.—Supply of 110 000 V transformer, for Mangahao electric power scheme (section 204). (Reference B.X. 4 952.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 19th.—Suppyl of 11 000 V switchgear, for Mangahao power development (section 203). (Reference B.X. 4 953.)

## Tenders Accepted.

HALIFAX CORPORATION.—English Electric Co., Ltd., supply of seven tramcars.

YORK CORPORATION.—W. Bellerby, Ltd., supply of police boxes, cycle sheds, etc.

BRIGHTON CORPORATION.—A. Reyrolle and Co., Ltd., e.h.t. switchgear, £822 12s. 6d.

WINDSOR CORPORATION.—H. Fennemore, re-wiring buildings at sewage farm, £29 17s. 6d.

SILVERTON (DEVON) PARISH INSTITUTE.—Christy Bros. and Co., Ltd., electric light wiring.

ST. CHAD'S CHURCH, ROMILEY.—A. Burgess and Co., concealed flood-lighting installation.

OLDHAM CORPORATION.—Etchells, Congdon and Muir, Ltd., electric lift, for electricity showrooms.

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LIVERPOOL CORPORATION.—McBride and Nuttall, supply and installation of lamps, etc., for artificial sunlight baths at Cornwallis Street Baths, £368. (Recommended.)

WEST LOTHIAN EDUCATION COMMITTEE.—J. Kilpatrick and Sons, Ltd., electrical work in connection with erection of a Central School at Bo'ness, £955. (Recommended.)

GLASGOW CORPORATION.—Supply of tramway material: Rails, Bolckow, Vaughan and Co., Ltd.; armature coils, P.R. Jackson and Co., Ltd.; armature binding wire, Bruntons.

DUBLIN CORPORATION.—Société Genevoise d'Instruments de Physique; Drake and Gorham Wholesale, Ltd.; and Metropolitan-Vickers Electrical Co., Ltd., supply of meters for one year.

CENTRAL ELECTRICITY BOARD.—Painter Bros. (through Callender's Cable and Construction Co., Ltd., main contractors), construction of steel transmission-line towers for southern portion of South-East England Electricity Scheme.

SHEFFIELD CORPORATION.—Davenport Engineering Co., Ltd., erection of cooling tower at Neepsend power station, £3 040; British Electric Transformer Co., Ltd., four 500 kVA sets of transformers, £1 280; A. Reyrolle and Co., Ltd., supply of sub-station switchgear, £745.

CHESTERFIELD CORPORATION.—Greenwich Cable Works, Ltd., cable for miscellaneous extensions, £1 810; Hewittic Electric Co., Ltd., 150 kW mercury arc rectifier equipment, and transformer for extension of the railless electric vehicle system to New Whittington, £960; British Thomson-Houston Co., Ltd., switchgear, £203 12s. 6d.

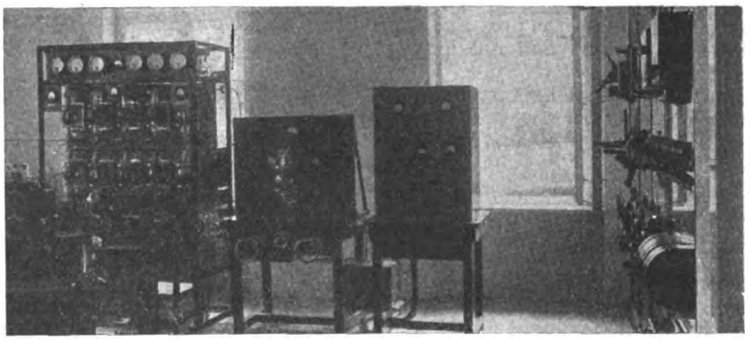
MANCHESTER CORPORATION.—R. Seddon and Sons, electric light installations at Housewifery Centre, Plymouth Grove West, and Princess Road School, and electric lighting alterations at Cambrian Street Municipal School; A. London electric light installation at Johnson Street Clinic and caretaker's house; R. M. Evans and Co., electric light installation at Oldham Road Depot.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—J. G. Statter and Co., supply of two negative l.t. switchboards, £388. (Recommended.) Also tendered: General Electric Co., Ltd., £420; Ferguson, Pailin, Ltd., £424; Bertram Thomas, £430; Edison Swan Electric Co., Ltd., £470; Johnson and Phillips, Ltd., £484; New Switchgear Construction Co., Ltd., £525; Whipp and Bourne, Ltd., £550; Park Royal Engineering Co., Ltd., £578; Nalder Bros. and Thompson, Ltd., £785; Metropolitan-Vickers Electrical Co., Ltd., £826; British Thomson-Houston Co., Ltd., £851.

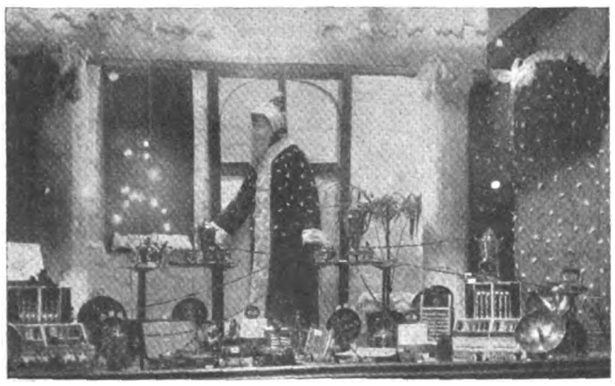
MANCHESTER CORPORATION.—Barber and Colman, supply of electric traffic signals; R. Johnson and Nephew, Ltd., copper and cadmium copper trolley wire; British Mannesmann Tube Co., Ltd., steel tramway poles; Bromford Tube Co., Ltd., tramway pole sleeves; Callender's Cable and Construction Co., Ltd., cable work in connection with Barton station extensions; Tudor Accumulator Co., Ltd., replacement of cells in Dickinson Street battery; Mather and Platt, Ltd., transformers, rotary converters, four motor-driven centrifugal pumps, and switchgear, for Lostock booster station; Tilghman's Patent Sand Blast Co., supply of second hand electrically-driven air compressor, for waterworks department.

## ELECTRICAL NEWS OF THE WEEK IN PICTURES.

The E.D.A. stand at the South Wales Mining Engineers' Exhibition which was held at Cardiff. The exhibit was associated with the Factory and Workshop Lighting Campaign, and attracted a considerable number of visitors.



The modern trend in the design of wireless transmitting equipment is shown by this 1½ kW Marconi set for Linz. Compared with the plant of the same power of some five years ago, the present day gear is remarkably compact and simple to operate. The set illustrated is crystal controlled for constancy of wavelength and is intended to radiate on 254.2 metres.



Father Christmas staged amid suitable electrical presents, in a window of the Bradford Corporation Electricity Department. The setting represents the outside of a house covered with snow, while an illuminated icicle hangs from the verandah. Father Christmas is about to open the door with his right hand, while in his left are red crepe paper strings linked with electrical gifts on the floor of the window.

The possibilities of window-display are also shown by this photograph of another Bradford window, wherein is being demonstrated the reception of wireless pictures. Some half-a-dozen radio displays in connection with the same demonstration have been introduced, and, considerable business is being done. The number of electrical firms and others who have devoted window space to wireless has appreciably increased.

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# ELECTRICITY SUPPLY.

## Extension of Blackpool Supply Area Generating Plant for Dumfries.

SHEFFIELD Electricity Committee has voted £20 000 for further mains extensions.

Abingdon T.C. has referred to a special committee the question of electricity supply in the town.

A company is to be formed for providing a supply of electricity for the village of Llanymynech.

Hereford Corporation's mains are to be extended to Kington in order to supply electricity to that town.

Dover T.C. has received sanction to loans of £2 280 for feeder mains and £1 520 for a switchboard.

Burton-on-Trent Electricity Committee is to extend cables, at a cost of £500, to supply factories in Wetmore Road.

Electricity is to be supplied throughout the Bolsover urban district, the supply being purchased in bulk from the Staveley Co.

Banbridge U.D.C. has decided to approach Belfast Corporation with a view to ascertaining terms for a supply of electricity.

Blackpool T.C. has received sanction for spending £44 800 for the extension of the electricity supply to Poulton, Carleton and Marton.

Wimbledon Electricity Committee has obtained sanction for the loans for mains and services, £100 000, and wiring installations, £5 000.

The output of the Preston electricity works during November was 5 850 000 kWh, an increase of 72% over last year, and the present month promises to create a record.

Retford T.C. has applied for a loan of £6 000 for the provision of electricity to the villages of Eaton, Gamston, Rockley, Markham Moor, East Markham and Tuxford.

The Electricity Commissioners have approved an agreement between Gainsborough U.D.C. and the Yorkshire Electric Power Co. for a bulk supply of electricity for the town.

Dumfries T.C. has received from the Electricity Commissioners approval of the proposed expenditure of £16 000 for a new steam turbine and auxiliary plant for the electricity works.

Bradford Electricity Committee is to extend the transformer chamber at the premises of Jeremiah Ambler and Sons, Ltd., Valley Road, at a cost, including mains, of £4 094.

Hungerford P.C. has decided that the Wessex Electricity Co. be written to in regard to the lighting of Charnham Street, and that if the work is not carried out within seven days the Gas Company be asked to do it.

In order to preserve its rights under the Worthing (Extension) Special Order, 1926, Worthing Corporation has decided to carry out the laying of mains and provision of transformer sub-station in Ferring and Findon, at an estimated cost of £9 680 and £11 043 respectively.

The electric lighting of Llantwit Major by means of current supplied by the South Wales Electrical Power Distribution Co., was commenced on December 11th. Mr. J. W. Beauchamp represented the company at the opening ceremony, which was performed by Mr. T. R. Thomas, chairman of the Parish Council.

The Central Electricity Board has intimated that, in the scheme adopted by the Board, provision has been made to enable Burnley to obtain energy from either Padiham or Nelson. The Board is unable to take over the 33 000 V cable laid by Burnley Corporation between its generating station and Rosegrove.

The Electricity Commissioners have decided to consent to the purchase of the Oxford Electric Co.'s undertaking by Oxford Corporation. The Commissioners feel that it should be possible, in exercising the right of purchase, to resolve ancillary matters of the kind to which their attention was directed during the course of the proceedings on the application.

Dalkeith T.C. has received an inquiry from the Lothians Electric Power Co. (Ltd.), whether the Council would entertain a proposal for the sale of its electricity undertaking to that company. The company undertakes that, on the completion of the sale, the prices of electricity in Dalkeith will be reduced to the rates ruling in the adjacent area of the county. The Dalkeith undertaking was transferred from the Electric Supply Corporation, Ltd., three years ago, at a cost of £18 000.

# COMPANY NEWS.

## Another Rise in Marconi Marine Shares—Meetings, Reports and Dividends.

SOME recovery in the market for Marconi International Marine shares has brought the price up again, at the time of writing, to 72s. 6d. Marconi's Wireless shares, too, are a little higher: Eastern Telegraph Stock is unchanged at just over 260. In the manufacturing group Johnson and Phillips shares are 2s. 6d. down and G.E.C.'s a trifle easier; Metropolitan-Vickers have hardened 1s. 3d. Yorkshire and Newcastle-upon-Tyne supply shares both show a small rise; but County of London have shed 6d. Underground Electric Railways ordinary shares have lost the 6d. rise of last week.

| Last Annl. Divd. | Description. | This Week. | Last Week. | 1912 to 1927. Highest. | Lowest |
|---|---|---|---|---|---|
| | **Electricity Supply.** | | | | |
| (d) | Brompton & Kensington Ord. .. | 27/- | 27/- | 45/- | 23/9 |
| 4 | Central Elec. Sup. 4% Deb. .. | 91½ | 91½ | 100 | 67 |
| (a) | Charing Cross Elec. Ord. (£1) .. | 26/6 | 26/6 | 60/- | 10/- |
| 4½ | ,, ,, ,, 4½% C.P. (£1) .. | 17/6 | 17/6 | 19/6 | 10/- |
| (e) | Chelsea Elec. Sup. Ord. .. .. | 27/- | 27/- | 39/6 | 10/- |
| 10 | City of Lond. Elec. L'ting Ord. .. | 30/7½ | 30/7½ | 52/10½ | 20/3 |
| 6 | ,, ,, ,, ,, 6% C.P. | 23/- | 23/- | 40/- | 15/6 |
| 7½ | County Lon. Elec. Sup. Ord. .. | 43/- | 43/6 | 68/6 | 14/6 |
| 6 | ,, ,, ,, ,, 6% C.P. .. | 23/6 | 23/6 | 24/9 | 15/3 |
| (g) | Kensington & K'bridge Ord. (£1).. | 26/6 | 26/6 | 104/6 | 3/- |
| (b) | Lon. Elec. Sup. Ord. (£1) .. .. | 26/6 | 26/6 | 38/3 | 5/- |
| 9 | Metro. Elec. Sup. Ord. .. .. | 45/- | 45/- | 43/- | 8/- |
| 4½ | ,, ,, ,, 4½% C.P. .. | 17/6 | 17/6 | 18/6 | 9/6 |
| 7½ | N'castle & Dis. Elec. Ltg. Ord. .. | 30/- | 30/- | 22/6 | 7/9 |
| 6 | N'castle-upon-Tyne Elec. Sup. Ord. | 25/7½ | 25/- | 26/- | 11/6 |
| 6 | N. Metro. Elec. 6% C.P. .. .. | 23/- | 23/- | 23/9 | 10/1½ |
| 6 | Notting Hill 6% C.P. (£10) .. | 10½ | 10½ | 10½ | 6/13/9 |
| (c) | St. James. & P.M. Ord. (£1) .. | 27/6 | 27/6 | 62/- | 22/- |
| 1/4½ | Shrops. Worcs. & Staffs Power B. Or | 34/4½ | 34/4½ | 23/- | 20/9 |
| (f) | W'minster Elec. Sup. Ord. (£1) .. | 27/- | 27/- | 52/- | 18/- |
| 4½ | ,, ,, ,, ,, 4½% C.P. (£1) | 17/6 | 17/6 | 21/6 | 13/- |
| 8 | Yorks. Elec. Power Ord. .. .. | 34/6 | 34/- | 32/9 | 12/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 24/- | 24/- | 25/- | 14/3 |
| | **Railways and Tramways.** | | | | |
| 8 | Brit. Elec. Trac. Pfd. Ord. Stk. .. | 124 | 124 | 152½ | 24 |
| 6 | ,, ,, ,, 6% Pf. Stk. | 127½ | 127½ | 129½ | 53 |
| 4 | Cent. Lon. Ry. Ord. Stk. (asstd.).. | 73 | 73 | 89½ | 40½ |
| 4 | ,, ,, ,, 4% Deb. .. .. | 81 | 81 | 103 | 56½ |
| 4 | City & S. Lon. 4% Perp. Deb. .. | 79½ | 79½ | 102½ | 50 |
| 4 | Lon. Elec. Rly. Cons. Ord. Stk. .. | 75½ | 75½ | 73½ | 10 |
| 4 | ,, ,, ,, ,, 4% Pf. Stk. | 73½ | 73½ | 84/2/6 | 43 |
| 4 | ,, ,, ,, ,, 4% Deb. .. | 81 | 81 | 98½ | 52 |
| 5 | Lon. & Sub. Trac. A. Deb. .. | 97½ | 97½ | 89 | 65 |
| 4 | Lon. Un. Trams, 1st Deb. .. .. | 62 | 62 | 82 | 30 |
| 4½ | Met. Elec. Trans, 4½% Deb. .. | 72 | 72 | 101½ | 49 |
| 5 | ,, ,, ,, 5% Deb. .. | 67½ | 67½ | 102/17/6 | 53 |
| 3 | Met. Rly. Cons. Ord. Stk. .. .. | 64 | 64½ | 84½ | 19 |
| 3½ | ,, ,, ,, 3½% Pf. Stk. .. | 65 | 65 | 88½ | 40½ |
| 3½ | ,, ,, ,, 3½% Deb. .. .. | 72 | 72 | 92½ | 51 |
| 4 | Met. Dis. Rly. Ord. Stk. .. .. | 80½ | 80½ | 66½ | 12½ |
| 4½ | ,, ,, 4½% 1st Pref. .. | 81½ | 81½ | 91 | 45 |
| 6 | ,, ,, 6% Perp. Deb. .. | 110½ | 116½ | 146/12/6 | 80 |
| 4 | S. Met. Elec. Trams, 4% Deb. .. | 79 | 79 | 73½ | 48½ |
| 5 | Underground Electric Rlys. Ord. .. | 26/6 | 27/- | 5/3 | 2/1½ |
| — | Yorks. (W.R.) Trams, Ord. .. | 5/- | 5/- | 27/- | 1/- |
| 4½ | ,, ,, ,, 1st Deb. .. | 61 | 61 | 87 | 52 |
| | **Electrical Manufacturing.** | | | | |
| 7 | Brit. Elec. Transformer 7% C.P. .. | 18/1½ | 18/1½ | 22/1½ | 11/6 |
| 15 | Brit. Insulated Cables Ord. .. | 80/- | 80/- | 86/3 | 26/6 |
| 6 | ,, ,, ,, 6% C.P. .. | 22/6 | 22/6 | 25/6 | 14/6 |
| 7 | British Thomson-Houston Pref. .. | 23/- | 23/- | 24/6 | 19/7 |
| 7 | ,, ,, ,, 7% Deb. | 104½ | 104½ | 109½ | 92/- |
| 10 | Brush Electrical Ord. .. .. | 28/9 | 28/9 | 29/9 | 10/- |
| 15 | Callender's Cable Ord. .. .. | 80/- | 80/- | 86/- | 22/- |
| 6½ | ,, ,, 6½% C.P. .. | 25/- | 25/- | 26/7 | 3/- |
| 7½ | ,, ,, 7½% B. Pref. .. | 27/6 | 27/6 | 27/6 | 16/6 |
| 8 | Crompton Parkinson 8% Cum. Pf. | 25/- | 25/- | 25/- | 9/10 |
| 6 | ,, ,, 6% Cum. 2nd Pf. | 18/3 | 18/3 | 18/- | 8/- |
| 10 | Edison Swan Elec. Ord (4/-) .. | 12/6 | 12/6 | 28/9½ | 1/11 |
| 7½ | ,, ,, 1st Pref. .. | 25/7½ | 25/7½ | 26/- | 5/- |
| 7½ | Elec. Construction Ord. .. .. | 26/10½ | 26/10½ | 35/9 | 6/7 |
| 7 | ,, ,, 7% C.P. .. | 22/6 | 22/6 | 25/3½ | 16/- |
| — | English Elec. Ord. .. .. .. | 7/6 | 7/6 | 29/3 | 7/3 |
| 6 | ,, ,, 6% C.P. .. .. | 10/- | 10/- | 22/1½ | 10/6 |
| 7 | Ericsson Telephones 7% Pref. .. | 19/- | 19/- | 22/9½ | 12/7 |
| 35 | Ever Ready (Gt. Britain) Ord. .. | 26/- | 25/9 | 93/9 | 18/6 |
| 6 | Ferranti 6% Pref. .. .. .. | 19/- | 19/- | 19/4½ | 16/9 |
| 7 | ,, 7% 2nd Pref. .. .. | 19/- | 19/- | 19/3 | 13/9 |
| 10 | General Elec. Ord. .. .. .. | 43/9 | 44/4½ | 59/- | 13/6 |
| ‡25 | W. T. Henley's Ord. .. .. .. | 112/6 | 112/6 | 108/9 | 23/3 |
| 12½ | Johnson & Phillips Ord. .. .. | 36/3 | 38/9 | 67/11 | 14/6 |
| 7½ | Lon. Elec. Wire & Smith's Pref. .. | 23/9 | 23/9 | 27/6 | 17/6 |
| 6 | Metropolitan-Vickers Ord. .. .. | 30/- | 28/9 | 37/- | 13/1 |
| 8 | ,, ,, 8% C.P. (£2) | 55/- | 55/- | 67/10 | 5/- |
| 7½ | Siemens Bros. & Co. Ord. .. .. | 26/3 | 26/3 | 36/6 | 12/3 |
| 10 | Telegraph Const. Ord. (£12) .. | 25 | 25 | 6/2/6 | 19 |
| | **Telegraph.** | | | | |
| 3½ | Anglo-Am. Tele. Ord. Stk. .. .. | 61½ | 61½ | 68½ | 40 |
| 10 | Eastern Ord. Stk. .. .. .. | 261½ | 261½ | 213½ | 113/2/6 |
| 3½ | ,, 3½% Pref. Stk. .. .. | 67½ | 67½ | 84/17/6 | 49 |
| 4 | ,, 4% Deb. .. .. .. | 79½ | 79½ | 103½ | 60 |
| 10 | Eastern Extension Ord. (£10) .. | 26½ | 26½ | 21½ | 10/12/6 |
| 22 | Gt. Northern Telegraph (£10) .. | 29½ | 28½ | 42/12/6 | 19 |
| 10 | Indo-European (£25) .. .. | 47½ | 47½ | 56½ | 25 |
| 20 | Marconi's Wireless T. Ord. .. | 75/- | 76/3 | 9/16/3 | 20/9 |
| 12½ | ,, Int. Mar. .. .. .. | 72/6 | 65/- | 5/11/3 | 14/11 |
| 10 | Western Tel. Ord. (£10) .. .. | 26 | 20 | 23 | 11/3/6 |

(a) 1s. 7 7/8d. per share. (b) £8 8s. 6·66d. per cent. (c) 1s. 6·949d. per share.
(d) 1s. 8·706d. per share. (e) 1s. 9·3d. (f) 1s. 0·912d. (g) 1s. 7·223d.
‡ Including 1s. bonus.

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BENN BROTHERS, LTD.—Intm. divs. 3% on pref. shs., 6¼% on ord. shs. and 1s. 3d. p. sh. on dfd. shs., all less tax (same rates as last year), payable on Feb. 15.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Intm. div. for three mos. ended Sept. 30, 1928, of 5s. p. sh., payable, tax free, on Jan. 15.

ARON ELECTRICITY METER, LIMITED AND REDUCED.—Intm. div. of 3% on pref. sh. cap. on acct. of year to March 31, 1929, has bn. declared. Warrts. will be posted to shhldrs. on Jan. 11.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½% p.a., less tax, on pref. stk. for qrtr. endg. Dec. 31, 1928, and div. of 2½% on ord. stk., tax free, for qrtr. ended Sept. 30, 1928, payable Jan. 15, are announced.

MAATSCHAPPIJ TOT FINANCERING VAN ELEKTRICITIJTS ONDERNEMINGEN.—This co., in which Elektricitäts Aktiengesellschaft W. Lahmeyer and Co. is interested, and which has a nom. cap. of Fl. 8 300 000, has been formed in Holland.

RADIOVISOR FOREIGN AND COLONIAL, LTD.—To comply with Stock Exchange regulations, statement giving particulars of this co. was published last week. Co. was formed to acquire, for all countries outside British Isles, patent rights in inventns. of John Neal, the basis of which is productn. in a commercial form of light sensitive bridge. Some applicatns. of Radiovisor are railway signalling, talking films, automatic street and other lighting, fire and burglar alarms, wireless, wireless pictures, etc. Issued and paid up sh. cap., £450 000.

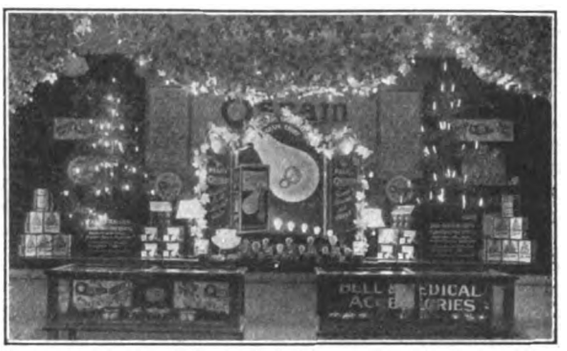
S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Pft. for year ended Aug. 4, 1928, £160 937. After provisn. for depreciatn., directors' fees, bank int., etc., blce. is £110 521, plus £34 203 brt. in. Deductg. cum. pref. div. already paid, leaves £111 679. After providg. for fixed div. of 7% on pfd. ord., it is proposed to pay further 10½% on pfd. ord., makg. 17½%, dfd. shs. receivg. 37½%. Written off patents, £10 000; to gen. res., £25 000. Fwd., £43 079. Directors propose to create further 50 000 pfd. ord. shs. of £1 each and 280 000 dfd. ord. shs. of 1s. each.

UNITED RIVER PLATE TELEPHONE CO., LTD.—It was announced last week that Messrs. Morgan, Grenfell and Co. had made an offer for purchase of the ord. shs. The offer gives shhldrs. optn. of exchanging five ord. for £22 10s. in cash, plus one $100 sh. in cap. stk. of International Telephone and Telegraph Corporation, or of receivg. £12 in cash for each ord. sh., and is conditnl. upon acceptance not later than Jan. 3 by 75% of the voting power. Directors of United River Plate Telephone Co. unanimously recommend hldrs. to accept offer, leavg. each hldr. to decide which optn. to take.

BULLERS, LTD.—Pft. for year ended July 31, 1928, after provision for all charges, includg. depreciatn. and deb. int., £24 479, increase £8 865. This result has, to some extent, bn. brt. about by increase in output, but mainly reflects applicatn. of improved methods of productn. Increased demand on the home market, due to expansion of electric power productn. under the national scheme, has attracted foreign competitn, and continental interests are associated with the building in England of a new factory for productn. of electl. porcelain. Therefore, directors propose, after provisn. for pref. div. £7 500 and deb. sinkg. fund, £6 822, to transfer £10 000 to gen. res. and carry fwd. £2 725.

## Company Meetings.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Mr. J. S. Austen, presiding at the meeting on December 12th, said it was something of a coincidence that their meeting was held on the day when so many people were talking of the contemplated sale of one of the most important telephone companies owned in this country to an American company. He only referred to the matter in order to draw the shareholders' attention to the potential value in sound telephone companies. The results of their company for the past year had been very much as usual. Receipts were about £9 000 more than last year; expenses, excluding certain extraneous charges, were about £3 000 more; and the net result was about £5 000 better. That £5 000 was sufficient to pay the increased dividend required by their increase of capital, and to add about £1 800 more than last year to excess profits account—the amount added this year being about £7 800. Subscribers had increased during the year by 572. Their automatic exchange in Caracas had either been completed or was just on the point of being finished. It was stated in the auditors' report that the extent of provision required to write off plant rendered obsolete by the adoption of the automatic system at Caracas had not yet been ascertained. That remark need not cause any anxiety. It meant that owing to the change over from one system to another the old plant had been rendered obsolete, and, as soon as they got some idea of the value of the old plant they would write that value off. They had an accumulated reserve against depreciation of £93 000, and the amount would come out of that account. It was for such occasions that that account had been accumulated, because a telephone company was specially susceptible to this change of system. The chairman concluded by announcing that the time was at hand when he must resign the chairmanship, and that he hoped Sir Alexander Roger would be his successor. The report and accounts were adopted, and the dividends recommended in the report were approved.



*VIEW showing effect of decorative lighting by means of Osram olive shaped and miniature candle pattern decorative lamps, all types of which have been reduced in price.*

CAPE ELECTRIC TRAMWAYS, LTD.—Mr. L. Breitmeyer, presiding at the recent ordinary general meeting, said the report showed that the past year had been a very anxious one for the directors and management, and the results, owing to the unfair competition from which they had suffered, had been disappointing. Passengers carried on the Cape Town tramways were 2 290 442 less than in the previous year, but their motor buses in Cape Town carried 7 519 995 more. The Port Elizabeth system had an increase of 571 113 in passengers. The combined figures showed that 41 493 331 passengers were carried, against 35 701 665, and that the earnings were £438 071, against £431 387. The gain had been illusory, and its advantage was lost by the necessary reduction of fares and increased mileage, entailing increased expenditure, which brought about the serious setback in the yearly profits from £70 200 to £38 300. The competition from motor-buses had become more severe notwithstanding the cuts that had been made in their fares, and the extra travelling facilities given to the public. In Cape Town at peak periods a large number of extra trams and buses were put into service, and taken off as soon as the rush was over, the vehicles used for this purpose being only partly operated throughout the day. This service, therefore, became costly and unremunerative. On the other hand, their competitors run their buses throughout the day, to the best advantage to themselves, and were able to pick up the most payable traffic without making any special effort in the rush hours. The company had costly obligations, such as paving in streets and maintenance of permanent way, which the rival bus escaped. Last year £30 000 was expended in this direction in Cape Town alone. In the early part of the year, regulations for the better control of motor-buses were promulgated, but they were practically disregarded by their opponents, and until these regulations were more rigidly enforced the unfair competition would continue. The capital expenditure charged during the year was £33 583. The profit and loss account, after charging London expenses and income-tax and taking into account the depreciation on motor-buses, showed a credit balance of £38 348, against which interest and redemption of debentures were charged, leaving a balance of £18 908, plus balance brought forward from last year, £19 718, making a total of £38 626, of which £10 000 was allocated to reserve, and the remaining balance, £28 626, carried forward. The heavy decrease in the profits had compelled the directors to forgo the declaration of a dividend this year. It was considered prudent to husband their resources. There was a ray of hope that they might be able to declare an interim dividend next June, if they had a good summer season and found they had reached the bedrock of their troubles. The report and accounts were adopted.

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# COMMERCIAL INFORMATION

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BENN, L., 72, St. Ann's Road, Southend, vendor of electrical goods. £11 0s. 7d. November 8th.

BROWN, George, 173, Upper Union Street, Dunstable, electrical engineer. £12 13s. 4d. November 8th.

HAYES, H. J., AND CO., South End, Croydon, electrical engineers. £18 4s. 8d. November 9th.

HORN, T. J., AND SONS, 221, Hanbury Road, Oxford, wireless dealers. £20 16s. 8d. November 6th.

JONES, A. E., (trading as RELIANCE ELECTRICAL CO.), 188, Brunswick Street, Oxford Road, Manchester, electrician. £54 0s. 9d. November 12th.

MATHUEN, N., Ltd., 12-14, Denman Street, Piccadilly Circus, wireless dealers. £21 17s. 10d. October 31st.

MATHUEN RADIO MANUFACTURING CO., 73, Portobello Road, Notting Hill Gate, manufacturers. £16 18s. 7d. October 22nd.

ROBERTSON, A. D., 260, High Road, Balham, electrical engineer, £22 17s. 7d. June 26th.

SANDS, C. W., High Street, King's Langley, electrical engineer. £15 2s. 9d. October 26th.

THOMPSON, George Ryland, 819, Rochdale Road, Manchester, wireless outfitter. £10 3s. 2d. November 8th.

WALLIS AND PITTOCK, 17, Marine Parade, Bexhill-on-Sea, wireless agents. £35 14s. 1d. October 26th.

WENDORFF, H., Radio Supplies, 223, High Street West, Sunderland, wireless dealer. £10 4s. 8d. November 5th.

## Receivership.

HIRCALITE MOULDED COMPOSITIONS, LTD. C. T. O'Callaghan, 47, Spencer Road, Wealdstone, was appointed receiver on November 29th, 1928, under powers contained in debenture dated April 5th, 1927.

## London Gazette, etc.

### Company Winding Up.

HELIKON WIRELESS CO., LTD. Winding-up order, November 20th.

### Bankruptcy Information.

BENNETT, Leslie Norman, 113, Croydon Road, Caterham Valley, Surrey, lately at 23, Carlton Gardens, Herne Bay, and East Street, Herne Bay, Kent, radio engineer. First meeting, December 21st, 3 p.m., 29, Russell Square, W.C.1. Public examination, January 24th, 11 a.m., County Court, Scarbrook Road, Croydon.

WILLS, Thomas Treneman, 17, Britannia Place, Prince Rock, Plymouth, formerly 16, Turret Grove, Plymouth, wireless apparatus vendor. First meeting, December 28th, 3 p.m., 11, St. Aubyn Street, Devonport. Public examination, January 11th, 11 a.m., Western Law Courts, Guildhall, Plymouth.

TURTON, John William, Market Place, Banbury, Oxford, electrical engineer. First meeting, December 22nd, 11.30 a.m. 37, Cornmarket Street, Oxford. Public examination, January 18th, 3 p.m., Town Hall, Banbury.

### Notices of Dividends.

HILL, Clement Sanderson, trading as SANDERSON AND CO., Waltham Chambers, Waltham Street, Kingston-upon-Hull, electrical factor. First and final dividend, 3s. per £, payable, December 21st, National Provincial Chambers, Silver Street, Hull.

NICHOLSON, Cecil, electrical engineer, 3, Lorne Terrace, East Boldon, Durham. First and final dividend, 1s. 8d. per £, payable December 12th, Official Receiver's Offices, 14, John Street, Sunderland.

WOOD, Harry, Market Place, Meltham, electrical and radio engineer. First and final dividend, 3s. 5½d. per £, payable December 15th, Official Receiver's Office, 12, Duke Street, Bradford.

### Notices of Intended Dividends.

NICHOLS, John Tucker, lately 4, Glebe Road, Dalston, London, wireless parts merchant. Last day for receiving proofs, December 28th. Trustee, P. M. Mordant, 115-117, Cannon Street, London, E.C.4.

POOK, Bernard Edwin Mark, 53a, Albert Road, Southsea, wireless dealer. Last day for receiving proofs, December 22nd, Trustee, J. L. Wilkinson, 87, High Street, Portsmouth, Official Receiver.

### Order Made on Application for Discharge.

GRIGSBY, William Reginald, trading as the WENHAM LIGHTING CORPORATION, 184, Gray's Inn Road, London, electrical factor. Discharge suspended for four weeks until December 7th.

# PATENT RECORD.

*The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.*

## Specifications Accepted.

301 221 ALLOY WELDING PROCESSES, LTD., and E. J. CLARKE. Electrodes for electric welding or soldering. (20/12/27.)

283 218 BRITISH THOMSON-HOUSTON CO., LTD. Cooling tanks for electric machines. (7/1/27.)

301 229 J. DIEUX. Installations comprising an amplifier or wireless telegraph apparatus and any source of vibrated or modulated electric current, such as an electric phonograph disc reproducer. (6/1/28.)

285 366 C. ZEISS, firm of. Regulating devices for arc lamps. (14/2/27.)

301 236 T. O'BRIEN, LTD., and A. J. FOWLER. Cabinets applicable for wireless receiving sets. (23/1/28.)

301 240 T. OHARA, K. ENOMOTO, and K. HONDA. Electric lamps. (30/1/28.)

284 678 P. L. HULIN. Electrolytic production of light metals. (3/2/27.)

301 248 J. H. R. WEBBER. Mounting and manipulating electric lights for automobiles. (10/2/28.)

301 250 DR. W. STUWE. Temperature-regulating device for electrical heating apparatus. (13/2/28.)

285 810 WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. Electron discharge devices. (21/2/27.)

287 049 R. BOSCH AKT.-GES. Distributors for electrical ignition devices. (12/3/27.)

286 722 BRITISH THOMSON-HOUSTON CO., LTD. Methods of and apparatus for mounting filaments of thermionic devices. (11/3/27.)

301 259 O. A. TOWNSEND. Devices for preventing the glare from electric lamps. (20/3/28.)

288 315 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electric switches. (9/4/27.)

290 244 A. JAENICKE. Operation of metal-vapour lamps by means of alternating current. (11/5/27.)

288 336 W. SCHWEDER. Production of mixtures of water gas and gases of distillation. (6/4/27.)

289 771 C. W. DINGERTZ. Electric switches. (30/4/27.)

289 820 INTERNATIONAL GENERAL ELECTRIC CO., INC. Oil switches with extinguishing chambers. (2/5/27.)

292 977 SIEMENS-SCHUCKERTWERKE AKT.-GES. Iron core with squirrel-cage type of winding, for electrical machines. (28/6/27.)

292 923 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electrical controlling devices. (25/6/27.)

## Applications for Patents.

### November 15th.

33 472 BRITISH THOMSON-HOUSTON CO., LTD. Transformers. (15/11/27, U.S.)

33 473 BRITISH THOMSON-HOUSTON CO., LTD. Electric discharge devices. (16/11/27, U.S.)

33 525 BRITISH THOMSON-HOUSTON CO., LTD. Radio signalling systems. (15/11/27, U.S.)

33 474 BRITISH THOMSON-HOUSTON CO., LTD. (GENERAL ELECTRIC COMPANY OF N.Y.). Motor control.

33 511 BUROVOX, LTD., and J. K. HAYNES. Telephone systems.

33 512 BUROVOX, LTD., and S. C. WINFIELD-SMITH. Telephone systems.

33 482 B. A. G. CHURCHER and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electrical indicating, measuring, etc., arrangements.

33 518 G. W. GROOT. Inductances.

33 457 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Means for nullifying voltage fluctuations in electrical circuits.

33 458 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Apparatus for generating electric oscillations.

33 517 ELECTRICAL RESEARCH PRODUCTS, INC. Frequency control systems. (24/2/28, U.S.)

33 507 ELECTRO-MECHANICAL BRAKE CO., LTD., and S. SMITH. Electromagnetically operated valves.

33 509 FERRANTI, LTD., and S. Z. DE FERRANTI. Electricity meters.

33 433 C. AND R. FRENCH. Cabinets for wireless loud speakers.

33 450 S. F. GAME and F. A. GOULDING. Thermionic valves.

33 419 W. J. and H. GARRATT and H. WOOTTON. Conduit fittings for electric wiring systems.

33 459 GENERAL ELECTRIC CO., LTD., and J. P. S. PILLAUS. Electrical apparatus.

33 476 P. GENY. Protecting devices for a.c. motors.

33 519 GRAMOPHONE CO., LTD., and E. M. PAYNE. Electromagnetic vibratory devices.

33 481 METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and E. M. JOHNSON. Power systems.

33 455 A. THURNKERR. Electric pocket lamps.

### November 16th.

33 643 L. H. BEDFORD and STANDARD TELEPHONES AND CABLES, LTD. Cathodes for electron discharge devices.

33 570 M. A. BOLTON and J. W. WALKER. Electrodeposition of metallic coatings on wire strips, etc. (27/4/28.)

33 617 BRITISH THOMSON-HOUSTON CO., LTD. Commutating a.c. dynamos. (16/11/27, France.)

33 672 C. O. BROWNE and GRAMOPHONE CO., LTD. Circuits embodying iron-cored transformers.

33 542 A. C. CLARK. Electrical cable connector.

33 526 P. W. FAWCETT and T. FIRTH AND SONS, LTD. Electric welding.

33 537 J. H. O. HARRIES. Control and synchronisation of rays for television, etc.

33 632 HEWITTIC SOC. ANON. Mercury vapour apparatus. (17/1/28, France.)

33 534 H. C. HOLMES, J. A. A. TAYLOR and A. WARWICK. Systems of distributing electrical signals.

33 652 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Contacts for circuit interrupters. (30/11/27, U.S.)

33 625 F. W. MILLER. Electroacoustic devices.

33 536 G. A. E. NORRIS. Detective signalling circuits for auto car battery ignition.

33 633 J. H. T. ROBERTS. Thermionic amplifiers.

33 641 STANDARD TELEPHONES AND CABLES, LTD., and W. K. WESTON. Insulated conductors.

33 644 STANDARD TELEPHONES AND CABLES, LTD. (F. A. ROOME). Telephone systems.

33 671 M. TROUTON and WIRELESS MUSIC, LTD. Magnetic devices.

33 669 A. VARGES. Application of galvanic currents for therapeutical purpose. (8/12/27, Brazil)

### November 17th.

33 711 C. F. H. BAYLY. Transformers.

33 783 BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION, P. D. MORGAN and S. WHITEHEAD. Electric cables.

33 802 BRITISH THOMSON-HOUSTON CO., LTD. Lightning arresters.

33 812 C. O. BROWNE AND W. F. TEDHAM (GRAMOPHONE CO., LTD.). Electrical conductors.

33 813 C. O. BROWNE (GRAMOPHONE CO., LTD.). Apparatus for recording sound.

33 814 C. O. BROWNE (GRAMOPHONE CO., LTD.). Thermionic amplifiers.

33 730 A. J. CURNOW. Electric bell push.

33 772 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Transformers.

33 738 P. DUNSHEATH, and W. T. HENLEY'S TELEGRAPH WORKS CO., LTD. Cut-outs for electric circuits.

33 763 J. L. GOTTLIEB AND CO., LTD., and J. L. GOTTLIEB. Thermionic amplifiers.

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# THE ELECTRICIAN

*Established 1861. The Oldest Weekly Illustrated Journal of*

**Electrical Engineering, Industry, Science and Finance.**

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# Current Topics.

## Resistivity of Aluminium.

PROPOSALS for the values of the electrical and other qualities of aluminium for transmission lines for recommendation to the International Electrotechnical Commission for adoption were considered at a meeting in Paris during November, when Great Britain was represented by by Dr. E. H. RAYNER and Mr. E. T. PAINTON. The subject has, of course, been under consideration for some years, information having been interchanged on a large number of experimental determinations, made at the chief national laboratories, of the resistivity, density and other qualities of both hard drawn and annealed material. It was considered that sufficient information of this nature had been obtained, and the subject had reached a stage when commercial interests were more particularly involved. The type of aluminium considered was restricted to hard drawn material in the form of wire, the annealed being left for consideration at a later date if it be thought desirable eventually to formulate standards for the softer material. The effect of annealing is considerable, usually resulting in a lowering of resistance of more than 1%. It was decided that it was of first importance to prescribe an upper limit of resistivity with which all commercial supplies of aluminium should comply. The chief reason for considering this as being important is the fact that the presence of impurities, if they exceed about 0·5%, is liable appreciably to increase the tendency to corrosion. Since increase in impurity is accomplished by an increase of resistivity, a limit to the permissible resistivity acts sufficiently approximately as a limit to the risk of corrosion.

## Defining "Hard Drawn."

IT is also necessary to define "hard drawn" since resistivity increases with increased strength such as would be obtained by cold working, and, in consequence, resistivity standards must refer to a well-defined range of tensile strength. These matters and other physical characteristics necessary for specification purposes were agreed to on the following lines:—The resistivity of commercial hard drawn aluminium wire at 20 deg. C. is not to exceed 2·873 $\mu\Omega$ centimetres. This is to apply to wire before being stranded into a cable. If the wire is tested after having been stranded, an increase of 1% of the above value is permitted. The wire is required to withstand for one minute a stress of 16 kilograms per square millimeter. It was considered desirable to adopt a definite nominal value for the resistance of commercial aluminium, which could be used in designing transmission lines. It would naturally be less than the maximum mentioned above. It was thought that this should be the average value of good material as at present manufactured. In order to obtain information on which such a value might be founded, it has been decided to postpone a decision on the subject until after March, 1929, so that in the meantime those interested can send the necessary information to the Central Office of the International Electrotechnical Commission.

## The Steel Merger.

THE big steel merger, preliminary details of which were published last week, represents an important step in the development of the process of rationalisation in the basic industries of this country. Its precise effects in the much-needed reorganisation of the British steel industry can only now be hinted at, but the move should certainly place the industry in a competitive position much stronger than that which it now occupies. Among the far-reaching consequences of the fusion, which may before long include other large and important steel manufacturing firms, its bearing on the manufacturing side of the electrical industry is potentially of very considerable importance.

## Medicine and Electrical Risks.

THE inquest last week on the unfortunate child who was killed while undergoing X-ray examination at the Royal Infirmary, Hull, showed that the apparatus was in no way faulty. During the evidence, however, attention was drawn to the fact that the nurse who acted in attendance upon the doctor had only once before been in the X-ray room and had no idea of the danger which might result from touching any of the switches or wires. The Coroner did not imply any culpability on her part, however. The question of admission to an X-ray room of an inexperienced nurse is one which should receive the immediate attention of hospital authorities, for when consulting a doctor one places implicit faith in all his actions, believing oneself to be in practical and skilful hands. Any of his attending staff share such faith, and if, as a result, the public are required to brave unnecessary risks the medical profession is running a grave risk of undermining the confidence of

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the public. Modern X-ray apparatus is safe enough so long as a slight knowledge of the properties of electricity is in the possession of the user, and providing the instructions of the makers of the apparatus are carried out. Without knowledge of the danger, a high tension cable looks innocent enough to touch, and because of its harmless appearance only those qualified in the knowledge of its risks should be allowed to approach within touching distance. These same remarks apply with equal force to users of ray-therapy equipment, for, here, too, fools may rush where "angels" in the guise of electrical engineers may fear to tread.

## "Tote" Possibilities.

THE electrical industry touches modern life at so many points that it is hardly surprising that we should be interested professionally—if not personally as punters—in the work of the Racecourse Betting Control Board. This authority, as is now well known, is charged with the task of establishing the Totalisator system of betting on English racecourses. The "tote" is a complicated piece of apparatus, mainly electrical, which costs a considerable sum of money, and, though many types of "tote" are in existence, we understand that these are largely of foreign origin. The matter has not been overlooked in this country, and as we gather that SIR CLEMENT HINDLEY, the chairman of the Board, would like to see British machines installed on as many racecourses as possible, our manufacturers are already provided with the necessary stimulus to secure the business of equipping the racecourses with British-made "totes." As the business of horse racing is now being subjected to such thorough re-organisation it is perhaps within the bounds of probability to look forward to the time when, like greyhound racing and certain other spectacular sporting events, horse racing will be carried out at night by artificial illumination, and thus provide further opportunities for the display of the skill of the illuminating engineer.

## Science for the Masses.

PROF. ANDRADE has already established a reputation for his very clear and interesting exposition of scientific matters to lay audiences. His series of broadcast talks on "Science in the Modern World" bid fair to enhance that reputation, standing, as they do, as remarkably fine examples of the way in which the most abstruse scientific problems can be treated in a way which can be grasped by the man-in-the-street. His recent talk from 2LO, for instance, touched on the carbonisation of coal, hydro-electric power, and nuclear activity in the atom in a manner which must have awakened a lively public interest in and a better understanding of such matters. It is unfortunate that talks of this kind should have to be given at an hour when many people are dining; it is unfair competition with the cooks. However, the sound dissemination in popular form of scientific views, is an eminently desirable thing and its development will provide a useful corrective to the highly-coloured, but mainly untrue "scientific" stories published by some of the daily papers.

## Smoke and Electricity.

As a result of a recent judgment in the Court of Appeal, details of which we give this week in our legal column, Manchester Corporation has been given a problem which is not easy of solution. We refer to the Barton power station, the fume-charged smoke from which is the cause of the trouble. The Corporation has been given a year in which to develop a scheme whereby it may consume its own smoke, so to speak, and the point is of more than local interest. That the electrical industry, in its mission to make a smokeless world, should at the very start be required to make such a bad example, is at the present stage of development and without water power, unfortunate, but none the less inevitable. To the man-in-the-street, however, the position is beyond all understanding, and with the tremendous strides which electricity generation and supply are making, the advantages gained are, in his opinion, seriously lessened by the smoke pall which is likely to result. The argument is not sound, we know, but it is nevertheless one which has in it a measure of truth. Further, it is to municipal authorities that the public look for the observance by industrial undertakings of the regulations guarding against air pollution, and, if our corporation-owned power stations are to be among the offenders, municipal authority stands little chance of enforcing its regulations in other directions. The law unto oneself must apply to all, and the present case is one which the electricity supply industry will watch with more than passing interest. Maybe, after all, the far-fetched suggestion of electric heating for boilers, as given in a supposititious interview in our last issue, is the best and only remedy so far available.

## An Advertisement for Gas.

UNTIL after the official inquiry into the terrible explosion of gas mains in one of the densely populated areas of central London which so seriously interfered with traffic and other arrangements during the pre-Christmas shopping rush, it is impossible for us to attempt to apportion blame. Certain gas interests, however, are apparently quite unaffected by such qualms, and already one hears suggestions that the Post Office Telephone Department is the real villain of the piece. Although it appears possible, though not probable, that the operation of an electric blower in a telephone duct may conceivably have played an innocent part in the mighty explosion which ripped up miles of streets and damaged many buildings, it seems fairly obvious that there was already present under the roads affected a large accumulation of escaped gas, and that sooner or later an explosion would have occurred in any case. Gas has been much in the news of late, its growing popularity for suicidal purposes—believed to be due to the increased restrictions placed upon the sale of poisons—being particularly notable. The advertisement which the gas industry has thus received cannot fail to have a good effect on the electrical industry, though, apart from such selfish considerations, it becomes increasingly obvious that, from a purely humanitarian point of view, serious consideration will have to be given to the conditions under which gas is distributed, and that distribution controlled, in crowded modern cities. The explosion at least provides the authorities concerned with an opportunity to put down a properly planned tunnel to house all the public utility services for the affected area, but we fear that it will not be taken advantage of.

## Christmas Benevolence.

OUR references to the Electrical Trades Benevolent Institution so often take the form of special pleas for donations, that the following true story, though not specifically devoted to that end, may possibly have that effect in some cases. A few days ago we were approached by a man who has seen many years' service in the electrical industry, and who was, through no fault of his own, out of employment. For some time he had been housed by a certain institution but, having stayed there for the maximum permissible time, he was faced with a homeless and cheerless Christmas. He therefore asked whether we knew of any organisation connected with the electrical industry which might help him over Christmas. Although he was not qualified for assistance as a subscriber to the E.T.B.I., we put him in touch with that Institution with the result, we are pleased to say, that the Committee has arranged a grant which will ensure that the applicant is free from want over the Christmas holidays and for the succeeding weeks until he is able to secure further employment. Our disclosure of this very human incident is, we hasten to add, made without any authority from the Electrical Trades Benevolent Institution. It is, however, a typical example of the truly benevolent way in which the funds of this Institution are dispensed. If any readers, after seeing this are tempted to send a special donation to the E.T.B.I. we cannot prevent them.

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# THE MAINTENANCE OF MECHANICAL OSCILLATIONS BY MAGNETOSTRICTION.

## Some Experiments on the Longitudinal Vibration of Ferromagnetic Bars—Striking Effects obtained with Nickel.

By J. H. VINCENT, M.A., D.Sc., M.I.E.E., F.Inst.P.

[EDITOR'S NOTE.—The manuscript of this article was received on September 20th, 1928.]

IN a letter to "Nature"* a short account was given of some experiments on the maintenance of longitudinal vibrations of metal rods by electric and electromagnetic forces derived from tuned valve circuits. The mechanical impressed forces were either due to electric attraction (electrotraction) or magnetostriction. In the following paper the experiments described are concerned with the longitudinal vibration of ferromagnetic bars under forces mainly due to magnetostriction.

Eccles and Jordan† showed how to maintain a tuning fork by a valve, and Eccles and Leyshon‡ have employed a neon lamp and also a rectifying crystal contact for maintaining a ork and for the maintenance of the longitudinal vibrations of bars at audio frequency. In the well-known application of Eccles and Jordan's invention to tuning forks, magnetotraction is chosen as the mechanical force to produce deflection from the normal shape of the fork.

The term magnetostriction is now used to embrace a large number of direct physical effects§ in which a strain in a body is produced by an applied magnetic field and the corresponding inverse effects.

The connection between vibrations of ferromagnetic bodies and magnetostriction has not been much studied in recent years. Rankine and Young‖ investigated the inverse magnetostrictive effects connected with the vibrations of an iron rod oscillating in various modes. H. J. Round¶ suggested the use of magnetostriction in loud speakers. Fromy** has employed the resonant vibrations of a tube produced by an alternating current to evaluate the Wiedemann effect (twisting of a tube due to a screw magnetic field). He carried out his researches on a nickel tube tuned to execute torsional vibrations at commercial frequencies. Fromy has also applied the Wiedemann effect in an iron tube in the construction of a resonance galvanometer.††

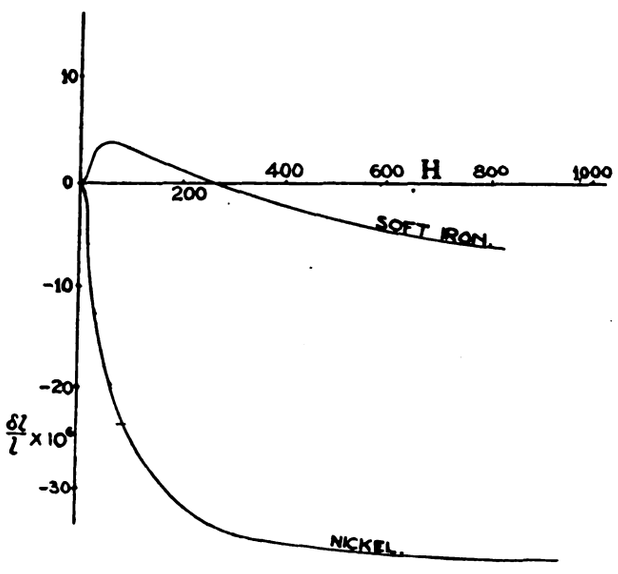


Fig. 1.

* December 31st, 1927.
† British Patent 155 854/1918.
‡ ELECTRICIAN, July 16th, 1926; "Proc. Phys. Soc." 1928.
§ For an enumeration and classification of these effects, see McKeehan, "Magnetostriction," "Journal of the Franklin Institute," vol. 202, pp. 737-773, December, 1926, or Williams' "Some Experimental Methods on Magnetostriction," "Journal of the Optical Society of America," vol. 14, pp. 383-408, 1927.
‖ "Phil. Mag.", November, 1919.
¶ British Patent 229382.
** "Ann. de Physique," December, 1927.
†† "Soc. Franç. Elect. Bull," January, 1928.

Earlier workers paid a great deal of attention to the vibrations produced in ferromagnetic bodies by changing magnetic fields. "In July, 1837, Dr. C. G. Page, of Salem, Mass., drew attention to the sound given out by an electromagnet at the instant when the electric circuit is closed or broken, and in October of the same year he discussed in a short article entitled "Galvanic Music," the musical note produced by rapidly revolving the armature of an electromagnet in front of the poles. Experiments bearing on this subject were subsequently made by a great number of investigators."* Reis used magnetostriction in the first telephone receiver ever constructed (1861). In 1902, Honda and Shimizu wrote a remarkably interesting paper entitled "Note on the Vibration of Ferromagnetic Wires placed in a Varying Magnetizing Field.† They review the previous work on the subject and divide the various sounds accompanying changes in the intensity of electric currents into those due to magnetostriction and those due to other causes. In their own experiments they used a string alternator to provide the alternating or intermittent current which produced the magnetic field in the solenoid in which the ferromagnetic body was placed axially. The effects studied were the forced longitudinal vibrations of the wires, the free frequencies of which were in all cases very much higher than the applied frequencies. The field was not polarised, so that the frequency of the sound was double that of the frequency of the alternating current. The effects observed were complicated by the inertia of the attachments to the wire; they were found to be much more marked in the case of nickel than of iron. They remark "that if an intermittent or alternate current is passed through a spiral of non-magnetic metals, an audible sound is produced," and give an explanation of the phenomenon.

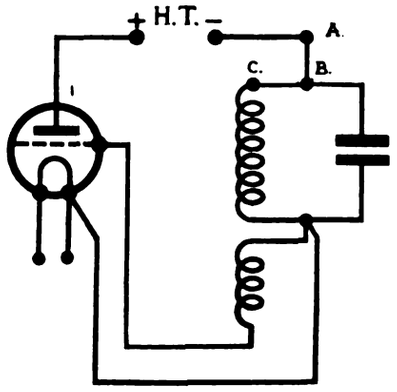


Fig. 2.

### The Joule Effect.

The fundamental direct magnetostrictive effect was first measured by Joule and is called the Joule effect. It consists in a change of length of the specimen in a magnetic field parallel to the length. In the case of iron an increase in length occurs as the field rises from zero to the neighbourhood of 50 gauss when the increment of length reaches a maximum of three or four parts in a million. On increasing the field the length of the specimen decreases. The curve of the Joule effect crosses the axis of field at about 250 gauss, and for higher fields the length is less than the original value. With nickel the effect is much larger and is unidirectional. The magnetic field causes longitudinal contraction which is of the order of thirty parts in a million for a field of 200 gauss. For higher fields the rate of change of length per unit increase of field decreases and the total decrease in length tends to attain a limiting value of nearly 40 parts per million. There is thus an ill-defined shoulder on the curve showing the Joule effect in nickel in the neighbourhood of 200 gauss. See Fig. 1, redrawn from Fig. 3, Plate XV, Honda and Shimizu, "Phil. Mag." 6, vol. 6, 1903.

There appeared then the possibility that attempts to maintain resonant oscillations by magnetostrictive forces might fail with iron and its varieties, but succeed with nickel.

* Kempe "Enc. Brit.", 11th ed., with references to early work.
† "Phil. Mag.", 6th Series, vol. 4.

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Troubles threatened to arise in consequence of eddy currents and hysteresis. However, it turned out on trial that cast steel bars and mild steel bars could be maintained in resonant vibration with great facility. With nickel the effects are even more striking.

Experiments in which the Ferro-magnetic Rod is surrounded by both Grid and Anode Coils.—Throughout this paper the valve maintained oscillating circuit employed is of the tuned anode type. The main oscillating coil was shunted by the variable condenser; the grid control circuit contained a d.c. microammeter provided with a variable shunt. (Fig. 2).

Tuning in the case of audio-frequencies is conveniently carried out by means of a reed telephone earpiece. When this is suitably oriented near the oscillating set it gives out a note of the same frequency as the alternating current in the set. It is not necessary to have any leads to the earpiece.

If a bar of either mild steel or cast steel, or nickel not previously magnetised or specially demagnetised is placed with its centre supported in the main oscillating coil, it is quite easy to tune the set by ear to a frequency an octave below the natural frequency of the longitudinal vibrations of the bar, by listening to the note of the bar when tapped on its end with a light hammer and comparing it with the note from the earpiece. An alternative method is to have a bar twice as long as that placed in the coils, and to tune the set to the fundamental frequency of the longer bar. In either case when the frequency of the set has been roughly adjusted the earpiece is put right away, when the bar will be heard to be emitting a note of twice the frequency of the set. Fine tuning is then carried out until the bar gives out an intense sound on the tuning being exact. This is referred to as the unpolarised effect. The experiment can be carried out by a slightly different method without employing a reed earpiece. In this method the observer compares the faint note of twice the frequency of the set (which is due to the electro-magnetic mechanical forces on the windings of the main oscillator coil and was noticed by Honda and Shimizu) with the natural note of the bar.

The final tuning in this and in the polarised case is exceedingly sharp; the sound rises from pleasantly audible intensity to great loudness with a very small fractional change in capacity.

## Resonance Effects.

To obtain the correct conditions for maintenance in the polarised case is easier. The note from the earpiece is compared with the fundamental of the bar directly. On obtaining approximate unison, the earpiece is dispensed with and the set further tuned to exact resonance either by adjusting for loudness or by beats. The beats are heard when resonance is not exact on suddenly switching on the high tension battery or on tapping the end of the bar. When resonance is exact, tapping the bar apparently produces no effect; the tap of the light mallet employed yields no musical note comparable to the vigorous sound emitted by the resonating bar.

The polarising field may be due to a separate coil placed round the centre of bar fed with direct current or by a magnet either permanent or electromagnetic.

The permanent polarised state may be provided by the magnetism of the bar itself when this is either iron, steel, or nickel. Indeed a bar of ferromagnetic material taken at random will usually be found to have acquired enough permanent magnetism to give a vigorous resonant vibration on testing for the polarised effect as described above.

In both the polarised and unpolarised cases the effects are more striking in the case of nickel than of iron or steel. The passage through resonance in the polarised case is accompanied in the case of nickel by a very deep cleft in the rectified grid current main condenser curve. This occurs either at or very close to its previous position on tuning through resonance in the opposite direction. A similar though less pronounced crevasse occurs in the curve when polarised bars of iron or steel are employed.

The variations in the deflections of the grid galvanometer are similar to those in which an oscillating valve assemblage is influenced by a neighbouring resonating circuit, a result in accord with the masterly researches of Butterworth.*

The method of tuning a valve set to the resonant frequency of a neighbouring circuit is described by Moullin.† Throughout this paper frequencies have been determined by this device. The simple wave-meter consisted of a coil of known self-inductance and self-capacity in series with a calibrated condenser.

On clamping the bars by means of heavy lead weights the crevasses in the curves disappear. This corresponds to breaking the connections in the case of a neighbouring resonating circuit.

## Sudden Fall in Readings.

The sudden fall in the reading of the grid galvanometer when the bar is in resonant vibration becomes more marked as the coupling between the grid coil and main oscillator coil is decreased to its lowest permissible value. This necessitates working with small oscillatory currents. This, however, is not always a disadvantage since the magnitude of the alternating current must be kept low enough to avoid unduly heating the specimens being tested. If the bars are thick, say from a half to three centimetres in diameter, they do not tend to heat rapidly when working with a 20 W valve. With thin rods care must be taken to keep the intensity of the oscillating currents within safe limits.

In these experiments the bars will vibrate readily in their higher modes. Thus in the case of a bar a metre long, if it is supported at a point 25 cm. from one end, with the middle of the coils at 25 cm. from the other end, the bars will vibrate vigorously, emitting the octave of its fundamental note if the main condenser setting is reduced to about a quarter of the capacity necessary for it to vibrate with only one node.

A series of experiments with nickel bars 2·54 cm. in diameter gave the following results :—

Table I.

| Length. Cm. | $n$ Per sec. | $V$ Cm. per sec. |
|---|---|---|
| 100 | 2 520 | $50{\cdot}4 \times 10^4$ |
| 50 | 5 010 | 51·1 |
| 25 | 9 980 | 49·9 |
| 12·5 | 19 900 | 49·8 |

The bars were not accurately turned cylinders, but were used in the condition received from the dealers.

Tests on Non-Ferromagnetic Materials.—Brass bars tested very carefully at audio-frequencies by these methods failed to show any signs of maintenance, but a bar of commercial aluminium gave a distinctly audible note when the circuit was tuned to resonance. A flint glass bar also gave a response which was just audible.

Coil in Series with Grid Coil.—Loud notes are given out by bars in this arrangement when the tuning is correct. The effect on the grid galvanometer on passing through resonance is not very marked and consists in a slight increase in the grid current.

If the coupling between the grid coil and main oscillator coil be reduced so as just to stop the set oscillating a light tap on the end of the bar will cause the set to oscillate temporarily, giving a large deflection on the grid galvanometer. If the ear piece is in the field of the main inductance, this also gives out the fundamental note of the bar. This experiment is indeed a simplification of some of the experiments of Rankine and Young.*

Bar in Coil Traversed by Anode Current.—This arrangement can also be used to excite resonant vibrations in magnetostrictive bars. The lead $A$ $B$, Fig. 2, is cut, and the coil in which the bar is placed is inserted in the gap. The reactions shown by the grid galvanometer are slight, however, and consist in a rise of the rectified current on passing through resonance. The intensity of the oscillations at audio-frequencies is, in favourable circumstances, very surprising.

Bar in Coil in Parallel with Main Inductance Coil.—Some experiments were carried out in which a coil of 4 000 turns surrounded a metre bar of nickel 2·54 cm. in diameter. The part of the bar in the coil was polarised by an electromagnet. The rectified grid current rose as the main capacity was increased towards resonance. When resonance was more closely approached, the current fell rapidly when the bar was giving its loudest sound; after this point was reached the current fell to a minimum and then slowly rose as the capacity was further increased. The curve is one sometimes called a "wiggle" curve, the point of exact resonance being on the downward declivity as the capacity is increased. The whole "wiggle" was wiped out by clamping the bar and repeating

* "Proc. Phys. Soc." vol. 27, p. 410.
† Radio Frequency Measurements," p. 14.

* Loc. cit.

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the readings when an almost straight line graph through the same range of capacity was obtained. Curves of a very closely similar shape were obtained by plotting the readings taken simultaneously on a Duddell thermo-galvanometer reading the main alternating current, and on a vacuum junction and galvanometer in series with the coil surrounding the bar.

Under some circumstances the irregularities on the grid galvanometer main capacity curves were not shown at the same capacities when the curve was drawn in either direction. This oscillation hysteresis is of the kind well known in connection with the method of tuning known as Austin's double click method.

### A Separate Heterodyne Circuit.

Some experiments in which a separate heterodyne circuit was used to produce an audible note in telephones in the plate circuit were carried out with the bar and coils in shunt on the main oscillator. On passing through resonance a sudden change occurs in the pitch of the note in the telephones. These were carried out as far as a nickel bar 6·25 cm. long and 2·54 cm. in diameter approximately. This bar was not turned up true. It resounded to a frequency of 39 000, this being distinctly less than what would have been expected for a uniform bar of this length.

Using this method of maintenance it was found quite easy to obtain the higher modes of vibration of nickel bars, in the way already explained. In the case of a metre bar of nickel this was carried out as far as the mode of vibration with four nodes, but the grid galvanometer indications of resonance were not sufficiently clear to enable this to be carried further.

A polarising electro-magnet with bored conical pole pieces through which the vibrating bar passed was first employed in this method of experimenting. The centre of the bar which was mid-way between the narrow ends of the cone was surrounded by the coil in parallel with the main condenser. This arrangement was used to determine the frequencies shown in Table 2.

TABLE 2.

Bars 2·54 cm. diameter.

| Material. | Length. Cm. | $n$ Per sec. | $V$ Cm. per sec. |
|---|---|---|---|
| Nickel .. .. | 100 | 2 520 | $50{\cdot}4+10^4$ |
| Mild Steel .. | 100 | 2 630 | 52·6 |
| Cast Steel .. | 100 | 2 630 | 52·6 |
| Nickel .. .. | 50 | 5 010 | 50·1 |
| Mild Steel .. | 50 | 5 200 | 52·0 |
| Cast Steel .. | 50 | 5 200 | 52·0 |
| Nickel .. .. | 25 | 10 050 | 50·2 |
| Nickel .. .. | 12·5 | 19 900 | 49·8 |

The continuation of experiments towards higher frequencies in which the bar was placed in a coil in parallel with the main oscillator coil led to troubles which though not certainly diagnosed were probably due to the assemblage having more than one possible mode of vibration.

*(To be concluded.)*

## BOOK REVIEWS.

**Heat and Thermodynamics.** By J. K. ROBERTS. (London and Glasgow: Blackie and Son). Pp. xvi.+454. 30s. net.

This book, which constitutes volume IV of Blackie's comprehensive Student's Physics series, is intended primarily for the student reading for an Honours Physics Degree. While the electrical engineer is not particularly interested in the intricate and specialised methods by which the physicist conducts his investigations in the search after truth, he may at times require to have available clear accounts of the latest theories in various branches of physics. As far as concerns the subject of heat and thermodynamics, the book under review fulfils particularly well this purpose of a work of reference for the engineer. Chief among its merits may be mentioned the logical way in which the book is arranged, and the complete system of subheadings employed, whereby from a list of contents, occupying ten pages, information on any required aspect of the subject of a chapter can at once be located.

In chapter I, dealing with "Temperature," seven pages are devoted to the electrical measurement of temperature by the platinum resistance thermometer and by the thermo-couple. In chapter II, on "Quantity of Heat," are described the various methods by which the mechanical equivalent of heat has been determined. The degree of precision aimed at by the physicist in his measurements can be judged from the fact that the three most reliable determinations by different experimenters give values which agree to within one part in a thousand. Subsequent chapters deal with the kinetic theory of gases, equations of state, low temperatures, the specific heats of gases, solids, and liquids, vaporisation, fusion, thermal expansion, and the transfer of heat by conduction and convection. In the chapter on vaporisation, reference is made to Langmuir's method of determining the vapour pressure of solid tungsten from the rate of loss of weight of a heated filament, this pressure being of the order of $10^{-6}$ mm. of mercury at a temperature of 2 600 deg. C.

The remaining half of the book is devoted to the subject of thermodynamics. The various considerations which apply to the ideal Carnot cycle and to the practical power cycles of the reciprocating steam engine, the steam turbine, the internal combustion engine and the refrigerator are dealt with in three chapters on "The Second Law of Thermodynamics," "Thermodynamic Relations and Their Use," and "Power Cycles." Then follow chapters on "The Principle of the Increase of Entropy," "The Equilibrium of a Physical or Chemical System," and "Chemical Equilibrium in a Gaseous System." In the last-mentioned chapter reference is made to the equilibrium conditions on which the e.m.f. of a cell depends. Chapter XVIII deals with the "Nernst Heat Theorem," and is followed by a useful chapter on "Radiation." The three concluding chapters on "Plank's Radiation Formula," "Debye's Theory of the Specific Heats of Solids," and "The Equation of State for Solids" deal with advanced theory, and are likely to be quite beyond the reach of the average engineer.

The book is very well printed with neat illustrations, and many references to recent original papers are given. There is a useful appendix giving some 37 thermodynamical equations and some notes on steam tables.

R. T. C.

**The A.B.C. of Battery Management.** 2nd edition. By ERNEST C. MCKINNON. (Manchester: Chloride Electrical Storage Co.). Pp. 121. 3s. 6d. net.

A welcome second edition carrying on the tradition of the earlier issue, and completely fulfilling the author's claim of sufficient technical matter with plenty of practical nature, this work is amply illustrated, and has a very useful feature in the glossary of terms in general use. The calculations are expressed clearly, and at the same time the ground is covered to meet all the requirements of the battery attendant, and the technical as well as the non-technical reader.

Many of the features are especially helpful, for instance, the correction of gravities for temperature is shown in a very useful manner, and such as could be readily copied on a larger scale for hanging in the battery room; the emphasis given to the necessity of "using" a new battery is well shown; also the reference to "tail end" regulation (page 52), a matter which might with advantage be more universally adopted in battery practice.

The whole subject is so convincingly dealt with that there are only a few points which can be raised, and these more especially with a view to amplification.

On page 60, Vessels and Utensils, it is rather suggested that the distilled water be handled in earthenware or papier mâché buckets. Any such decanting, of course, offers an added risk of impurities reaching the battery, and except in the case of high tiered cells the water could conveniently be syphoned from the carboy, as it comes from its source, without the intervention of tanks, etc.

On page 60, a description is given of the cadmium test apparatus, and reference made to the curves on page 15. This information might have been given also in tabulated form as many of those to whom this book would appeal are not readily conversant with graphical expressions.

The list of possible battery troubles is very comprehensive, but the probability of many of these coming to the notice of any one attendant during a lifetime is remote.

The book admirably carries out the intention of the author and is a sound practical exposition of lead acid battery work and maintenance with sufficient theory to make reading of an interesting and educational nature for the battery man, to whom, as well as others interested in battery work, it can be confidently recommended.

L. W. de GRAVE.

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# RAIL BOND TESTERS.

## Equipment for Electric Railway Engineers—Minimising Stray Currents—Forms of Testing Apparatus—Employment of a Collapsible Testing Staff—A Convenient Self-Contained Unit.

THE rapid growth of railway electrification during recent years has brought into increasing prominence the importance of efficient bonding, not only of the electrified conductor rail from which the electric trains obtain their motive power, but also of the rails forming the permanent way, along

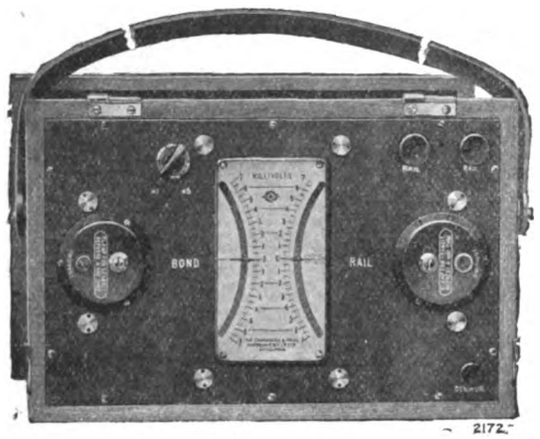



**Fig. 1.—A simple pattern testing set.**

which the return current flows to the power house. If the resistance of the rail bond is considerably higher than that of the solid rail, some part of the return current will be carried by conductors buried in the earth, such as cable sheaths or pipes laid in the vicinity, causing corrosion by electrolytic action. These stray currents may, however, be effectively prevented or, at least, minimised, if steps are taken to ensure that the resistance of the rail bond employed is kept as low as possible. Owing to the severe weather and traffic conditions to which the bonds are exposed, deterioration cannot be avoided, and it is therefore essential to have a convenient means of testing the resistance of rail bonds from time to time.

Various forms of apparatus for this purpose have been available for many years, one well-known instrument being that illustrated in Figs. 1, 2 and 3, which is made by the Cambridge Instrument Co., Ltd., 45, Grosvenor Place, London, S.W.1. This apparatus utilises the current in the rails, and comprises a collapsible testing staff (Figs. 2 and 3) provided with three steel contact points in line, equally spaced at intervals of about 0·5 metre, which is connected by flexible leads to terminals on the instrument shown in Fig. 1. This instrument consists of two low-reading Unipivot millivoltmeters mounted together in a portable case. Each millivoltmeter is calibrated for two ranges, 0-12 and 0-60 millivolts, and fitted with a range switch and a reversing switch, the scales being arranged opposite to one another in the centre of the instrument.

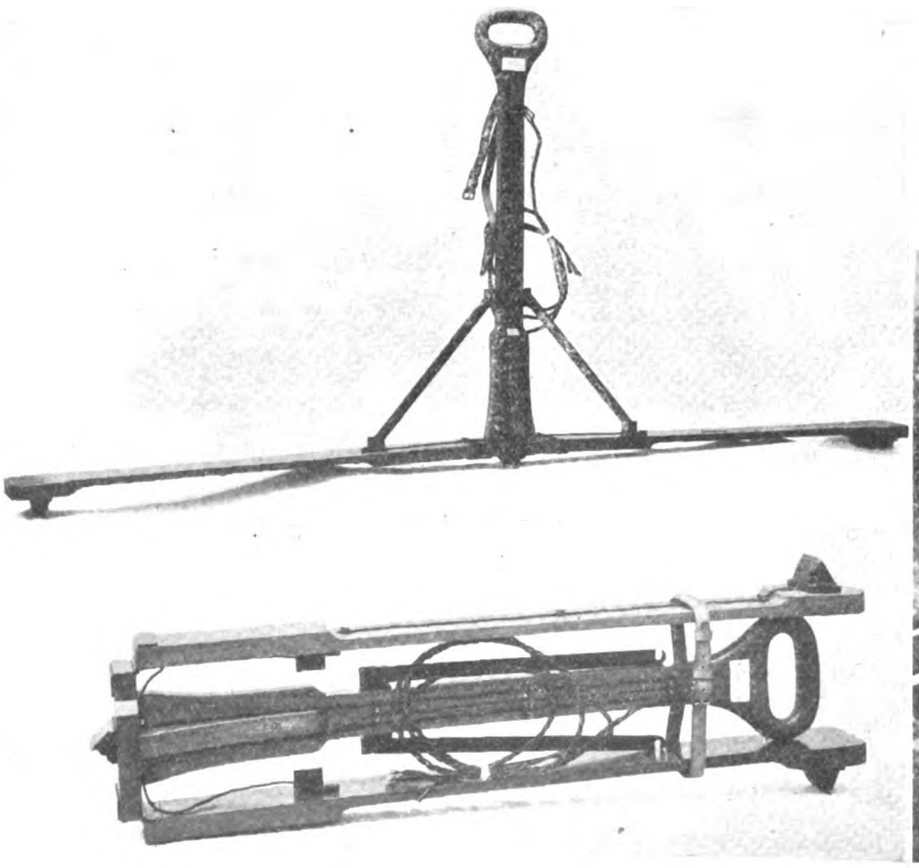
### Test Methods.

When taking a test, the staff is placed on the rail so that the bond lies between the centre contact and one of the outer contacts, and a length of solid rail between the centre and the other contact, the connections being so arranged that one of the millivoltmeters measures the potential drop across the bond, while the other measures the drop along the rail only. The relative positions of the pointers then show the condition of the bond, and, by taking the ratio of the deflections, the resistance of the bond in terms of the rail may be calculated.

A more recent instrument developed by the Cambridge Instrument Co., at the suggestion of Mr. J. Wilson, O.B.E., M.I.E.E., Chief Electrical Engineer of the Buenos Ayres Western Railway, is shown in Fig. 5, in which the two millivoltmeters (which have double-pivoted movements in this instance) are so mounted in the portable case that the scales are opposed to one another, each subtending an angle of 60 deg. The two pointers are arranged to cross, and swing freely one above the other, the position of their intersection on the dial indicating the ratio between their deflections. The dial and pointers are seen through an opening of triangular shape. The millivoltmeter connected between the " rail " terminals has a scale

*RAIL BOND TESTERS.*

*THESE illustrations of rail bond testing apparatus are referred to in the accompanying article.*



**To the left (Figs. 2 and 3 are seen a testing staff in the open and closed positions. Fig. 4 (right) shows the Southern Railway pattern testing set in use.**

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range 0-6 millivolts, while that connected between the " bond " terminals has a scale range of 0-12 millivolts. A two-range switch is provided, by means of which the ranges of both instruments can be simultaneously multiplied five times. Five ratio lines, 1½, 1¾, 2, 2½ and 3, are marked on the scale to facilitate the immediate estimation of the efficiency of the bond, and a movable index line is provided, which can be set by an external knob so as to coincide with any desired position of the intersection of the pointers between the ratios of 1¾ and 2½.

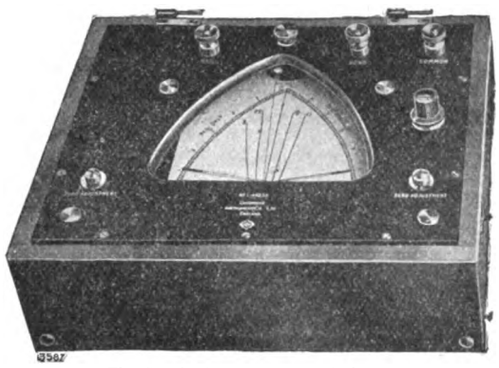

Fig. 5.—A standard pattern testing set.

Since the ratio of the two deflections should remain constant for both switch positions, it is possible at any time to test the accuracy of the instrument. A long shoulder strap is fitted to the instrument, enabling it to be supported while operating the switches, without recourse to the aid of a tripod.

## A Self-contained Equipment.

A somewhat lighter form of instrument (Fig. 6) has lately been developed by the Cambridge Instrument Co., in conjunction with the testing engineers of the Southern Railway Co., in which two small millivoltmeters are mounted side by side in a case measuring only 11 by 6 by 4½ in. and weighing about 6½ lb.

As will be seen from Fig. 4, which illustrates the apparatus in actual use on the permanent way, the instrument can be mounted directly on the testing staff, the complete apparatus thus forming a convenient self-contained unit weighing about 12 lb. The two millivoltmeters are of the well-known pattern I Unipivot type, each having a centre-zero scale, with a range of 1·5-0-1·5 millivolts, and the instrument is fitted with a two-range switch, which enables the ranges of both millivoltmeters to be simultaneously multiplied ten times.

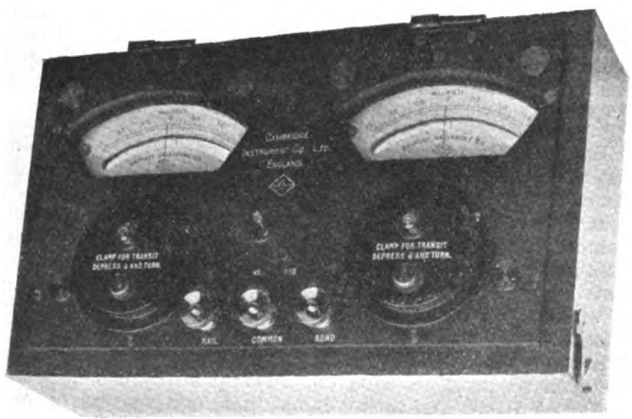

Fig. 6.—A small (Southern Railway) pattern rail bond testing set.

Although this instrument does not permit the ratio of the deflections to be read off with the same facility and accuracy as the instrument shown in Fig. 5, it has proved thoroughly satisfactory in use, and there is every probability that it will find an increasingly wide field of employment as an instrument for use for the making of routine tests on electrified lines.

# LOAD-LEVELLING.*

## Relays and their Application to Future Metering Problems.

By W. HOLMES, A.M.I.E.E.

IN the early days of electrical distribution, lighting was the only source of revenue. The advantage of a good load factor on the station became apparent, and the electric motor load, together with the installation of electric cooking and heating apparatus, are now in excess of the lighting load.

The relatively high price charged for the lighting service was due to the low load factor obtained. In order to encourage consumers to provide loads during the off-lighting periods, energy for motors and for cooking and heating was offered at a low price. Very low rates also are now being offered for the domestic water-heating load, owing to its attractive load factor.

Perhaps the first and simplest method of charging was a fixed rate per annum per kilowatt of load. Current-limiters were sometimes installed to prevent the plant being over-

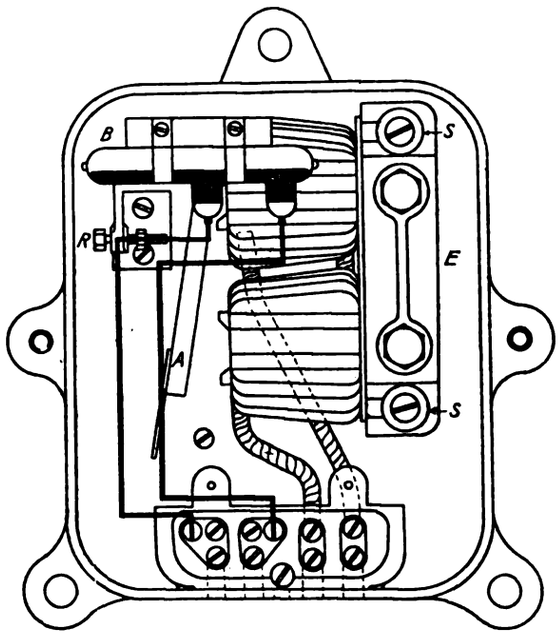


Fig. 1.—The Ferranti d.c. load leveller.

loaded, but they were found to impede electrical development, for consumers were afraid to add to their electrical equipment and were actually influenced by the current-limiters to use less electricity.

Flat-rate metering was therefore welcomed, and exists to a very large extent to-day, with rates varying from a fraction of a penny to over a shilling per unit.

The various metering and multiple-tariff systems now in force have all been devised with the one object of encouraging consumers to use electricity at the off-peak periods. Of these systems, the most popular is the well-known two-part tariff system which consists of a fixed rate per annum plus a charge per unit. Two-rate metering has been used to a large extent, and is attracting considerable attention. Under this heading the author includes various combinations, such as :—

Two meters controlled by a time switch; meters with double counting mechanism controlled by a time switch; meters with double counting mechanism with distant control, such as the " Olipel " system; the two-meter method—one meter on the lighting circuit and one on the power circuit; the peak meter, whereby an additional meter is started by an overload relay to integrate the peak-load units; shop-window lighting with a time switch and meter; water heater with time switch and meter.

With the same object in view, namely, the levelling-up of the supply, considerable ingenuity has been shown in applying prepayment meters to collect the two-part tariff. Examples are the continuous running motor or clock method, the feeble-shunt running meter, and Dr. Lulofs's method whereby mechanism changes the rate after the first few coins per

* Abstract of a paper read before The Institution of Electrical Engineers.

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month. A similar method has been suggested by Dr. Ferranti, in which a discount is given after the first few coins per month, thereby providing a check on the collector, encouraging thrift, and also encouraging the consumer to use more electricity.

One of the most interesting practical schemes for load-levelling control at the generating station and sub-stations is the Wilkinson change-circuit system, but unfortunately the scheme involves additional mains and special gear at the receiving end. The control of relays by pilot wires has received little attention. but the radio control of relays has

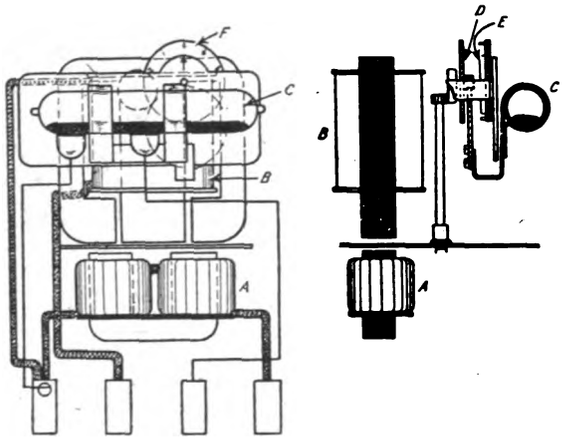


Fig. 2.—The Ferranti a.c. load-leveller.

been considered and investigated. In San Francisco, carrier-current control of street lighting is in use, and the "Olipel" impulse system has also been applied. Load-levelling by time switches may be regarded as controlled from the station, although, in order to set the clocks, the station engineers depend upon the regular habits of the public.

## Attractive Off-Peak Loads.

According to the Electricity Commissioners' Report of 1925-6, 51·4 per cent. of the revenue of undertakings throughout the country is derived from lighting and domestic supplies—even if such areas as Newcastle and Manchester are included. It is therefore necessary to find other sources of consumption. The modern hot-water storage tank is wonderfully efficient. The author, in the original paper, illustrates this fact by a comparison with an electric storage battery, and contends that thermal-storage water heating, both for water supply and central heating, supplies the ideal off-peak load. This system has been used with some success in Switzerland, and in Norway and Sweden the thermal storage cooker has been adopted. Industrial chemical processes using electricity, and electric horticulture (Stockholm has a 500 kW load for heating the ground for horticultural purposes) are other possibilities.

The load-levelling relay is intended for installation with the service fuse and meter on a consumer's premises. It disconnects the load which, without inconvenience to the consumer, can be dispensed with when the general demand exceeds a certain figure, and re-connects it when the general demand is reduced. Typical load-conditions are illustrated in the original paper by the aid of diagrams. Curves for residential districts show a pronounced peak, and a flat part with practically no load. Even a large industrial city, such as Manchester, showing only a small percentage domestic load, also shows valleys in the load curve in the early hours. From the curves it is possible almost to read the habits of the residents. All the curves show breakfast peak and evening loads.

The author considers the results obtainable from an all-electric home having a diversity factor of 50 and a peak load of about 26 A. By analysing the conditions, a theoretical load-curve is built up and illustrated, and the improvement that could be effected by a load-leveller discussed.

In the next section of the paper various forms of load-levelling relays are described. A simple form uses a sealed tube in which a plunger rests in mercury, and over which the operating solenoid is placed. A more complicated type is operated by three electromagnets, two small 2-way switches and a heavy current switch. Relays operating on the thermostat principle are also in use, and combined thermal and electromagnetic relays have been designed in the United States. Yet another form employs a shaded pole induction motor, the coil of which carries the current of the controlling circuit.

A combined meter and load-levelling relay, suitable for use where a separate tariff is in operation for water-heating is described in detail, and the Ferranti load-levellers, both of the d.c. and a.c. types, are fully described and illustrated.

In the standard Ferranti d.c. load-leveller (Fig. 1) the main current passes through the heavy winding of the electro-magnet *E*. The gas-filled mercury switch *B* is rigidly connected to the armature *A*. As the armature is attracted to the core the mercury switch tilts and breaks the circuit to the off-peak load. The movement is gravity-controlled and, as the operating current decreases, the switch is restored to its normal position by gravity. The magnetic gap is not completely closed. In this simple relay there are no auxiliary contacts, the only circuit to be broken being by the gasfilled mercury tube. The gasfilled mercury switch used is unique in that the contacts never wear out, and there are no fumes given off from the arc.

The relay can be adjusted within wide limits by releasing the fixing screws *S* and sliding the electro-magnet to or from the armature *A*. The screw *R* acts as a stop to keep the mercury switch level; thus the adjustments, once set, are rigid.

The Ferranti a.c. load leveller (Fig. 2) obtains its driving force from watt-hour meter elements, the current coil of which carries the current of the controlling circuit. When this current reaches a predetermined value the disc armature is caused to rotate. Geared to the disc spindle through a train of wheels is a mercury switch which is caused to tilt when the disc rotates, and thus open the off-peak load circuit. When this current falls below the predetermined value the mercury switch is restored to the closed position by means of a spring acting against the torque of the motor meter. To vary the current at which the load leveller is to operate provision is made for varying the tension of the above-mentioned spring. In addition the torque of the driving element may be varied by turning a screw which causes the current-coil core to rotate about an axis. To assist the spring to restore the switch to the closed position the meter friction compensation device is utilised, the driving element being given a backward-shunt running tendency. If the controlling load is inductive, torque can be increased by the quadrature adjustment.

Referring to Fig. 2, *A* is the current or operating coil, *B* the shunt coil, *C* the mercury switch, *D* the train of wheels, *E* the spring, and *F* the graduated dial wheel. The adjustment is easily made by turning the graduated dial wheel.

It is not suggested that load-levelling relays will displace all other load-levelling devices, but they will often prove of service. The author quotes the following figures as given by a large electrical undertaking:—

| | |
|---|---|
| Generation cost, plus spares .. .. .. .. | £25 per kW |
| Transmission .. .. .. .. .. .. | £17 per kW |
| Distribution and services, for domestic supplies .. | £94 per kW |

Thus, most of the capital is spent upon distribution and services. It is, therefore, very important to level up the load on the distribution and services in order to save capital. There might be a 100% load factor on the generating station and a 25% load factor on the network and services, but the undertaking with a level 50% load factor on both may be the more economical so far as capital cost is concerned.

## Capital Costs.

Engineers may also have to decide whether the combined capital charges due to load levellers and smaller distribution mains are not less than the extra running cost of partly loaded generators. In a case analysed by the author a load leveller reduced the capital cost from a 40 A service to a 25 A service. This may be done fairly effectively by means of a time switch. But the action of the load-leveller is more complete, e.g., it would operate when the lighting load was suddenly increased by a fog.

In order to illustrate the effect of load-levelling devices the author reproduces some curves supplied by the electricity works at Basle, indicating individual load factors of 90% and revealing that the usual valley between midnight and 7 a.m. is filled up. The load factor for the year 1927, even with a gradually increasing load, was 57·4%. The average price obtained per unit is 0·89d. and the cost per unit of the night-storage, 0·4d. These results were obtained by load-levelling by time-switches and thermal storage.

The introduction of a load-leveller further complicates supply service. But if it replaces some of the more complex metering methods it will help towards standardisation and reduced costs. With a perfect system of load-levelling the two-part tariff system would become a one-part tariff.

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# THE CONTINUOUSLY-LOADED SUBMARINE TELEGRAPH CABLE.*

## Conspicuous Developments which have Improved Signalling Speed—Manufacture of Loaded Conductors—Duplexing Non-Loaded Cables.

By A. E. FOSTER, P. G. LEDGER, M.I.E.E., and A. ROSEN, Ph.D., A.M.I.E.E.

OUR knowledge of the theory of submarine telegraphy is founded on the work of the late Lord Kelvin. He showed how to predetermine the "arrival curve" and introduced the well-known "*CR* law," which remains as a guide to signalling speed of non-loaded cables to the present day. The necessity for keeping the resistance (*R*) low without unduly increasing the cross-section of the conductor, which involves increasing the cost and electrostatic capacity (*C*), led to greatly increased purity of copper manufactured for telegraphic purposes. The electrostatic capacity, depending on the dimensions of the core and on the specific inductive capacity of the insulating material, has also received attention with a view to its reduction to a minimum value.

The advent of the loaded cable for transoceanic telegraphy is due to a proper appreciation of theories of transmission originated by Heaviside and others, and to the discovery of the unique magnetic qualities of certain alloys.

The authors then present an analysis of the qualities of non-loaded cables, in order to disclose the limitations which have led to the use of inductive loading. The derivation of the "arrival curve" is explained, and a curve is presented showing how current at the receiving end of a cable grows very slowly compared with that at the sending end.

Hence, too-rapid impulses following the Morse code result in the signals at the receiving end overlapping and becoming undecipherable. Attenuation and distortion of current impulses are due mainly to the resistance and capacity of the cable, but earth currents and mutual interference of departing and arriving impulses also cause deformation. Attenuation may be reduced by adjustment of the cable constants, but extraneous interference can be met only by special local measures; for instance, interference caused by electric power plants may be alleviated by making the earth-connection as remote as possible from the source of interference.

### Improvements in Reception.

Several conspicuous developments which have substantially improved the speed of signalling may be mentioned. A method of "curbing" signals, which consisted of switching off the battery and earthing the cable after each impulse had been sent, was early introduced. The introduction of networks of inductance and capacities has effected an improvement in the steepness of the arrival-current by correcting distortion, and has made possible a higher-speed of signalling. Subsequently such devices as the Huertley magnifier, the Cox selenium magnifier and the Orling jet relay were introduced. These and other appliances have helped towards the solution of the problem. In more recent activities the thermionic valve has played an important part, and may prove as valuable in telegraphy as in telephony.

The Kelvin equation shows that the magnitude of the arrival current depends on the voltage *E*, and the time-constant $CR/1^2$. Telegraph companies are reluctant to increase the e.m.f. beyond the 50-60 V ordinarily used, owing to possible weakening of dielectric strength—especially in view of the fact that every 1 000 miles of cable may contain 500 joints. The alternative course is to reduce the time-constant, and careful consideration is given to this point in cable design. In the original paper the authors present a curve illustrating general practice in regard to relation between the weight of the conductor and of the dielectric, and electrical and mechanical data for six different sizes of standard conductors are given. The "arrival curves" of these conductors emphasise the advantage of reducing attenuation by increasing the size of the conductor. The merits of different sizes of cores may be compared by the aid of the formula Speed $K/(CR.1^2)$, where *K* is a coefficient depending upon the method of operation, the sensitiveness of the terminal apparatus and the extraneous interference.

With modern receiving and transmitting systems it has been found that legible signals may be obtained with *K* as high as 840, the length being expressed in nautical miles and the speed in letters per minute. In the original paper comparative operating speeds at 1 500, 2 000 and 2 500 miles are presented for coefficients varying from 600 in the smaller to 750 in the larger cables. The rate of improvement in speed of signalling diminishes as the size of cable increases, so that a limit is imposed on the size of cables.

### Economic Cable Sizes.

It appears, therefore, that the maximum economic size of non-loaded cables has been attained, and at the moment no very material advance in this direction seems possible. But during recent years a great step forward has been effected by the use of certain alloys with special magnetic properties. The effect of inductance is to retard the growth of the current and to maintain it when established, and this fact enables signals following each other in rapid succession through an inductively loaded cable to be readily identified. Application of this principle was formerly impracticable because the permeability of iron at the low magnetising forces operating in telegraphy is not enough to satisfy requirements; indeed, the attenuation of a signal may be actually increased by loading the conductor with ordinary iron. The position has, however, been changed by the discovery of the properties of the alloys referred to above.

In order to illustrate the advantages derived the authors present arrival curves for the same cable, loaded and unloaded. In the case of the loaded cable the current rises instantly to a relatively high value; with the unloaded cable the growth is slow. Alloys of nickel and iron, and other metals in the magnetic group develop high permeabilities with low magnetising forces. In addition to possessing high permeability such materials should exhibit low hysteresis loss. The qualities in these respects of such alloys as "permalloy" and "armco" are illustrated by curves in the original paper.

In the next section of the paper the authors describe in detail the manufacture of loaded conductors. The alloy must be in the form of cylindrical wire or narrow flat tape, which is wound helically round the copper conductor, and in contact with it. In the process of winding stresses are imposed on the alloy, and these must be removed by subsequent heat treatment. Tensile stresses may also be set up during cooling, owing to the varying coefficients of expansion of the materials. Finally, the influence of the annealing process on the copper itself must not be overlooked.

In order to avoid stresses it is desirable that the outer sheath should not be rolled too tightly on the copper core. Annealing is very carefully applied by means of a special electrical furnace, equipped with a caterpillar mechanism for feeding the loading conductor. Oxidation of the material must be prevented, and any gases formed by the presence of oil, grease or carbonaceous matter, which tend to render the metal brittle, are removed by the passage of a stream of inert gas, such as nitrogen. In order to exclude air from the conductor, Chatterton's compound, which has a tendency to harden in course of time, is not effective. Compounds such as refined bitumen of natural origin, which remain fluid, are preferred. Gutta percha has proved to be the most suitable insulating material for submarine cables, but the modern form of this material represents a distinct improvement on that available in the past. In the original paper the method of preparation is fully described.

The subsequent processes which convert the core into cable are similar to those used in the manufacture of non-loaded and other types. The most important feature of the protective covering is the steel sheathing designed to suit conditions existing in the cable route. Sections of typical cables are illustrated in the original paper.

The subject of transmission characteristics receives detailed attention. The resemblance between the conditions to be met in modern telegraphy and telephony is pointed out, and various simplifications in mathematical treatment are mentioned. An expression for the current in a loaded telegraph cable is obtained, and the attenuation of a square-topped wave discussed. It is concluded that the properties of a loaded

* Abstract of a paper read before the Institution of Electrical Engineers.

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telegraph cable may be studied by considering a steady sine wave. Conditions for low attenuation include (1) low resistance, (2) low capacity, and (4) low leakage ration. An expression for the calculation of inductance is presented, and its influence discussed.

## Effective Resistance.

The effective resistance is composed of (1) d.c. resistance, (2) hysteresis loss in the loading material, (3) eddy current loss, and (4) resistance of "sea return." Expressions for the determination of these losses are derived, and a curve relating leakance ratio to frequency presented. "Sea Return" resistance is usually negligible for steady direct currents, but with a.c. the return path consists partly of the armouring wires, partly of the sea water, and partly of the bed of the ocean. In practice its value can only be forecasted with great difficulty. "Head end" loss varies considerably with both current and frequency, and is due mainly to hysteresis of the loading material. An expression for the predetermination of this item has been derived.

The duplexing of non-loaded cables has become progressively more difficult as the weight of the copper has increased, for when the resistance of the conductor is low the balance is very sensitive to small changes of temperature; also, owing to the low impedance of the heavy conductor cable the sending currents are comparatively high, and a more accurate balance of the artificial line is necessary. In the case of loaded cables other factors operate. The authors presented curves showing the irregularities which occur in the impedance frequency characteristics. Impedance is not a fixed quantity, even with a constant frequency, and the problem of balancing therefore becomes highly complex. The greater the distance of a change of characteristic from the end, the less is its effect.

It has been proposed to have the end-sections of the cable non-loaded and gradually to increase the inductance towards the middle. At the present time, however, no successful method of duplexing cables throughout their length has been evolved.

Disturbances involving interference with the received signal may be due either to power supplies or to natural causes. The troubles from the first source are purely local, and can be overcome by suitable earthing precautions. Interference from natural causes is of the same nature as "atmospherics" in radio communications. Their effects are, however, much less when the cable is at a considerable depth, the disturbance picked up below 500 ft. being negligible. The effect of such disturbances may be greatly diminished by extending the "earthing core" out to a point where the depth of water is about 500 ft.

## Testing of Loaded Cables.

The final section of the paper is devoted to the testing of loaded cables. The electrical tests made during manufacture involve additions to those used for non-loaded cables. D.c. tests are supplemented by a.c. measurements. For telephone cables such tests have been fully developed for voice frequencies, i.e., 200-2 000 cycles per sec., and have been adapted, with little change, for telegraph cables, the chief distinction being the lower range of frequencies (10-100 cycles per sec.) used. If a sine wave shaped e.m.f. is desired, either an alternator or a valve oscillator may be used. For a square topped wave some form of commutator, giving a series of reversals of a d.c. battery may be adopted. Measurements of inductance and effective resistance are carried out at various stages of manufacture. For this purpose a bridge with variable inductance and resistance is indicated as being suitable.

The magnetic properties of the new loading materials are very susceptible to mechanical pressure, and the dielectric is affected both by temperature and pressure. Tests under actual conditions occurring at considerable ocean depths are, therefore, desirable. In the original paper results of some such tests are presented, and methods of conducting experiments described. Methods of measuring received current are also discussed.

Yet another test of importance relates to the time of propagation of a given signal. The use of the formula $T=1\sqrt{(CL)}$ enables the value of inductance after the laying of the cable to be determined once the time $T$ is known. The transmission time between Fanning Island and Suva was found to be 0·467 sec. From this it was deduced that the inductance was not more than 5% below the value measured in the factory.

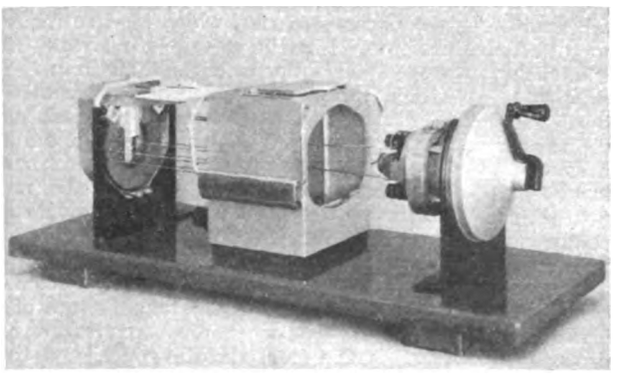
## Conclusion.

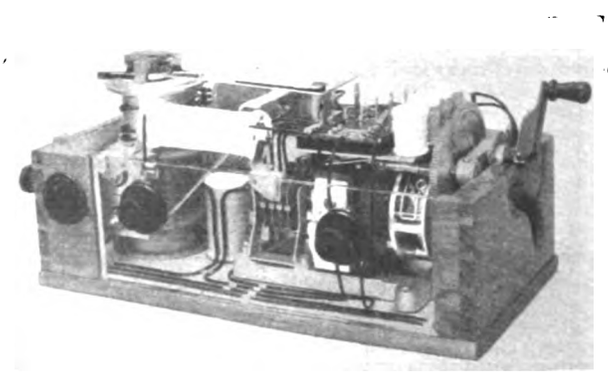
It has been computed that a loaded cable capable of transmitting 1 000 letters per minute in one direction over a distance of 2 000 miles would involve only half the capital outlay needed for a system of non-loaded cables of equal transmitting capacity, viz., 500 letters per minute in each direction simultaneously. When high transmitting speeds are assumed, or when greater distances have to be spanned, even larger savings would be effected by adopting the loaded type of cable.

On the other hand, in view of the liability to interruption of submarine cables, the wisdom of installing single units of large capacity is open to question, and, therefore, the apparent advantage of loaded cables based on initial outlay only may be overestimated. As a rule, the failure of a non-loaded cable causes no serious interuption to the service, as alternative lines are generally available, but in the event of the cable being one of high speed, working at full capacity, very serious congestion and delay will arise when a breakdown occurs, unless the alternative lines are equally efficient.

It would appear that the only satisfactory solution of this problem—which does not become acute until the cables are worked to full capacity—will be found in providing a duplicate cable.

The result of lower capital and working costs must be substantial adjustments of cable rates, but although reductions have been made since the arrival of the loaded cable, much remains to be done in this direction. Obviously the development of the overseas telegraph habit can best be fostered with the powerful aid of cheap rates.





*INSTRUMENTS FOR SCIENCE MUSEUM.*

*THE accompanying pictures are reproduced from photographs of two electrical instruments which have been loaned by the manufacturers, Messrs. Evershed and Vignoles, to the Science Museum at South Kensington, London. To the left is seen a constructional model of the "Meg" insulation tester, made to show the three-unit construction; the generator on the right, ohmmeter on the left, and containing case with resistance in the centre. The other illustration is of a "Bridge-Megger" testing set which has been specially built with a plate glass front, and with the magnets cut away to show the internal construction.*

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# INSULATORS.

## Discussion at Meeting of Overhead Lines Association—Manufacture of Porcelain Insulators—The Jeffrey-Dewitt Type—Methods of Testing—Cap and Pin Insulator Recommended for General Service—Advantages of Glass as Insulating Material.

A MEETING of the Overhead Lines Association was held at the Institution of Electrical Engineers, London, on December 19th, Mr. W. Fennell (president) in the chair.

In opening a discussion on insulators, Mr. C. W. MARSHALL gave a brief account of the manufacture of porcelain for insulators, and indicated the proportions in which clay, felspar, and flint are used, and also gave some information as to the methods of firing the completed insulators after manufacture. Continuing, he mentioned that the commonest types of insulators were the cap and pin, the Hewlett, the Jeffrey Dewitt, and the motor, the first-named being most commonly used, and having the outstanding advantage of a good standard of reliability and comparatively low cost.

### Disadvantages of Porcelain.

The disadvantages were uncertainty of uniformity of quality due to the occasional unreliability of the pin fastening methods, and relatively low puncture strength. The Hewlett insulator was expensive, gave an inferior voltage distribution curve and a lower flash-over voltage, and was liable to cascading. It was probably the most difficult of all types to manufacture really well. At the same time, it had been an outstanding success when made satisfactorily and applied under suitable conditions. The Jeffrey-Dewitt insulator was greatly favoured by some American transmission engineers, its puncture strength and ruggedness being points in its favour, although these advantages did not appear to justify its higher cost. The motor insulator in its present form was a comparatively recent innovation, but was really a development of the stem insulator used by Dr. Ferranti about 30 years ago. It was strong mechanically, although it used porcelain in tension, which was contrary to the doctrines instilled by most teachers of electrical engineering. It was almost puncture proof.

Regarding the effect of salt deposit on insulators, Mr. Marshall referred to the happenings in this country during the storm of 1927, when many insulators, especially near the coast, were coated with a salt deposit which caused serious interruptions to the supply. Similar troubles had been experienced in the coastal regions of Morocco and California, and the explanation given as the result of investigations was that a salt laden air caused a layer of conducting material to form on the insulators, and breakdown took place. To overcome the difficulty from salt and fog laden air on the Moroccan coast a special type of oil-filled insulator had been developed, and, it was claimed, gave satisfactory results. At the same time, the oil-bath insulator required refilling with oil at fairly frequent intervals, due to the shaking up of the oil and the filling up of the oil reservoir with dirt, and therefore the success of this type of insulator was a matter of balancing up the advantages of washing the ordinary type of insulator against the cost of washing and refilling with oil in the case of the oil-filled type.

Bechdoldt, in the "E.T.Z." for March 18th, 1928, summarised the difficulties which had been encountered in Germany where deposits due to atmospheric pollution in the neighbourhood of chemical, cement, and metallurgical works had caused considerable trouble, whilst fog trouble had also been experienced. The Lapp anti-fog suspension type of insulator had been developed to meet the atmospheric conditions of the Pacific coast and districts such as Pittsburgh, the object being to secure uniformity of surface conditions or, in other words, to avoid having surfaces of large area of low resistance in series with small areas of high resistance. The wet-soot flash-over of an insulator chain of the anti-fog type was about double that of an equivalent chain of standard cap and pin insulators. He also understood that the Germans had developed special insulators for use on the coast of Palestine, where the conditions were said to be as bad if not worse than those on the coast of Morocco.

Dealing with the subject of insulator testing, Mr. Marshall remarked that, due to the incomplete state of our knowledge of stresses to which insulators are subjected in practical service, the tests now applied to establish soundness were of a very empirical nature. Electrical and mechanical strength was established by the application simultaneously of suitable voltages, and the degree to which insulators should be stressed was largely a matter of experience. The puncture strength of an insulator was usually determined by applying a voltage to it when immersed in an oil bath, usually at normal voltage. In service, however, punctures were mostly caused by high frequency or impulsive stresses, and to determine the properties of insulators under such conditions an impulse test was used which consisted of suddenly applying a high degree of stress by discharging a condenser through the insulator undergoing test. Standards for impulse tests had not yet been developed, but sufficient experience had been gained to make it certain that such tests give a very useful measure of the quality of an insulator.

High frequency tests were made by "flashing over" in air at a frequency of the order of 200 000 cycles per second. This test was useful in revealing surface defects such as cracks in glazing, but it had a decided tendency to damage sound insulators by overheating them. A "thermal" cycle test was usually made on insulators used for outdoor work. This test consisted in immersing the insulators alternately in hot and cold water, the temperature range being of the order of 70 to 80°. Porosity tests were made by subjecting broken pieces of porcelain to high hydraulic pressure using a fuchsine solution as an indicator of the depth of penetration.

Chains of insulators were tested by determining their dry and wet flash-over. The dry flash-over test, however, was hardly more than a measurement of the dielectric strength of air and the wet flash-over test was more useful, but great care had to be taken in making it if trustworthy results were to be obtained.

The question had been put to him, said Mr. Marshall, as to possibility of a shortage of insulator through manufacturers of ordinary porcelain not being able to manufacture electrical porcelain. It should, he thought, be possible for this to be done in time, but he did not anticipate the development of standardised methods of manufacture which would enable ordinary manufacturers of porcelain to change over without considerable study of the whole conditions.

The cap and pin insulator was the best for general service, although there was still the difficulty of fixing the pin. One firm used screws and another cement, whilst yet another used a metallic fixing. The only certain test as to which was the better was time. In many cases cemented insulators had given excellent results over a period of 4 or 5 years, and then cracking trouble had set in. The supporters of metallic fixing claimed to have eliminated this trouble. The Hewlett insulator had a few strong supporters and the motor insulator had undoubtedly made great headway within the last four or five years, and looked like being a serious competitor.

### Fog and Salt Deposits.

Fog and salt deposit insulators had also made great headway, and the Lapp was a distinct improvement. The oil-filled insulator had given a longer period of peace from line repairs, although he could not say that it appealed to him. As to the latest improvements of the German insulator manufacturers, the results had yet to be published, and if anyone had information on the subject it would be appreciated. The great variety of tests that were applied to insulators was the best evidence of the suspicion with which insulators were viewed, but in actual practice insulators from a good maker showed remarkably few failures and some French electricity companies made it a point of buying only from makers who could give proof that not more than a certain small percentage of their insulators were rejected during the course of manufacture.

Major THEODORE RICH regretted that we did not possess in this country a laboratory for testing insulators such as that owned by the Ohio Brass Co. in America or the Electro-Ceramique in Paris. As this country was intending to spend an enormous sum of money on the erection of the grid lines, it would pay the Government to spend some money also in assisting manufacturers of insulators to provide the necessary testing facilities. In France there were probably three glass insulators made for every one of porcelain, but glass did not seem to have made very much progress in Germany, although the Pyrex people had done a certain amount of work.

Attempts had been made to make insulators of basalt in France and Italy, and also in steatite, but he did not know with what success. Up to the present, efforts to make insulators

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of powdered material such as bakelite had not been successful, but it seemed that insulators which could be made of a moulded material would not be so liable to break nor be so vulnerable to the stones of small boys. Some people did not like using Portland cement for fixing the pins of cap and pin insulators and in some parts of Europe a special form of plaster mixed with gum arabic was used as a cement.

Mr. COCKBAIN said that the trouble of cascading with the Hewlett insulator used to exist in the early days, but it had now been completely overcome. As to the trouble with cement for fixing the pins of cap and pin insulators, he believed the trouble was not due to the cement being Portland cement but, on the contrary, that where trouble had occurred it was due to the cement not being true Portland cement. As to the use of lead, he knew of one case in which lead was used as the attachment between the spindle and the porcelain, but in the case of a fault the lead aggravated the trouble. One great fear of insulator manufacturers with the Lapp type of insulator was the ratio of spark-over to puncture which was reduced owing to the increase of leakage path which was possible.

Major RICH mentioned that one of the advantages of the glass insulator was the ability to examine it by polarised light to investigate the composition, and he believed makers of these insulators guaranteed their products were tested in that way.

## Bakelised Wood.

Mr. A. C. DUNLAP mentioned the use of bakelised wood for the cross arms and insulator pins as having completely overcome the troubles on the Moroccan coast due to the salt laden air, and he gave some results of tests carried out in this connection at Nancy University. The tensile strength of bakelised wood was roughly three times that of untreated wood, and although it was not uninflammable it was difficult to set it alight. Further it was not an expensive product. Bakelised wood was simply wood impregnated with bakelite varnish.

Mr. C. S. GARLAND said he felt very much encouraged by the remarks of Major Rich who suggested that the Government should assist manufacturers to instal suitable testing laboratories. In connection with a porcelain factory he was erecting, it was proposed to erect a testing laboratory capable of testing up to one million volts and any assistance from the Government would be most welcome. As to steatite, it had a very much higher tensile strength than porcelain and the success of the motor insulator had been largely due to the use of steatite in the case of one of the biggest railway crossings over the Maine near Frankfort. Experiments were also being carried out with steatite in Switzerland and as indicating the high tensile strength of this material he said voltages up to 10 million volts had been successfully withstood. In some of the German factories it was the practice to use X-rays to investigate the condition of porcelain and to ascertain if there were any undue stresses.

Mr. C. D. KING said there existed in this country a laboratory for high voltage testing of insulators which was at the disposal of anybody desiring to make use of it, and if the Secretary of the Association was communicated with he would be willing to put those interested in communication with the right quarters.

Mr. HARBER did not think Major Rich had made out as good a case as could be made out for glass, which had an electrical resistance approaching infinity. Moreover, it was much better mechanically than porcelain because porcelain was very weak in tension.

Mr. COCKBAIN said it was undesirable to use porcelain in tension because when used in compression it was working at its best. In comparing glass with porcelain, the outstanding requirement was the ability to withstand inherent stress, and as time goes on it was apparent that inherent stress would become more severe. He believed there was a laboratory at Teddington with plant for testing up to one million volts, and instead of the Government supplying funds for the establishment of similar laboratories by manufacturers, he felt that all the facilities of this nature should be concentrated at one centre, such as Teddington.

Mr. ERLEBACH said the Hewitt insulator was introduced because there was trouble with the cementing of the cap and pin type, but he believed the leading makers had got over the trouble with cementing, having found that the fault lay not with the cement but with the method of application. So much improvement had there been made in this direction that he recently knew of a case in which the purchaser of some switchgear specified that certain cementing in connection with it should be done by insulator makers.

Mr. ANDERSON suggested that we should aim at simplicity in insulator design and stick to the cap and pin type because not only was this the most economical but it was also the best engineering job to meet the various conditions arising in overhead line transmission work.

## An Independent Testing Laboratory.

The PRESIDENT remarked that when he had trouble with his insulators during the brine storm of 1927, he sent some of them to the British Engineering Standards Committee which apparently found no difficulty in having them tested. He did not think there had been any suggestion by Mr. Marshall that the Government should assist manufacturers to build their factories, and he felt it was important that we should have an independent testing laboratory in order to check the figures given by the manufacturers. Some hundreds of Hewlett insulators had been in use for four or five years on his system and had given very little trouble; indeed, they did not break down during the brine storm, although the pin insulators did. He had been hoping that insulator manufacturers would be able to produce an insulator that did not need washing because with the increase of the load on the stations which would mean that Sunday morning would be taken up with the cooking load and the afternoon with radiators, whilst the water heating load would be on all night, he failed to see where the opportunity would come to carry out the washing operations. It was to be hoped that something would develop out of the use of bakelised wood. It seemed to him likely to lead to a revolution if we could manufacture the complete insulator of that material, and he hoped that members of the Association as well as others would hear more about it in the near future.

Mr. MARSHALL, in replying to the discussion, said it had always been a matter of regret to him that the Continental people were so far ahead of us in this country in regard to testing facilities which had enabled them already to compile exact data regarding the performance of insulators. Glass insulators had not been used to any extent in this country, but they had had considerable success in France. Steatite was a magnesium silicate instead of an aluminium silicate, which was the ordinary porcelain, and it was undoubtedly a remarkable product with excellent mechanical properties. Anybody who had observed the difference between the porcelain and steatite insulators on the German lines would appreciate the immense advantages found in the use of steatite.

The CHAIRMAN, proposing a vote of thanks to Mr. Marshall, said he felt considerably happier now that it had been made apparent that insulators in this country would be designed with regard to the particular local conditions. At one time he had rather felt that there was to be a sort of mass production for the grid system irrespective of the requirements of local conditions.

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# THE PHYSICAL SOCIETY EXHIBITION.

## Details of the Forthcoming Show at South Kensington.

THE nineteenth annual exhibition of the Physical and Optical Societies is to be held on January 8th, 9th and 10th, at the Imperial College of Science, Imperial Institute Road, South Kensington, and will be open from 3 p.m. to 6 p.m., and from 7 p.m. to 10 p.m.

Over eighty firms have accepted the invitation to exhibit in the trade section, and in addition a group of research and experimental exhibits is being arranged. Some interesting historical exhibits will also be included. The discourses, which will be given at 8 p.m. on each evening, are as follows: On January 8th, Prof. F. Lloyd Hopwood, "Experiments with High Frequency Sound Waves," and Mr. Conrad Beck, "Lenses." On January 10th, Mr. A. J. Bull, "Some Colour Problems in Photo-Engraving."

We understand that invitations to the exhibition have been sent to the Institution of Electrical Engineers, the Institution of Mechanical Engineers, the Faraday Society, and a number of other societies and bodies. As in previous years members of these societies should apply for tickets to their secretaries. Others may obtain tickets on application to the Secretary, the Physical and Optical Societies, 1, Lowther Gardens, Exhibition Road, London, S.W.7. Tickets are required only on January 8th and 9th. Admission on the third day, January 10th, will be without ticket.

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# SIR JOSEPH SWAN'S ELECTRICAL WORK.*

## Early Mention of the Incandescent Lamp—Difficulties of Obtaining Vacua—The First Carbon Lamp—Making Filaments of Cotton—The Edison Patent.

By J. SWINBURNE, F.R.S.

I was employed by Mr. Swan in 1881, and was in Newcastle while he was developing the incandescent lamp in the late 'seventies.

The earliest mention of the incandescent lamp I know was in the "Courier Belge" in 1836. It referred to safety lamps for miners, and pointed out that the solution is a carbon conductor electrically heated in a vacuum.

The invention of the Gramme dynamo, and the public attention it attracted, made a number of inventors turn their attention to electric lighting, especially by arc lamps, semi-incandescent lamps, and crude attempts at incandescent lamps.

Among the mid-century inventors was Staite; and young Swan had heard him lecture on his arc lamp, and had seen a platinum-iridium lamp of his. This was in 1845, when Swan was a boy Soon after he began experimenting, carbonising all sorts of brands of paper in narrow strips, in a pottery kiln. He sometimes hardened these by soaking the paper in gum, treacle, dextrin, and the like.

These carbons were mounted in the best vacuum Swan could get. You may remember the air pumps of those days. They were brass cylinders with pistons with leathers like cycle inflators; and they had oil-silk valves. They gave a poor vacuum. The Deleuil pump was known in Paris; it was a little better. In spite of this Swan lighted some carbons with a battery of 50 cells; but they soon burned out. This was about 1855 to 1860.

Sir Joseph Swan whose work on the invention of the incandescent lamp was the subject of a paper read before the Institution of Electrical Engineers, on December 20th.

A few years later Sprengel invented his pump. When the Geissler pump came out, I do not know. Crookes, whom I remember lecturing in Newcastle, had got very high vacua.

By this time electric lighting looked possible; and Swan returned perseveringly to his carbon lamp. He got in touch with Mr. C. H. Stearn, an enthusiastic experimenter in high vacuum work. Swan made the carbons, and Stearn and Mr. F. Topham (then his assistant) exhausted the lamps.

Those of you who do not remember the early days can hardly realise the difficulties Swan and Stearn met. Carbonised paper is difficult to mount, and it was difficult to avoid great local heating at the joint. Sealing into glass was in itself easy; but the heating of the joints was apt to crack them. Experiment had to find out a glass that would take platinum and would join to the soda glass used for the bulbs. Then, when the finished lamp was run, gas came out of the conductor and the joints, and spoiled the vacuum. If a straight carbon was used its variation of length gave trouble. If the conductor was not of uniform resistance along its length it got too hot locally, and broke.

Swan got his first good results with thin straight rods. Carré made rods of, as far as I remember, 1 or 1.5 mm. dia. in 1881, and probably a few years earlier. This lamp was exhibited in 1878, and attracted a great deal of attention. Swan, hearing of Edison's work on platinum lamps, was advised to protect his work by patents; but he felt there was little patentable. Early in 1880 he patented running the lamp during exhaustion, to get the gas out. Later in the same year he found he got better carbons by using parchmentised paper, such as that made for covering jam jars. He then made nearly homogeneous thread by treating knitting cotton with sulphuric acid of the right strength; and washing and drying it. The thread was then drawn through sharp-edged jewel holes. This was the foundation of homogeneous or amyloid material which came into universal use. To make the ends, muslin was wrapped round the thread ends, and the threads were treated with acid again. The parchment ends were then trimmed. The early lamps had long shanks, and silver and steel holders to grip the thickened ends. Mr. Swan, I think, with the help of Mr. Gimingham, elder brother of the Mr. Gimingham we know of Edison Swan, made joints by locally heating under aniline. He found benzole better. By this time—towards the end of 1881—he had perfected the carbon lamp for up to 60 volts. He soon got the carbon fine enough for 100 volts.

Parchment thread was not quite uniform. The carbons were therefore heated in coal gas under reduced pressure. This hardened the carbon, and equalised the temperature. It also enabled the maker to reduce the resistance to a standard, so as to get the lamps to run in parallel on a desired pressure. Who invented this, I do not know; but I think it was Hiram Maxim, well known in artillery work. He patented it first. An earlier patent of Sawyer and Man, though it covered the process, did not disclose treating in vacua for hardening, equalising, and standardising.

To get more homogeneous amyloid, Weston took celluloid and reduced it with ammonium sulphide, or ferrous chloride.

In 1884-5 Swan, assisted by Stearn and Topham, worked out the squirting process. He used pyroxylin, and reduced it. Other makers then adopted other solutions of cellulose in a similar way.

I have now explained shortly how Swan, working almost independently, developed and produced the carbon incandescent lamp, which held the field until tungsten came into use.

Meanwhile his brother, Alfred Swan, had worked out the vitrite cap, now adopted for practical use all over the world.

Edison was working at platinum lamps, but when Swan's lamp was known it seemed likely that carbon would be the solution of the lamp problem. Edison then took out a patent for a lamp with a carbon filament in vacuum, sealed into glass. This was really not a patent for an invention directed to the solution of the problem of making an incandescent lamp.

There was nothing practical in it from that point of view. There was enough for patent law; but there was no advance in lamp making in Edison's famous patent. Edison, though he may have thought out the matter independently, had done nothing in inventing parallel distribution. St. George Lane-Fox—then a mere boy—took out a patent more than a year before Edison in which he explained 100 volt parallel distribution, and used secondary batteries, and proposed earth returns to minimise the copper conductors. Lane-Fox's patent was bad in law; but he must have the credit of having propounded completely, with luminous clearness, the parallel distribution, and dispelled the fog about the "subdivision."

After Lane-Fox, given Swan's low resistance lamp, there was no invention for Edison in saying that for parallel distribution the lamp should have high resistance, especially when he did not know, or show how to make it. All the same, Edison's patent was upheld, and Lane-Fox's was not. Personally, I believe they were both bad from a legal point of view.

Edison went on with carbon lamps, and soon succeeded; but he was, however, following in the footsteps of Swan all the time.

Swan helped forward the secondary battery, as he did a good deal of work on it in 1881; but his reputation as a pioneer and inventor in the electrical world will undoubtedly rest on his production of the incandescent lamp.

* Abstract of a Special Paper read before the I.E.E. on Dec. 20th.

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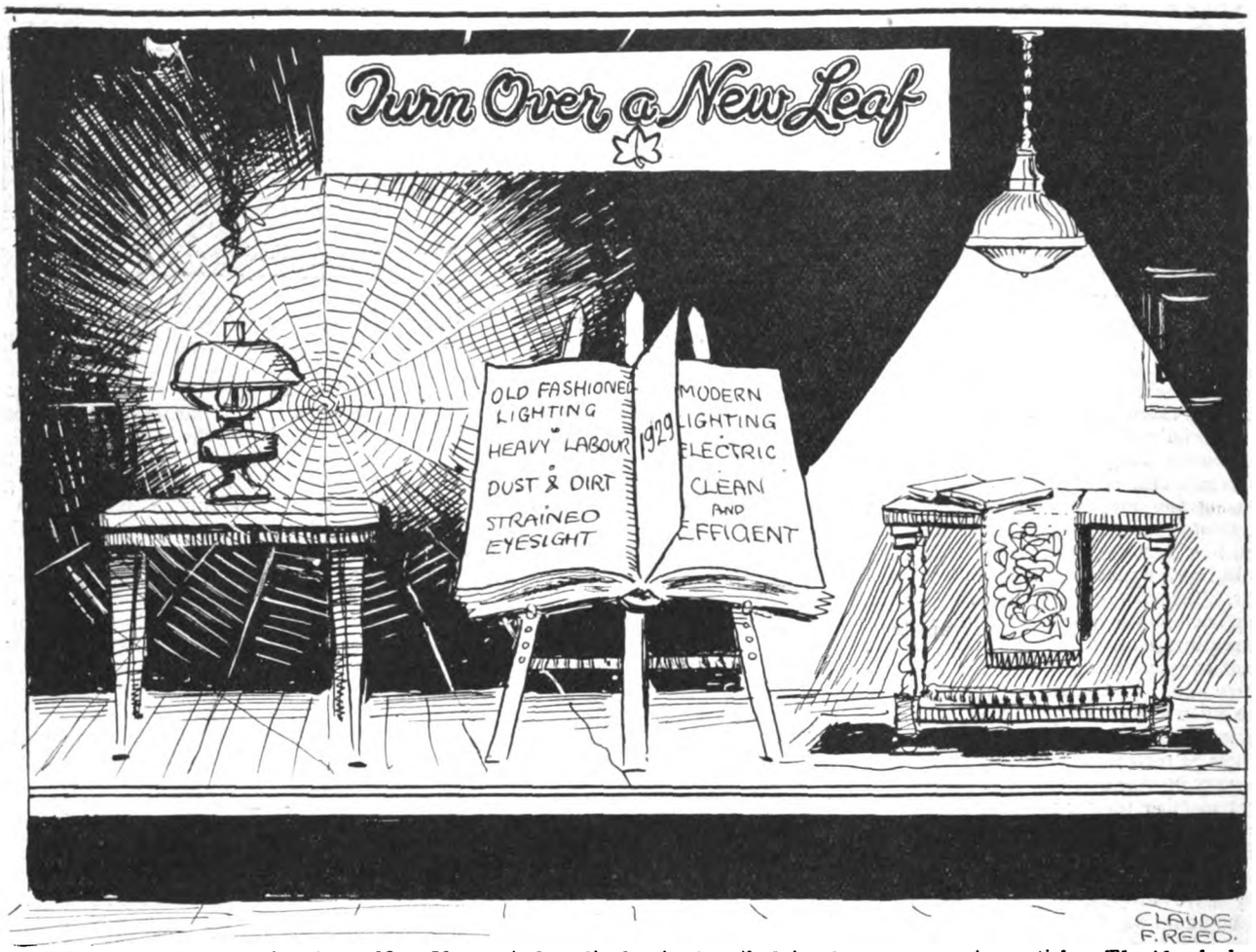


*THIS rough suggestion for a New Year window display is described in the accompanying article. The idea lends itself to very simple or elaborate treatment according to the size of the window and the display resources available.*

# WINDOW DISPLAYS FOR THE NEW YEAR.

## Avoiding a Stale After-Christmas Effect—Exploiting the Good Resolution Idea—Some Practical and Economical Suggestions.

By A. EDWARD HAMMOND (Author of "Shopfittings and Display" and "Practical Aids to Retail Selling").

FOLLOWING the Christmas activities and festivities many electrical contractors are inclined to slacken off a little on the selling side and to confine themselves, as far as possible, to contracting work, which they cannot afford to neglect. But they are not alone in this respect. Some of the supply authorities' showrooms have a rather worn out appearance immediately after Christmas, and their windows occasionally suggest that their display man has been granted a prolonged leave of absence to recuperate after Christmas jollification.

There is a tendency, too, on the part of both supply authorities and independent contractors to allow stocktaking or reorganising activities to absorb practically all their attention at the beginning of another year, and, for either or both of these reasons, it often happens that the window is left to look after itself for a few days.

Some contractors argue that local residents and visitors will not want to look at window displays during the holiday period, but this practice of taking their disinterestedness for granted is rather short-sighted, for two reasons. In the first place, it must be remembered that for at least a fortnight after Christmas many householders are entertaining, for people who have been away for Christmas frequently entertain their friends or relatives in return, and, in any case, parties and social gatherings are the order of the day.

Private entertaining generally necessitates certain replenishments of furnishings and fittings, including such things as lamp shades and reflectors, and reserve supplies of electric lamps. Perhaps an extra standard lamp or bedside or reading lamp may be decided upon. An electric kettle or toaster may help to make the drawing room tea more attractive, and then, of course, there are the usual household electrical appliances, such as suction sweepers, irons, and so on, which it may be thought wise to invest in before the guests arrive, in order to speed up the preparations. It may be desired to brighten up the porch or outer hall with a new electric lantern. An electric fire in the dining room will save continual lighting and re-lighting of fires.

What about wireless? Some improvements will generally be found necessary to existing sets, and there are still people who have not become converted to the joys of listening-in. They may consider the time opportune for investment in a complete radio set.

Last but not least, fancy electrical decorations, in the way of strings of coloured lamps will still be required. Electric candles for Christmas trees and so on. And, if all these points are not sufficient to convince the electrical contractor of the selling value of an after-Christmas display, there is a second reason which there will be no need to emphasise to readers north of the Tweed; but all south country contractors may not be cognisant of its importance, and that is the fact that to *real* Scottish people, the New Year festivities are regarded as being of more importance than Christmas itself, and they are keenly receptive to any suggestions which will add to the enjoyment of a *guid* New Year's Eve. But this does not mean to say that the contractor or the supply authority's display man will be justified in merely leaving his Christmas window display in for a week or so longer than he originally intended. On the contrary, it is a great mistake to let that stale "after-Christmas" look become apparent. Passers-by do not wish to see after Christmas the same

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display of goods from which they may have already made some selections. It is essential to give them something entirely new, and to cut out all Christmas greetings.

At the same time, the window should be allowed to retain much of the Christmas gaiety. A really bright New Year element should be brought into the display, with which is incorporated a fair sprinkling of Christmas decorations (these should preferably be different from those used in the Christmas window), and one or two New Year Greetings.

It is, in fact, a good idea to link up the electrical goods exhibited with New Year resolutions, and the following are some practical suggestions as to how this may be done :—

People have heard a lot about buying British goods. Why not have a special New Year display of electrical products of purely British manufacture? A large showcard on an easel in the centre of the window might be introduced, bearing the words: "One good resolution: Buy only British Electrical Goods during 1929." A rough outline map might be drawn in red chalk on a sheet of cheap canvas, and used as a background. On this could be indicated the centres where the various electrical supplies were produced, and such places as Rugby, Birmingham, Woolwich, Hayes, and Manchester should be marked with a red blob, and connected by means of drawing pins and lengths of red ribbon to the electrical fittings produced in those particular districts. The sketch reproduced on this page gives a rough idea of how this might be carried out.

Another idea for a New-Year-resolution-window-display, is one in which forceful suggestions are made in favour of local residents confining their purchases of electrical supplies to a *local* supply authority or contractor, as the case may be, in order that the electrical people concerned may make a special study of the individual requirements of each resident and thus ensure the maximum degree of efficient service during the coming year.

It would be as well to show in such a window as extensive a range of goods as possible without overcrowding, and, at the same time, advantage should be taken of the opportunity to invite new customers to commence their purchases with the New Year.

These invitations might be introduced by means of large cards specially printed for the purpose, and it would be a good plan to include also a neatly written or printed card in the centre of the window, thanking past and present customers for their support during the last twelve months, and stating that the proprietor and staff look forward to another year of service in their interests.

## An Adaptable Idea.

The idea of "turning over a new leaf" is not new as a feature in window dressing; but there are several methods of incorporating such a suggestion into the display scheme. The illustration opposite shows, in rough outline, one form which a display of this type might take. The small contractor should have no difficulty in modifying this to meet his own requirements or in adapting it to the size of his window; while the display man of an electricity supply authority, with the more generous window space which he usually has at his disposal, could carry out the idea on more elaborate lines by having an old-style coal-burning grate with a burnt-out fire on one side, with ashes and dust in the hearth, and fireirons and black-leading utensils, dustpan, and so on, placed as though cleaning activities were about to commence. In conjunction with this, suitable messages could be introduced into that

*"BUY BRITISH" is an attractive slogan at any time. Utilised in the way suggested above it should provide a good business-bringing window display for electric shops and showrooms during January.*

*D*

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section of the window, about hard-labour, waste of time, dust and dirt, with their insanitary and unhealthy effects.

On the other side, a glowing electric fire might be shown, with a clean, cosy hearth, backed up with sales messages to the effect that an electric fire is always ready for use at any hour of the day and night, without the slightest labour or effort.

Emphasis is added to the contrast if a "cobweb" is fixed in front of the section of the window in which the old lighting or heating methods are shown. This can be done with tinsel string, or ordinary white string will do. The diagonal strings can be fastened to the window-frame and the circular strings knotted on to these. A spider might be cut out in black paper or cardboard if it is thought that the "web" only may not adequately convey the idea of out-of-date, dust-begetting methods.

A large loose-leaf ledger or other book with the messages printed on the respective pages could be used as a centre-piece, on an easel or display rack, and the page being turned over should be stiffened by a piece of cardboard so that it does not fall on either side. The main story of the display—the turning over of a new leaf—should be developed on a large showcard beneath the easel.

## CORRESPONDENCE.

*The Editor welcomes the free expression in these columns of genuine opinion on matters of public interest, although he disclaims responsibility alike for the opinions themselves and the manner of their expression.*

### Electric Road Vehicles.

[To the Editor.]

Sir,—As one who still believes that electrically propelled vehicles will really come into their own I have noted with interest your frequent references to the possibilities in this field. I well remember the enthusiastic interest shown in the

**One of the electrically-propelled carriages used by visitors to the St. Louis Exhibition twenty-five years ago.**

pre-war long-distance electric car trip which terminated at The Electrician's old offices in Salisbury Square, and with you deplore the lack of progress from that point.

It occurs to me that some of your readers may like to see the enclosed picture of one of the electrically-propelled carriages used to transport visitors about the St. Louis Exhibition—twenty-five years ago!—I am, etc.,

"Elecvee."

Manchester.
December 21st.

### "Electrical Fires and Hand Extinguishers."

[To the Editor.]

Sir,—The origin and the geographical position of an electrical fire appears to decide the efficacy of the type of hand extinguisher employed.

In Germany and on the Continent the large electrical works, and others, use extensively the "dry" fire extinguishers as a first aid. In operation an inert gas under pressure blows out a non-conducting harmless cloud of powder which is not only eminently suitable for electrical and oil fires, but can be used with excellent results where sand and other methods are necessarily restricted.

The introduction of electricity has rendered certain extinguishing machines more dangerous than is generally realised, and some little discrimination is now necessary.

A flash fire is not uncommon in some industries, and a stream from a liquid extinguisher on live apparatus has been known to endanger the life of the operator and defeat the object by causing fire.

The British dry fire extinguisher has been tested by Faraday House, and from the report may be gathered a good reason why this particular type of extinguisher is gradually being adopted by prominent electrical engineers in this country.—I am, etc.,

L. E. Wilson.

Hodson's Court, Corporation Street,
Manchester.
December 17th.

### B.E.A.M.A. and Credit Policy.

[To the Editor.]

Sir,—The figure of 94%, as given in my letter published in your issue of December 14th, indicated the combined results of registered companies and private concerns. It was given in this form as it is more interesting and illustrative of the unfair struggle of industry and commerce against an adverse, unscientific monetary technique.

The Pollack Foundation of Economic Research, Newton, 58, Massachusetts, in their publications, "Money," "Profits" and "Business Without a Buyer," give many figures and charts of bankruptcies. Writing from memory, I think the percentage of failures in registered corporations alone varied from 75% during the year of extreme deflation in 1920 to 40% in their industrial boom years.—I am, etc.,

H. J. D. Thompson, A.M.I.E.E.

155, Pilgrim Street,
Newcastle-upon-Tyne.
December 17th.

[To the Editor.]

Sir,—The thanks of engineers are due to you for publishing Mr. Thompson's letter in your issue of December 14th.

A growing number of members of the engineering profession is getting tired of the inferred slur on their ability to organise, which is conveyed by the increasing tendency to appoint accountants and bankers' representatives to the boards of directors of engineering firms.

Engineers' efforts are constantly countered by the effects of the obsolete system of finance and accountancy under which we labour, and which, depressing effective demand at home, drives industry to seek often unwilling foreign markets in order to dispose of the output rendered possible by the efforts and skill of engineers and scientists. Such fighting for foreign markets carries the seeds of war, since all manufacturing nations are obliged by the same effete system of finance to struggle for what foreign markets are still open in order to endeavour each to obtain a "favourable balance of trade." Finance and the monetary system seem to have badly lagged behind advances in the power of production due to engineers and scientists so that the nation's "power factor" has become very low, and industries' efforts are largely cancelled.

Mr. Thompson's suggestion that the technique of the central banks should be subjected to an open inquiry is valuable, but may I suggest that when the inquiry is made representatives of the central banks should serve as witnesses, and not on the examining bench, which bench should be constituted of the industrialists, engineers, and the consumers who are suffering. No useful purpose is likely to be served unless this is assured.

If an engineer designs and builds a bridge which fails he becomes the defendant in the inquiry, and if lack of knowledge, ability, or forethought is proved he may be professionally ruined.

The policy of our financial pundits has failed to deliver the goods; they therefore must be examined in the inquiry, and not carry out the examination.—I am, etc.,

Charles H. Wright, A.M.I.E.E.

65, Carmyle Avenue,
Carmyle, Glasgow.
December 17th.

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When their trade was "down and out," the Germans jumped at the chance of digging canals and of electrifying the countryside.—*General Sir Ian Hamilton.*

* * *

Continuity in advertising is as necessary as continuity in breathing.—*Mr. H. Gordon Selfridge.*

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# NEWS IN BRIEF.

## Manchester and Electric Cookers—The Television Society—Electrically Driven Ships and Trade Unions—Electricity Growth at Blackpool—Australian Delegation for Britain.

WORSTON is shortly to have a supply of electricity from Clitheroe Corporation.

Manchester electricity department connected 79 hired cookers during October last, making the total on circuit 4 884.

The note which appeared in our last issue on page 718 relating to West Ham was printed East Ham, due to printers' error.

Wakefield Electricity Committee has authorised the purchase of a portable oil purifying plant for dealing with oil used in oil-cooled transformers, at an estimated cost of £170.

The B.T.-H. Ladies' Staff dinner was held at the Savoy Café, Coventry, on December 7th.

Automatic electric traffic control came into operation at Coventry on December 17th. Three-coloured lights to indicate "go," "caution" and "stop," are used. It is hoped to save £390 per annum at each junction so equipped.

Of 434 suggestions received during November from employees of the "Underground" group, 32 have been adopted including an improvement to current rails of 40-ton cranes at Lots Road power station, and improved hinged trolley heads for tramways.

At the ninth annual dinner of the South Wales Section (Western Division) of the Electrical Power Engineers' Association on December 14th, Mr. J. W. Beauchamp, proposing the toast of "The Electricity Supply Industry," remarked upon the enormous development of electricity. When he entered the industry, he said, people would walk half-a-mile to see an arc lamp; to-day they would probably have to walk ten miles to find one. Electrical engineers belonged to one of the most important and indispensable industries in the world.

At Llantwit Major, where electricity supply, obtained from the South Wales Electrical Power Distribution Co., was inaugurated on December 11th, an electrical exhibition was held during the remainder of the week.

The Clyde District Committee of the Electrical Trade Unions has directed the attention of members of Parliament to the claim of the Unions for the certification of electrical engineers as controllers of the electric plant of electrically-propelled ships.

In the course of a lecture to the Glasgow and West of Scotland Association of Foremen Engineers and Draughtsmen on December 8th, on "Measuring Instruments," Mr. Sidney M. Hawkins said in many branches of instrument making, and particularly that of electrical measuring instruments, Lord Kelvin's achievements formed a monument for all time, and they reflected credit upon the University and the city.

On the occasion of the opening of Blackpool Corporation's electricity exhibition, Coun. T. G. Lumb, chairman of the Electricity Committee, commented on the remarkable strides made by the electricity department. Their pre-war consumers were 2 000; to-day there were 17 000. Their output before the war was 4 750 000 kWh per annum; now it was 33 500 000. The pre-war revenue was £40 000 against £212 000. Electricity sold per head of the population before the war was 30 kWh per annum; at present it was 200.

Wokingham T.C. is to consider the question of installing electric lighting in the town hall.

The Central Electricity Board has asked Stoke-on-Trent Corporation for details of the all-electric houses it has erected.

Brighton Electricity Committee is to obtain tenders from leading battery makers for the supply of a 1 200 Ah battery for the North Road power station.

Mr. John Christie, borough electrical engineer, has reported to Brighton T.C. that he recommends that an exhibition be held from, say, October 3rd to October 12th next, inclusive.

Demonstrations of electric cooking, water heating, etc., are being arranged by Tynemouth Electricity Committee.

Users of electricity in Gloucester are asked to restrict their requirements between 4 p.m. and 5 p.m., except on Saturday and Sunday.

It is reported that an Australian delegation of four employers and four employees will leave Australia early next year to study industrial conditions in Britain.

What is believed to be a record of picture transmission by wireless was established last week when pictures radiated by 2XAL were received in Johannesburg.

As a result of the recent heating and cooking demonstrations at Lowestoft, agreements for the hire of forty stoves have been signed, and a further forty inquiries are being dealt with.

According to the "Irish Independent," Limerick Finance Committee has decided to take legal proceedings against the Electricity Supply Board for recovery of rates in respect of the Municipal power station which was taken over by the Board in May last.

The Commissioners of H.M. Works, etc., invite tenders for the erection of telephone exchanges at Sunbury (Middlesex) and Hampstead (London) and extension of the Sydenham Exchange.

On the ground of economy, Skelton and Brotton U.D.C. has decided that a number of partially foreign-made electric meters and Austrian-made electric lamps be purchased, in preference to British-made goods.

Electrical apparatus is to be sold on the hire purchase scheme by Bury (Lancs) electricity department, and the selling price is to be 5% over the list price for purchase in one year, and 10% for two years.

Six electric escalators capable of carrying 6 000 persons per hour are being installed by Messrs. Waygood Otis, Ltd., at the emporium of Messrs. Lewis, at Liverpool. The installation, of which two units are now working, will be completed early in the new year. Each escalator is driven by a 20 H.P. motor.

The next meeting of the Television Society will be held at the Engineers' Club, Coventry Street, W.1, on January 1st, 1929, at 8 p.m., when Mr. J. Cameron Rennie will deliver a paper entitled "Scanning Methods used in Television." At the monthly meeting to be held on the first Tuesday in February, a series of short informal discussion, will take the place of the usual lecture.

*NOVEL LAMP CARTONS.*

*A CARDBOARD model house for use as a lamp carton is a novelty introduced by the Edison Swan Co. "Edison Villa" is made in Tudor and modern designs and a garage containing automobile lamps is also available.*

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# LEGAL INTELLIGENCE.

## Judgment in Farnworth v. Manchester Corporation Action.

THE Court of Appeal consisting of Lords Justices Scrutton, Lawrence, Sankey, on December 13th delivered judgment on the appeal of Mr. Arthur Farnworth, a farmer of Bromyhurst Farm, Barton-upon-Irwell, from the judgment of Mr. Justice Talbot at the Assizes, dismissing the action which he brought against the Manchester Corporation of an injunction to restrain the Corporation from so working the electric power station situate at Barton-upon-Irwell so as to emit fumes heavily charged with sulphur and sulphur compounds, to the damage of the property of the applicant, and to his health. He also claimed damages for the injury caused to his crops and farm.

The Corporation admitted that a nuisance was created, but contended that as the station was of a kind which Parliament had authorised, Mr. Farnworth could not succeed in his claim.

Mr. Justice Talbot upheld that contention and stated that no means which science and knowledge could suggest could have avoided the nuisance. He accordingly gave judgment for the Corporation, but without costs, and Mr. Farnworth now appealed.

Lord Justice Scrutton in giving judgment, said it seemed clear that the station using the coal it did discharged such a quantity of sulphur that fumes mixed with moisture were not diffused or dispersed in the atmosphere but descended on Mr. Farnworth's land and damaged it. In view of the fact that it was said other and large stations were being erected in agricultural districts, the legal effect of this was important. Within their own area it appeared clear that the Manchester Corporation were liable for damage by nuisance, but it was said that they were not liable outside their area, because their powers were obtained by a private Act. He could see no reason why Parliament should make the Corporation liable for nuisance in their area and exempt them from liability for nuisance outside their area. In his view the special Act of 1914 did not vary the operation of the nuisance clause in the General Act of Parliament and if the nuisance clause was contained in the Act of 1914 it seemed that the Court was bound to hold that the Act of 1914 did not relieve the Corporation of the liability to pay compensation for damage by nuisance from the station. It was for the defendants to prove that the nuisance was an inevitable result of the working of the station, and they had not satisfied him that they had taken all reasonable precautions to prevent damage. He thought the appeal should be allowed, with costs there and below up to the present time and judgment entered for the plaintiff for damages up to the present day.

There should also be an injunction to restrain the defendants committing a nuisance by fumes from their generating station, the operation of the injunction to be suspended for a year to enable the Corporation to adopt such measures as they were advised to stop or mitigate the nuisance with liberty to apply after a year for suspension or variation of the injunction. The case showed, added the Lord Justice, the necessity for Parliament and other authorities giving more careful attention to provisions for compensation for damage caused by the development of electrical power stations.

Lord Justice Lawrence delivered a dissenting judgment, in which he agreed with the judgment of Mr. Justice Talbot in the Court below that the Corporation ought not to be held liable for negligence. The Lord Justice thought the appeal failed and should be dismissed.

Lord Justice Sankey delivered a judgment agreeing with that of Lord Justice Scrutton, and by a majority of the Court therefore, the appeal was allowed.

### METRO-VICK PLANT IN AUSTRALIA.

The Yallourn station of the Victoria State Electricity Commission is equipped with six Metropolitan-Vickers 12 500 kW turbo sets, but during the year ended June 30th last only five were installed. The maximum demand on the station varied from 58 000 to 67 000 kW, the total capacity of the generating sets being 62 500 kW. The running hours of the five sets totalled 33 179, which gives an average of 6 635 hours per machine. The station load factor recorded monthly varied from 53·5% to 62·8%, the monthly average being 58·7%. The machine load factor varied from 71·8% to 77·8% and averaged 75·3%. During the previous year the load conditions were equally severe.

# PERSONAL.

NEW associate members of the Institution of Civil Engineers include Mr. G. T. Allcock, of the Electricity Supply Department, Carolina Port, Dundee, and Mr. F. H. Davies, of the Export Department of the British Thomson-Houston Co., Ltd., Rugby.

In connection with the explosion which occurred at the public house, Lord Howick, Woolwich, on December 22nd, we understand that the man killed, Mr. Ralph Banks, was employed by Siemens Bros., Ltd.

We are pleased to learn that Mr. A. P. Wood, managing director of the Lancashire Dynamo and Motor Co., Ltd., is already benefiting from the complete rest he is taking, and that he hopes to be able to meet his many business friends again comparatively early in the New Year.

Mr. W. E. Bush was last week presented by colleagues of the E.L.M.A. Lighting Service Bureaux with a clock. Mr. Bush, as previously announced, is relinquishing his position as manager of the E.L.M.A. Bureaux which he inaugurated, to become general sales manager for Curtis Lighting of Europe.

The first Committee of the recently formed Meter and Instrument Section of the Institution of Electrical Engineers has now been appointed, as follows: Chairman, Mr. G. D. Malcolm; the President, I.E.E. (*ex officio*); the chairman of the Papers Committee, I.E.E. (*ex officio*); Member of Council, Mr. C. C. Paterson; Ordinary Members—Messrs. W. E. C. Alliss, F. A. East, C. H. W. Gerhardi, J. T. Haynes, E. W. Hill, R. G. Isaacs, F. C. Knowles, W. Lawson, C. W. Marshall, A. Middleton, William Phillips and G. F. Shotter.

At a meeting of the Board of Directors of the Marconi International Marine Communication Co., Ltd., on December 19th, Mr. F. S. Hayburn was appointed a director and deputy managing director of the company, the appointment to date from January 1st. Mr. Hayburn will also carry out the functions of general manager. The Rt. Hon. F. G. Kellaway is managing director. Mr. Hayburn has been associated with the Marconi International Co. for over 24 years. He was appointed assistant general manager in 1922, manager in 1925, and general manager in 1927. After leaving college he spent ten years in the telegraph branch of the Post Office and was the first British Government telegraph engineer in the Orange Free State after the Boer war.

# BUSINESS ITEMS.

THE telephone numbers of the new London office of JOHNSON AND PHILLIPS, LTD., at Columbia House, Aldwych, W.C.2, are Holborn 8326, 8327 and 8328. See page 753.

Sir Hugo Hirst, the chairman of the GENERAL ELECTRIC CO., LTD., has been reported as having stated that his company proposed to establish a factory in Australia for the manufacture of electrical apparatus. We understand that this report is not accurate. Sir Hugo's statement was only to the effect that British manufacturing companies will have to study seriously the question of manufacturing in Australia.

The ELECTRIC HEATING CO., of 6a, George Street, Croydon, has just completed a large contract for the supply of electric radiators for an important foreign naval power. The work has occupied a period of nearly ten months, during which time a special staff of mechanics has been fully employed on the work. The radiators are of the most modern type, the elements being carried in a specially constructed cradle to reduce the risk of fracture during the periods of gun fire.

The final change-over from manual to automatic working at Leicester took place at midnight on December 8th, the automatic exchanges in the area being Central (8 000 lines), and its three satellites—Syston, Western Park and Wigston. These exchanges were opened in February last, when 1 200 of the subscribers on the manual central were transferred to the new automatic exchange, and, at the same time, the manual exchanges in the satellite areas were closed down and their subscribers changed over to the new system. The final change, which has just been completed, consisted of transferring over 5 000 subscribers to the new Central automatic exchange, and closing the old manual exchange. The new automatic equipments are Siemens Brothers No. 16 system, and this firm also supplied the new manual trunk switchboard at Central. A new five-position No. 10 C.B. manual switchboard built by SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E., was opened on December 12th, with 400 subscribers from the old magneto exchange, which is now closed down.

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# TRADE PUBLICATIONS.

"THE Ferranti Fire" is the title given to a new booklet just issued by FERRANTI LTD., Hollinwood, Lancs.

The current blotter of MAVOR AND COULSON, LTD., of 47, Broad Street, Mile End, Glasgow, has been received.

The ISENTHAL CO., LTD., of Ducon Works, Victoria Road, North Acton, London, W.3, has issued a new list of resistances.

MAVOR AND COULSON, LTD., of 47, Broad Street, Mile End, Glasgow, have sent us a leaflet dealing with a new belt conveyor driving gear.

The current blotter of the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1, features the company's "Junior" electric cooker.

Radio wires, cords and flexibles are dealt with in a new publication by the L.P.S. ELECTRICAL CO., LTD., Avenue Road, Acton, London, W.

DOMESTIC ELECTRIFICATION, LTD., Townsend House, Greycoat Place, London, S.W.1, has published a leaflet describing type R.F.S. electric radiator.

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, has just issued a new catalogue entitled "Modern Style Electric Light Fittings."

CAMPBELL AND ISHERWOOD, LTD., Raleigh Street, Bootle, have sent us publication E.P.T. 10, which deals with S.D.L. refrigerating and ice-making machinery.

GEORGE H. SCHOLES AND CO., LTD., Blantyre Street, Hulme, Manchester, have published a new booklet explaining the "Wylex" and "Sanco" wiring fittings.

The HEWITTIC ELECTRIC CO., LTD., of Hersham, Walton-on-Thames, Surrey, has published two new booklets, dealing with the company's rectifiers. Nos. 105 and 106.

BRITISH INSULATED CABLES, LTD., Preston, Lancs., have published booklet P.242, dealing with aluminium matting, sections and sheets. This replaces booklet P.217.

LACY HULBERT AND CO., LTD., Boreas Works, Beddington, Surrey, has issued List P.7, which deals with petrol and electrically-driven portable air compressors.

List No. 401, illustrating and describing "Cosyglo" fires, has been sent to us by SIEMENS ELECTRIC LAMPS AND SUPPLIES, Ltd., of 38-39, Upper Thames Street, London, E.C.4.

Practical gifts for the new year are illustrated and described in a new leaflet published by the SUN ELECTRICAL CO., LTD., 118-120, Charing Cross Road, London, W.C.2.

The WHOLESALE FITTINGS CO., LTD., of 23-37, Commercial Street, London, E.1, announces that supplement No. 221, dealing with lighting glassware, is now available to the trade.

A special folder dealing with the "Wirt" lightning arrester and its use in connection with radio receiving sets has been issued by E. R. MORTON, LTD., 117, Charlotte Street, London, W.C.1.

Catalogue No. 609, concerning outdoor lanterns, signs, floodlight projectors and industrial fittings has been issued by FALK, STADELMANN AND CO., LTD., Veritas House, 83-93, Farringdon Road, London, E.C.1.

## Lighting Fittings.

A new catalogue has been published by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, giving a selection of the "Home Series" artistic electric lighting units. The reference is F. 4819.

SIEMENS BROTHERS AND CO., LTD., Woolwich, London, S.E., have sent us catalogue No. 817 (October, 1928), descriptive of temperature recorders, and No. 840 (November, 1928), dealing with electrical distance thermometers.

A new leaflet relative to electric lamps has been issued by the NOX ELECTRIC LAMP CO., LTD., Clarence Road Works, Hunslet, Leeds. A memorandum note pad for desk use has also been prepared for the convenience of the trade.

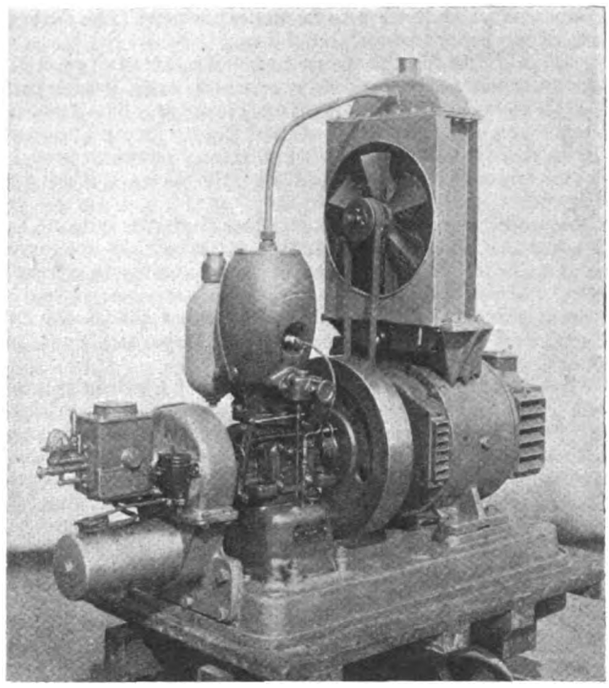
We have received from MOUL AND CO., LTD., 15, Old Queen Street, London, S.W.1, list No. 72, which deals with hand tachometers, type N. List No. 74 has also been received, and the subject dealt with in this case is the company's tachochron. This device consists of a combined anti-magnetic chronometer and revolution counter. Another publication is list No. 73, which describes tachoscope No. 250, model 1927.

The MULLARD WIRELESS SERVICE CO., LTD., of Denmark Street, London, W.C.2, has issued a number of leaflets relative to valves and components, the references being VT. 28 (type S.W.6), VR.76 (P.M.3), VR.59 (P.M.252), VT.31 (S.W.3), VR.35 (D.F.A. 6, 7 and 8), VU.21 (U.15), VR. 66 (P.M.22), VR.57 (P.M.1A), W.A.10 (H.T. supply unit), VR.75 (P.M. 5X), VR.44 (P.M.2), W.A.15 (P.M.R.C.C. unit), W.A. 12. (P.M. grid leak), VU.20 (U.12), VU.18 (U.9), VR. 67 (P.M.24), VM.8 (T.11B.). The types of valves and components described in the respective leaflets are indicated in brackets.

# NEW LIGHTING PLANT.

## Self-Contained Automatic Plant for Country House Lighting.

AMONG the electrical exhibits at the Smithfield Show, which concluded in London on December 14th, was a new automatic electric lighting set exhibited by PETTERS, LTD., of 75b, Queen Victoria Street, E.C.4, and Yeovil. The plant, as the name suggests, is automatically controlled, and is started and stopped by hand by pressing a controlling switch placed in any part of the house to suit the convenience of the occupier. The speed of the engine is controlled by a centrifugal governor which regulates the consumption of petrol in proportion to the number of lights in use. When current is no longer required the house switch can be operated without going anywhere near the actual installation itself. If desired, additional controlling switches may be installed in any part of the house. The advantage of starting the engine from special switches and not from any switch in the house is that it saves all unnecessary running of the engine, and arrangements may be made to place the controlling switches under lock and key, to prevent unauthorised tampering. It is claimed that in the operation and maintenance of the plant no engineering or electrical knowledge is required. There is no switchboard. The amount of attendance required is very small owing to the simplicity of the plant. Petrol and lubricating oil tanks of ample capacity are provided and an inspection for filling up at weekly intervals is all that should be necessary. The engine and dynamos are separate units so that the dynamo can be removed for repair and adjustment should this be required. The plant consists of a Petter two-stroke water-cooled engine fitted with a self-starter, and is direct-coupled to a compound-wound dynamo. The engine is fitted with the "Wico" magneto. The main bearings and cylinder are lubricated by a positively-driven mechanical lubricator which starts and stops with the engine. The engine is water-cooled with radiator and fan. The dynamo is fitted with ball bearings and driven by a flexible coupling on the engine shaft. There are no storage batteries except for a 12 V starting battery of the car type kept fully charged by the starter generator and with ample capacity for starting the engine. The plant is made in three sizes, 700, 950 and 1 450 W, 110 V, and can be supplied in other voltages if desired.



**The new automatic lighting set by Petters, Ltd.**

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West Kootenay Power and Light Co. has published plans for the new Pend Oreille plant which will be one of the largest electrical undertakings in Western Canada, and will cost $40 00 000. It is expected to produce 80 000 H.P. By the time the new plant is ready, all the power it can produce will be required for industrial undertakings.

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# AFFAIRS AT NEWPORT, MON.

## Electricity and Tramways Department Replies to Adamson Report.

IN connection with Adamson report upon the Newport, Mon., Corporation undertakings, details of which were published in THE ELECTRICIAN of November 9th, Mr. N. J. Young, general manager, and Mr. A. Nichols Moore, borough electrical engineer and tramways manager, have signed a joint ment in reply to that section of the report which concerns the electricity and tramways undertaking. The salient points of the report are given below.

Mr. Young and Mr. Moore write: "The relative positions of the chief officers are said to give rise to considerable difficulty. The present arrangement, however, has been in existence since 1912 without such difficulty being apparent. Also, as recently as January, 1927, it was recommended by your Committee and confirmed by the Council that this arrangement should be continued.

"We would remind your Committee that it is not one but two separate and distinct undertakings which are under consideration. With the sole object of economy in administration, however, they are for practical purposes worked as one joint undertaking. In almost all other places the two undertakings are entirely separate, with separate heads and duplicate staff."

"With regard to the duties of the Chief Clerk in relation to the management, we submit that if the time of the management is to be conserved for the general administration and development of the undertaking and needless duplication of work and consequent delay are to be avoided, it is essential that the present system, which is the usual one, must be adhered to."

### The Electricity Undertaking.

"The suggestion is made that every official position which would appear in an undertaking of larger dimensions exists in the electricity undertaking, and that the general staff is larger than is necessary. We submit that to cope efficiently with the work of the undertaking the staff is not larger than is necessary."

"We regret the statement should have been made that supervision is not satisfactory, and that it is suggested insufficient attention is paid to Llanarth Street."

With regard to the borough electrical engineer's appointment as president of the Incorporated Municipal Electrical Association, and his absence from Newport on official business, it is pointed out that "as the investigator was aware of the fact, he might in fairness have mentioned that during the last three years the borough electrical engineer has sacrificed a considerable proportion of his annual leave in order that the interests of his department should not suffer. In addition to this, the more recent development of our undertaking has necessitated his continuing to work at his office with monotonous regularity until after 7 p.m., irrespective of the amount of time he has felt obliged to put in on Sundays."

The statement that the delay in closing Llanarth Street as a generating station cannot be defended is "a most surprising statement" which can be refuted entirely by the simple statement that bringing a power station up to first-class involves the incurring of heavy capital expenditure—the very thing which the investigator criticises. . . .

"Extensions are retarded as long as reasonably safe, so as to avoid premature capital expenditure and to ensure that the new plant should have as much productive output as possible, but an extension scheme when once embarked upon is pressed forward expeditiously. The retarding of extensions does not, as suggested by the investigator, give rise to undue hurry."

"The delay which has taken place in connection with the major extension, viz., the pumping station, has been due to causes for which neither the Council, your Committee, nor your officials were responsible." (The circumstances are detailed.)

"In the matter of the economies which will result from the operation of the new plant and the shutting down of the old plant, and to which the investigator makes a brief reference in passing, the borough electrical engineer has always assured your Committee that once the extension scheme was finished and in reliable commission, very substantial economies in operation and maintenance costs would immediately be secured in two directions: (1) By a reduction in coal costs, and (2) by a reduction in permanent staff."

"It is difficult to estimate accurately the former until the new plant has been in operation for some time to ascertain the results, but in regard to the latter we are in a position to state that the saving will be of the order of £2 000-£2 400 per annum. There will also be a saving of £800 per annum due to the final closing down of Llanarth Street."

As to the investigators' suggestion that the margin between demand and capacity is too high, the reply points out that, "If the margin of plant capacity were too high, it is surprising that the technical advisers to the Electricity Commissioners should have definitely advised your Council in March, 1927, that in their opinion a further 10 000 kW set and boilers were necessary."

The present system regarding coal tolls is detailed and figures given showing that Newport's average cost per ton is lower than four other undertakings referred to—in one case 4s. 10½d. lower. The expert's statement that "The equipment for handling coal is neither satisfactory nor up-to-date, and in the future it will have to be modernised," is described as "incorrect." The coal elevating and conveying plant is said to be of modern first-class design and ample capacity, and is similar to that installed in numberless other undertakings.

"It is satisfactory to find that the investigator can comment favourably upon the development of the cooker business, and that it has justified itself, notwithstanding that the department overstates rather than understates its expenses on this section. . ."

"The first recommendation, which is submitted as that of the investigator and upon which he claims one of his largest savings, is to close Llanarth Street, as a generating station. This recommendation, as previously mentioned, was originally made by the borough electrical engineer, and the work has been in progress the whole of the time. Any credit for closing this station or saving effected thereby is certainly not due to the investigator. His suggestion to dispose of the surplus plant is equally unnecessary." Then follows a long explanation and detailed statement of the position, with a mass of information regarding jointers, and the opinion is expressed that to remove the motor testing department from Llanarth Street would involve difficulties.

"Llanarth Street is the principal distributing sub-station of your system, being the main centre for controlling many of the outgoing extra high tension supplies, and it must continue so for a long time to come. It is not an ordinary static sub-station, but to a great extent a rotary sub-station with running plant. At Llanarth Street is also stationed the main battery for maintaining balance upon the system and safeguarding the direct current supplies."

"There must always be on duty at Llanarth Street, qualified assistants capable of running the station, operating the plant, and dealing with the hundred and one requirements of such a distributing centre, and the absurd suggestion that the three junior assistant engineers responsible for its operation can be dispensed with can only arise from an entire misconception of the functions and operation of a main distributing sub-station. The alleged saving of £638 on this account cannot accrue."

The extensions of mains into outside areas are justified, and it is pointed out that it is not sufficient merely to meet the demand, but in many cases necessary to provide facilities to stimulate it. "There is, in fact, a twofold form of profit on such extensions: (1) in the extensions themselves; and (2) in the greater user of electricity to be obtained later, thereby causing a reduction in the average cost of generation."

### The Tramways Department.

The joint reply to the criticisms of the tramway department, points out that with regard to the financial position, the investigator makes no reference to the prevailing trade depression, and apparently assumes that the losses incurred are entirely the result of 'bus competition. The reply continues, "to check the economical use of electrical current as suggested, it would be necessary to instal an expensive system of meters, entailing considerable clerical supervision and check. Such a system was in use for years at Newport, and discontinued after mature consideration as undesirable. The discontinuance has been general throughout tramway undertakings."

"Finally, the Corporation is asked to consider the advisability of offering the undertaking for sale. The value of the business would scarcely be enhanced by a perusal of the investigator's report, or even by reading the statements made in the Council Chamber and recently appearing in the local Press. The question of the sale or otherwise does not depend upon the management." There follows a statement regarding the savings claimed by the investigator as a result of his recommendations; there is shown what proportion of these had

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already been considered by the committee and the management and been definitely decided upon prior to the investigation, or found upon examination to be impracticable; and also the remaining savings which it may be possible to effect, but of which £508 is contingent upon the transfer of stores and staff from Llanarth Street to the East power station, which, however, involves heavy expenditure for extension of stores and building accommodation. The statement gives the total savings as estimated by the investigator as £4 970, of which £2 250 has been "found impracticable." There are the proposed dispensing with the services of switchboard assistants (£638), chief clerk, distributing and sales department (£235), typists (£65), stores accountancy assistant (£80), consumers' accounts clerks (£194), storekeepers' assistants (£182), assistant mains engineers (£200), yardmen and watchman (£136), public lighting alterations (£400), and meter reader (£120). The writers show that before the visit of the investigator they had in view reductions, etc., which would amount to £1 850—engine drivers, stokers, etc., £832; drawing office assistant, (£260), draughtsman (£195), typists (£78), consumers' accounts clerks (£271), yardmen and watchman (£214).

## SIGNALLING BELLS.

### Report on Mining Experiments at Sheffield—Parallel Connections on Bare Wire Circuits.

A REPORT by Captain C. B. Platt (Superintendent Testing Officer) and Dr. R. A. Bailey (Investigator) on an investigation carried out at the Mines Department Testing Station, Sheffield, into the safety of certified mine signalling bells when connected in parallel has just been issued.

The report states that since the Senghenydd Colliery explosion in 1913 experimental investigations have been carried out into the safety of bare wire signalling systems in fiery mines. Since 1917 numbers of mining type bells fitted with "safety devices" have been certified as safe for use in certain circumstances. It had been established, however, that the certificate of safety did not hold good if two or more bells were connected in parallel on a bare wire circuit. In such conditions the break-flash at the bare signal wires might become dangerous. In any event the margin of safety would be greatly reduced.

The object of the present report was to give an account of further experimental work by which it was shown that, under certain limiting conditions, certified bells might safely be connected in parallel on a bare wire circuit,. The conditions are defined in the report.

"The problem for solution," the report states, "is to diminish the energy of the break-flash at the signal wires to less than that which will cause ignition of the most readily ignitable fire-damp air mixture."

The report continues: "The simplest, and least costly, method of increasing the safety factor of a certified bell is to incorporate a non-inductive resistance in parallel with the magnet coils. The value was determined, for different makes of bells, of the resistance of the shunt required to ensure the safety of four and six bells, respectively, in parallel. Where the bell was fitted with a shunt as the protective device it was disconnected.

"Experiments have shown that a type of battery of sufficiently high internal resistance to ensure the safety of nearly all types of certified bells when used in parallel is the porous-pot Leclanché battery, consisting of cells of three-pint size connected in simple series, and provided that not more than one battery of this type is connected in the system. There are one or two types of certified bells which are not safe for use in parallel in definite numbers even with this battery, but they require only slight modification to make them so. It should be clearly understood that modifications of the ordinary Leclanché cell, having a relatively low internal resistance, such as the 'Carsac' and the 'Carporous,' as well as so-called dry batteries, are not safe for use with certified bells in parallel when operated from bare wire signal circuits."

### HYDRO-ELECTRIC POWER IN BRITISH COLUMBIA.

The West Kootenay Power and Light Co., Ltd., a subsidiary of the Consolidated Mining and Smelting Co., is planning to erect a large hydro-electric power plant on the Pend Oreille River, east of Trail, B.C., adjacent to the United States border.

Though the size of the proposed development has not been revealed, a survey of the site is now being carried out, and the Minister of Lands for British Columbia has granted the company permission to apply for a licence to harness the Pend Oreille River.

## A COMBINATION METER.

### An Interesting Instrument for Laboratory, Test Room and Shop.

AMONG the latest instruments which are likely to interest radio manufacturers, battery eliminator makers, gramophone recording engineers, etc., is a combination instrument just placed on the market by the AUTOMATIC COIL WINDER and ELECTRICAL EQUIPMENT CO., LTD., Winder House, Rochester Row, London, S.W.1. The instrument is called the "Avometer," and without external shunts or multipliers may be used as a voltmeter, ammeter or resistance measurer over a wide range of values. The Avometer (model 1928) is a portable combination electrical measuring instrument, designed and manufactured to give direct and accurate readings (d.c.) covering the following ranges:—Current: 0·1 mA to 12 A, 0–12 A, 0–1·2 A, 0–0·12 A, and 0–0·012 A. Pressure: 1 mV to 1 200 V, 0–1 200 V, 0–120 V, 0–12 V, 0–1·2 V, and 0–0·12 V. Resistance: 0·1 Ω to 1 mΩ, 0–1 000 000 Ω, 0–100 000 Ω, 0–10 000 Ω, and 0–1 000 Ω. The set comprises a moving coil of aluminium wound with copper wire, and supplemented with Constantan wire to a resistance of 20 Ω. The coil is pivoted by means of hardened and polished steel points, moving in sapphire jewels, and swings in a strong field controlled by a powerful cobalt steel magnet. Two phosphor bronze hairsprings are fitted for the purpose of conveying current to the moving coil and tortionally for the return of the pointer to zero. A knife edge pointer is fitted to the movement, the whole being strong and carefully balanced. The dial is marked with two scales, each about 5 in. long, the upper, 1 000–0, being used for all resistance tests, while the lower, 0–120, is used for measuring current or voltage, and is uniformally divided into divisions approximately 1 mm. each. The dial is also provided with a mirror, to prevent parallex errors. The movement is moderately damped, and each scale is individually calibrated, to agree with readings of standard instruments. The front of the set consists of a moulded bakelite panel, on the inside of which are mounted the whole of the switching apparatus, resistances, shunts, rheostats, etc., and the moving coil. The resistances are pile wound on flat bakelite slabs. The current regulating rheostat is wound on an insulated copper frame, which allows any heat developed to be rapidly dissipated over a large area. Part of the winding is made with heavy gauge wire and the total resistance is approximately 500 Ω. On the knob is marked the current which each section may carry continuously without undue heating. In the "off" position the rheostat is short-circuited. A single switch governs all ranges of amperes, volts or ohms, and is fitted with a spring clip operating at each position. The knob is marked with each range, while an arrowhead indicates the one in use. The bakelite front fits into an aluminium case, the joint being dust-proof. In the back of the case is a compartment for holding a single 1·5 V dry cell, which is connected in the ohm-meter circuit, for the two lower ranges. A quick and easy method is provided for checking and if necessary compensating for any variation in battery voltage or resistance.

### Other Resistance Ranges.

For the two higher resistance ranges a 7·5 or 75 V battery should be connected in series with the resistance being measured. These voltages should give full scale deflection in each case, without the resistance. When used as a voltmeter the resistance is 167 Ω per volt, which gives a full scale deflection with 6 milliamperes. It is thus possible to use the 0·12 V range as a milliammeter, in which case the instrument is twice as sensitive as when used on the 0·012 A range. The insulated leads are provided with spring clips at their outer ends, but on voltages of over 600 the use of special leads is considered by the makers to be advisable. All exposed metal parts are insulated from the electrical circuits. All fittings, resistances, etc., are standardised, so that replacements or repairs can be expeditiously carried out. No connecting up with outside shunts, resistances, etc., is necessary, and the set may be used by anyone possessing but little electrical knowledge, and using a reasonable amount of care. Any of the above ranges come into circuit simply by turning the switch to the relative position, no alteration of the testing leads being necessary. The rheostat automatically comes into circuit under current tests, and is a useful auxiliary for regulating the amount of current should this be desired.

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# BUSINESS OPENINGS.

## Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited. The closing date is given, when available.

PENZANCE GUARDIANS.—Supply and fixing of wireless installation at the institution. Specification, etc., from the Master.

METROPOLITAN WATER BOARD, December 31st.—One electrically driven and one water driven centrifugal pump, for Kempton Park pumping station. Specification, etc., from the Chief Engineer, at the Board's offices, 173, Rosebery Avenue, London, E.C.1; deposit £1 1s.

MIDDLESBROUGH EDUCATION COMMITTEE, December 31st.—Electric lighting installation of ten Council schools and the Stockton Street Practical Instruction Centre. Specification, etc., from the Borough Electrical Engineer.

SOUTHEND CORPORATION, December 31st.—Supply of 3 000 joint boxes, for the light railways and electricity department. Full particulars from Mr. R. Birkett, Electricity Works, London Road, Southend-on-Sea.

BRADFORD EDUCATION COMMITTEE, January 1st.—Electric lighting installations in various schools. Specifications, etc., from the City Architect, Town Hall, Bradford.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 2nd.—Manufacture and erection of e.h.t. three-phase and h.t. single-phase switchgear and accessories. Specification from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

LAMBETH (LONDON) GUARDIANS, January 3rd.—Twelve months' supply of incandescent electric lamps. Forms of tender, etc., from the clerk, Mr. J. L. Goldspink, Board Room and Offices, Brook Street, Kennington Road, S.E.11.

CENTRAL ELECTRICITY BOARD, January 4th.—Supply and erection of 132 000 V transformers, under the South-East England Electricity Scheme, 1927. Specification (No. S.E.E. P.T.1) and form of tender from Mr. J. R. Brooke, Secretary, Central Electricity Board, Trafalgar Buildings, 1, Charing Cross, London, W.C.2; deposit £2 2s.

SALFORD CORPORATION, January 4th.—Supply of e.h.t. and l.t. paper insulated, lead covered and armoured cables. Particulars from the City Electrical Engineer, Frederick Road, Salford.

BELFAST CORPORATION, January 7th.—Manufacture, delivery, and erection of h.t. armour-clad switchgear. Specification (No. W. 70) and form of contract from Mr. F. H. Whysall, city electrical engineer and general manager, Electricity Department, East Bridge Street, Belfast; deposit £2 2s.

BETHNAL GREEN (LONDON) BOROUGH COUNCIL, January 14th.—Electric lighting and power and telephone installations at Public Baths and Washhouses in course of erection in Old Ford Road. Specification, etc., from the Borough Engineer, Town Hall, Bethnal Green, E.2; deposit, £3 3s.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 14th.—Maintenance of electric lighting, heating and power installations (section L) and supply of electric lamps (section S) for twelve months. Forms of tender from Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

STOKE-ON-TRENT CORPORATION, January 16th.—Supply and erection of an electrically-driven air compressor at the central power house, Hanley. Specification, etc., from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2.

STOKE ON-TRENT CORPORATION, January 16th.—Supply of low tension d.c. switchboard, for electricity sub-works, Bagnall Street, Stoke-on-Trent (contract 2 836); and supply of e.h.t. ironclad type switchgear at Central power house, Hanley (contract 2 839). Specifications from the City Electrical Engineer, St. George's Chambers, Kingsway, Stoke-on-Trent; deposit £2 for each.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Manufacture and supply of one 5 000 kVA Scott-connected transformer, for three-phase system, 6 600 V and 2 000/2 300 V per phase, with voltage regulator; and 375 kVA and/or 750 kVA Scott-connected transformers, for three-phase system, 6 600 V and 2 000/2 300 V per phase. Specification, on and after December 1st, from the Borough Electrical Engineer, 60, Eden Grove, Holloway, N.7.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 18th.—Supply of cables; electricity meters; terminal, service, network and fuse boxes; oil circuit breaker switches; electrical sundries; wires; lamps; transformers, etc., for one year. Specification from the Town Clerk.

WEST RIDING EDUCATION COMMITTEE, January 19th.—Electric light installations in Norton New School and in Glass Houghton Ashton Road Council School and caretaker's house. Specification, until January 14th, from Education Department, County Hall, Wakefield.

ESSEX COUNTY AND COLCHESTER HOSPITALS COMMITTEE, January 21st.—Internal electric wiring of Brentwood Mental Hospital, with fuseboards, motors, etc. Specifications, etc., from Mr. H. H. Gepp, 66, Duke Street, Chelmsford, deposit £5 5s. Only registered contractors are invited to tender.

## Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1. *Note.—An asterisk denotes that local representation is, in practice, essential.*

TURKISH RAILWAYS AND PORTS DEPARTMENT, December 30th.—Supply of fuel economiser, machine tools and d.c. motors. (Reference A.X. 7 281.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of 15 715 electric meters and spares.

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 2nd.—Supply of two hydraulic pumps and electric motors. (Reference A.X. 7 150.)

EGYPTIAN STATE RAILWAYS, January 3rd.—Telegraph and telephone wire (approximate cost £E3 600 to £E4 400). Specification will be issued to firms on the Administration's official list. Further information from Chief Inspecting Engineer, 41, Tothill Street, London, S.W. (Ref. E.S.R. 7 903.)

JOHANNESBURG MUNICIPALITY, January 3rd.—Electricity meters and time switches. (Reference B.X. 4 945.)

TURKISH DIRECTION-GENERAL OF POSTS, TELEPHONES AND TELEGRAPHS, January 5th.—Supply of 60 000 porcelain insulators and 15 000 swan neck fittings. (Reference B.X. 4 904.)

INDIAN STORES DEPARTMENT, January 8th.—Three oil engine driven 12½ kW generator sets (order No. N/9248). (Reference B.X. 4 956.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 8th.—Supply of protective apparatus for telephone equipment, including fuses, heat coils and arresters (schedule C. 380). (Reference B.X. 4 881.)

SOUTH AFRICAN RAILWAYS AND HARBOURS (extension of date), January 10th.—Supply of five electrically-driven traversers and one 5-ton hand-operated crane (tender No. 1 344.) (Reference A. 7 023.)

VICTORIAN ELECTRICITY COMMISSION, January 14th.—Supply of 11 000 V transformers and spares (specification No. 29/1). (Reference B.X. 4 900.)

NEW ZEALAND POSTS AND TELEGRAPHS, January 15th.—Supply of telephone cords (tender No. P. and T. 151/1 084). (Reference B.X. 4 847.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Supply of timing clocks (schedule C. 382). (Reference B.X. 4 905.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 15th.—Supply of vitreous enamel indicating plates. (Reference B.X. 4 927.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 15th.—Telephone transformers (schedule C. 383.) (Reference B.X. 4 878.)

TURKISH DEPARTMENT OF POSTS, TELEGRAPHS AND TELEPHONES, January 16th.—Supply of underground telegraph cable, and accessories. (Reference B.X. 4 942.)

VICTORIAN RAILWAY COMMISSION, January 16th.—Rotary converter or rectifier set, for Glen Waverley sub-station. (Reference B.X. 4 893.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 17th.—Air compressor, arc welding set, electrically-driven wheel lathe, motor-driven foundry sand and loam mill, motor-driven rattler and motor-driven stone crushing machine (tender No. 1 367.) (Reference A.X. 7 226.)

GRAHAMSTOWN (SOUTH AFRICA) MUNICIPALITY, January 22nd.—Supply and erection of centrifugal pumps, motors and cable (Contract B. of 1928). (Reference A.X. 7 187.)

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GRAHAMSTOWN MUNICIPALITY, January 22nd.—Supply of cable, transmission lines and transformers (contract C. 1 928). (Reference B.X. 4 913.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd. — Supply of telephonists' telephones. (Reference B.X. 4 888.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd. — Telephone transmitters and associated parts (schedule C. 386.) (Reference B.X. 4 889.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 22nd.—Telephone receivers and associated parts (schedule C. 387). (Reference B.X. 4 890.)

EGYPTIAN MINISTRY OF THE INTERIOR, January 24th.—Supply and installation of electric system for Beba. (Reference B.X. 4 916.)

SOUTH AFRICAN DEPARTMENT OF POSTS AND TELEGRAPHS, January 24th.—Supply of telephone switchboards (tender No. 143). (Reference B.X. 4 912.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 24th.—Supply of two small d.c. generating sets, running on crude oil, for Maquassi. (Reference B.X. 4 943.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 29th.—Accumulator batteries and counter E.M.F. cells (schedule C. 390). (Reference B.X. 4 906.)

WAIRARAPA (N.Z.) ELECTRIC POWER BOARD, January 29th.—Supply of 15 sets of earth leakage protection equipment (contract No. 78). (Reference B.X. 4 950.)

EGYPTIAN MINISTRY OF THE INTERIOR (SECTION DES MUNICIPALITÉS ET COMMISSIONS LOCALES), January 31st.—Diesel engine driven generator set, d.c. rotary balancer, and accessories, for Kafrel Zayat electric station. (Reference B.X. 4 931.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, January 31st.—Supply of electrically driven locomotive turntable (tender No. 1 386). (Reference A.X. 7 253.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 11 000 V switchgear, in connection with the Yallourn power station extensions. (Specification No. 29/5). (Reference B.X. 4 897.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 22 000 V switchgear and accessories, for Richmond Terminal Station. (Reference B.X. 4 901.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of 11 000 V switchgear, for installation in the Richmond Terminal Station (specification No. 29/3). (Reference B.X. 4 898.)

VICTORIAN ELECTRICITY COMMISSION, February 4th.—Supply of pillar insulators, with metal parts, for use on 132 000 V outdoor circuits. (Reference B.X. 4 921.)

INDIAN STORES DEPARTMENT, NEW DELHI, February 5th.—Supply of turbo-alternator, boiler, economiser, switchgear and cables. (Reference B.X. 4 944.)

EGYPTIAN STATE RAILWAYS, February 9th. — Electrification and equipment of Heluan line, including equipment of power station, overhead transmission lines, track bonding, motor and trailer coaches, etc. Tenders to General Manager, Cairo Station.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 12th.—Supply of 110 kV switchgear, and controlling equipment, for Waitaki power scheme, section 3. (Reference B.X. 4 848.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, February 12th.—Supply of v.i.r. wire (No. P and T. 151/1184). (Reference B.X. 4 951.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, February 14th.—Supply of 15-ton electrically-driven portal titan crane (tender No. 1 366). (Reference A.X. 7 272.)

INDIA STORE DEPARTMENT, February 15th.—Supply of hydro-electric plant, comprising four 12 000 kW water-wheel driven alternator sets, auxiliaries and spares (schedule 4). Forms of tender (5s.) from the Director-General, Belvedere Road, London, S.E.1.

NEW SOUTH WALES DEPARTMENT OF PUBLIC WORKS. Extension of date.—February 18th.—Supply and erection of hydro-electric generating plant for Burrinjuck development. (Reference 4 938.)

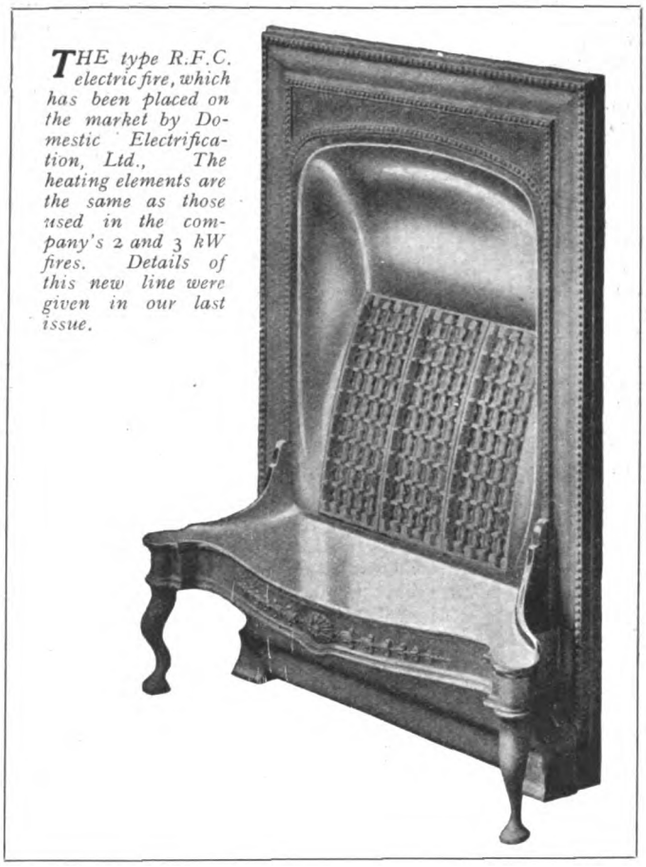
NEW ZEALAND POSTS AND TELEGRAPHS, February 19th.—Supply of bronze wire and copper binding wire. (Reference A.X. 7 252.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, February 19th.—Supply of 120 000 galvanised steel spindles for insulators. (Reference B.X. 4 948.)

WHANGAREI (N.Z.) HARBOUR BOARD, February 28th.—Supply of one 15-ton electrically-operated level luffing gantry crane (contract No. 35). (Reference A.X. 7 263.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 5th.—Supply of seven single-phase 5 500 kVA transformers, for Waitaki power scheme, section 4. (Reference B.X. 4 873.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 19th.—Supply of 110 000 V transformer, for Mangahao electric power scheme (section 204). (Reference B.X. 4 952.)



*THE type R.F.C. electric fire, which has been placed on the market by Domestic Electrification, Ltd., The heating elements are the same as those used in the company's 2 and 3 kW fires. Details of this new line were given in our last issue.*

NEW ZEALAND PUBLIC WORKS DEPARTMENT, March 19th.—Supply of 11 000 V switchgear, for Mangahao power development (section 203). (Reference B.X. 4 953.)

## Tenders Accepted.

WIMBLEDON CORPORATION.—A. Reyrolle and Co., Ltd., alterations to 11 000 V switchgear, £230. (Recommended.)

DARTFORD URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., e.h.t. cable, to be laid in Havelock Road, £777.

METROPOLITAN ASYLUMS BOARD.—Semarks and Co., Ltd., electrical installation at St. Annes Home, £380. (Recommended.)

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—General Electric Co., Ltd., feeder panel, £248; S. Lucey and Co., 14-way feeder panel, £172.

TWICKENHAM URBAN DISTRICT COUNCIL.—Walter's Electrical Engineering Co., Ltd., supply of eight fire alarm posts, £160. Also tendered: G. Longfield, £176.

NEWPORT PAGNELL RURAL DISTRICT COUNCIL.—Northampton Electric Light and Power Co., electric light installation in 14 houses at Newton Longville, £6 per house.

BRIGHTON CORPORATION.—Ferranti, Ltd., two 200 kVA transformers, £277 10s.; A. Reyrolle and Co., Ltd., 300 A 11 000 V switch panel, £329 7s.; Metropolitan-Vickers Electrical Co., Ltd., l.t. switch panel, £505; L. Weekes (Luton), Ltd., street lighting switches, £35 5s.; Croydon Engineering Co., Ltd., earth cones, £2 6s.; George Ellison, l.t. switchboard, £584 15s. (All recommended.)

BRADFORD.—Parmiter, Hope and Sugden, Ltd., unit type switchgear, for Valley Road power station; James Gordon and Co., Ltd., automatic combustion control for two boilers at Valley Road Power Station; F. Draycott, electric light installations of six shops and houses on Eccleshill estate, £11 10s. per house; J. Carter, electric light installations of four houses on the Shirley Manor estate, £12 18s. 11d. per house.

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# ELECTRICITY SUPPLY.

## Proposed New Mains for Coventry—Plant Extensions at Colchester—Truro and Rural Supply—Clyde Valley Tariffs—Assisted Wiring Schemes at Hastings—Irregularities at Gelligaer—The Hammersmith Undertaking.

COVENTRY Electricity Committee is seeking a loan of £22 500 for new mains.

Hemel Hempstead Hospital Board has decided to ask Watford T.C. on what terms the electricity mains could be extended to the hospital.

Croydon Lighting and Electricity Committee proposes to carry out street lighting improvements at a cost of £3 059 10s., and mains extensions to cost £825.

Penybont R.D.C. has agreed to the erection by Bridgend U.D.C. of an overhead cable over the roads in the Penybont district to supply electricity to Porthcawl.

Gravesend T.C. has decided to apply for a Fringe Order in order to supply electricity to Higham, owing to the Kent Electric Power Co. being unable to supply current.

Bangor T.C. has decided that application be made for sanction to a loan of £1 500 to cover expenditure upon converting the whole of the street lamps from gas to electricity.

Colchester Corporation has decided to apply to the Commissioners for consent to the installation at the generating station of a 4 500 kVA 6 600 V turbo-alternator and auxiliary plant.

East Ashford (Kent) R.D.C. has consented to an application by the U.D.C. for an Order to supply electricity to Wye, Hinxhill, Eastwell, Boughton Aluph, Brook, Sevington and Mersham.

In consequence of the refusal of Truro Corporation to permit the Cornwall Electric Power Co. to erect wooden poles, the company is referring the matter to the Ministry of Transport, and extension to outlying areas is held up.

With a view to improving the lighting on the Grand Parade, Tynemouth T.C. has authorised the provision of 17 lamps at intervals of 70 yards, at a cost of about £450. The additional lighting is to be on the east side of the Grand Parade only.

Gillingham (Kent) T.C. has applied for a loan of £3 000 for cables, switch-house and switchgear in connection with the supply to Rainham, Wigmore and Hempstead, for which electricity will be supplied in bulk by the Kent Electric Power Co.

The Clyde Valley Electrical Power Co. has decided that any consumers who are averse to being charged under the new rental tariff for electricity consumed shall have the option of continuing to take their supplies under the terms of their old contracts.

Hastings Electricity Committee has obtained sanction for loans of £10 000 for hire purchase house wiring installations; £1 000 for purchase of land and works adjoining Bromsgrove generating station; £17 997 for mains, and £1 670 for station equipment and kiosks.

Bedford Electricity Committee has authorised mains extensions at a cost of £900.—The Committee recommends that, in order to meet increased demands by Cryselco, Ltd., a three-phase main be laid from the generating station to the company's works, at an estimated cost of £2 900.

Hazel Grove and Bramhall U.D.C. has instructed the Electricity Manager to prepare schemes for the conversion of public lamps from gas to electricity in London Road and Offerton Lane, and to prepare alternative schemes for lighting Bramhall Lane electrically by means of overhead lines.

As a result of the recent Ministry of Transport inquiry into the proposal to erect overhead cables at Rhyl, the Minister has informed the U.D.C. and the promoting company that he withholds his consent to the greater part of the scheme, but accedes to the application with regard to a small portion of the area.

Carlisle Electricity Committee seeks sanction for the provision of two additional trunk feeder equipments, £1 300; cubicle equipment for trunk feeder, £650, and emergency access ladder, £88, at Willow Holme station; rotary converter and switchgear, £5 242, mains, h.t. feeders, at James Street station, and trunk feeder between the two stations, £2 150.

It was reported to Gelligaer U.D.C. last week that the Council's electricity consumers were tampering with the fuses in their homes, and that when fuses blew they were replaced by pins, nails and other unsuitable materials. The electrical engineer, Mr. H. McNaul, also stated that people extended their installations without notifying the department.

The St. James's and Pall Mall Electric Light Co. intends to dispense, as far as possible, with brick boxes, in laying the new system of a.c. mains, and proposes to place over each cable joint either three or four hard electricity tiles, or a ¼-in. steel plate. The company has at present in position on its d.c. system some 2 290 footway boxes and 149 roadway boxes.

Tonbridge U.D.C. has decided to give a supply of electricity to the works of the Crystalate Manufacturing Co., for power and lighting, at a special flat rate of 2d. per kWh, with a minimum of £500 per annum, for five years from January 1st next.—The Council, on December 5th, decided to change over the system from d.c. to a.c., and to apply for a loan of £21 100 for the work.

Mr. J. E. Nelson, managing engineer of the Mersey Power Co., in a recent address to Runcorn Chamber of Commerce, said Runcorn was to be one of the most important places in the country in the national electricity scheme, and when their extensions were completed in a few years' time they would be able to supply electricity for Central England, and as far north as Carlisle if necessary.

At a recent conference of representatives of the East Ham and West Ham Corporations and Barking U.D.C. it was decided to adopt a uniform system of lighting of the East Ham and Barking bye-pass road by electricity; that underground cables be laid in preference to overhead cables; and that lamp columns be placed at approximately 80 yards apart of the north side, so that if additional lighting is deemed necessary later, further lamps can be placed on the south side.

Rotherham Electricity Committee has authorised the Town Clerk and Electrical Engineer to enter into further negotiations with the Yorkshire Electric Power Co. with regard to supply to consumers in the Moorgate and Herringthorpe areas.—The Electricity Committee has appointed a sub-committee to deal with questions in connection with the interchange of electricity between Rotherham and Sheffield.

The Borough Electrical Engineer of Stoke Newington (London) has prepared two alternative schemes, one for extension of plant and the continuation of the present system of conversion, the estimated cost being £54 088; and the other for the building and equipping of a static transformer station and the change of the system of supply from d.c. to a.c., the cost being estimated at £76 170. The Electricity Committee recommends that Mr. A. M. Sillar, be engaged, at a fee of 100 guineas, to advise on the matter.

The "Daily Sketch" and "Sunday Graphic," Ltd., has asked St. Pancras (London) B.C. for terms for a stand-by supply of 400 kW, mainly for power, for the company's works abutting on Gough Street, Gray's Inn Road. The Electrical Engineer has reported that additional mains would be required, at a cost of £8 000 to enable this supply to be given, and the committee proposes that the company should pay a minimum of £2 500 per annum for five years, a further £3 per kW for any demand over 400 kW, and 1d. per kWh.

Hammersmith (London) Electricity Committee proposes to seek sanction for a further expenditure of surplus revenue to the amount of £4 000 (making £15 000 in all) in connection with the scheme for the hire and hire-purchase of electric wiring installations, £3 039 is to be spent on mains extensions, and the provision of additional equipment in existing sub-stations, as well as equipment in new sub-stations to be provided by consumers in new factories in Beavor Lane, and £601 on 0·1 sq. in. h.t. cable to be laid from Becklow Road sub-station to Wendall Road sub-station.

Godstone R.D.C. has declined to consent to the application of East Grinstead U.D.C. for an Order to supply electricty to premises at Felbridge and Baldwin's Hill. The Rural Council has consented to the application of the Sevenoaks and District Electricity Co., which it is stated, covers all the premises referred to in the East Grinstead Council's application, except one house. The U.D.C. considers that the consent of the R.D.C. has been unreasonably withheld, and has asked the consulting electrical engineer to arrange an interview with the Commissioners for the purpose of laying the facts before them.

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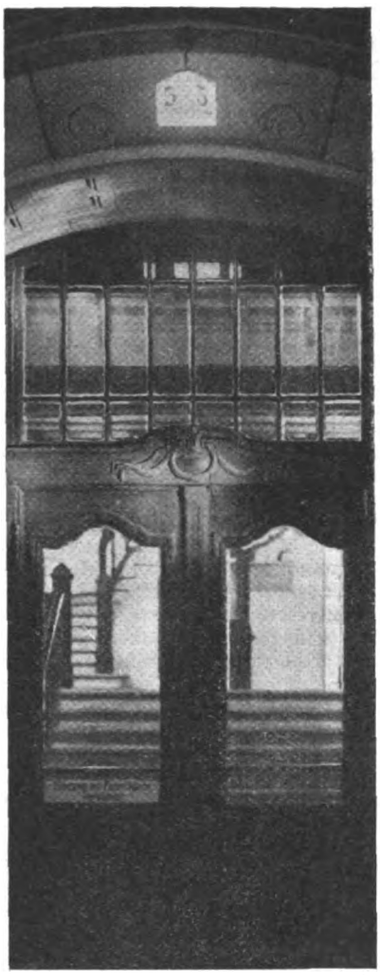
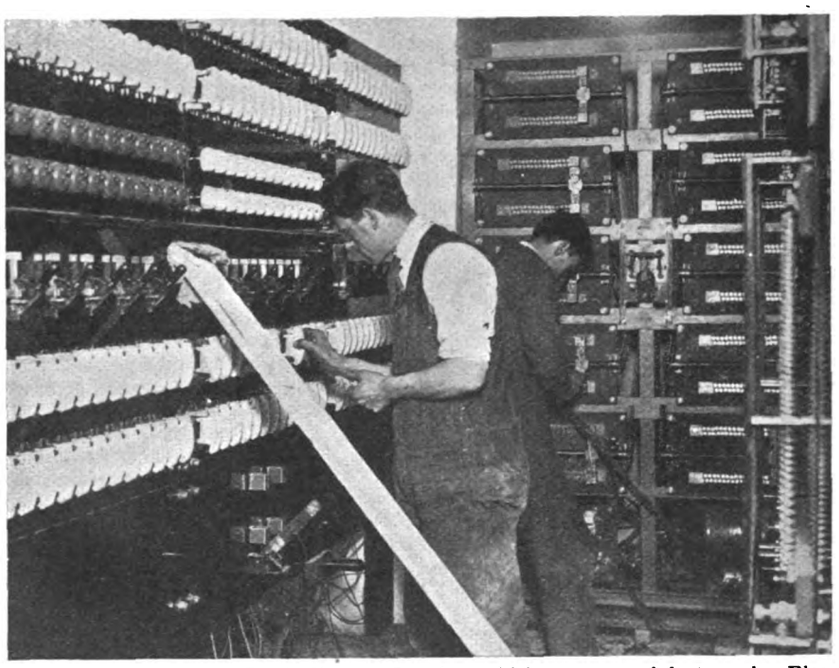
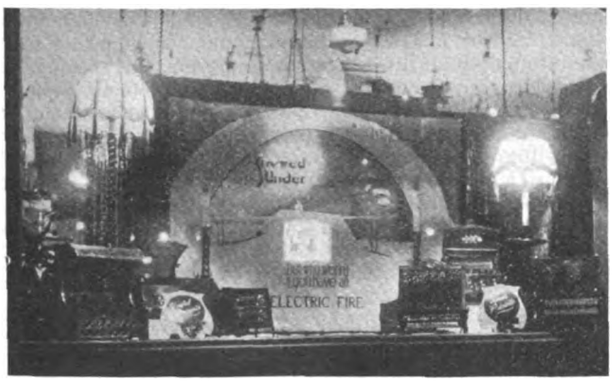
# ELECTRICAL NEWS OF THE WEEK IN PICTURES.



In connection with the remarks made in our last issue with regard to illuminated numbers for private and other dwellings, the above picture shows one of the devices which has been adopted in Berlin.



The switch-room at the Davis Cinema, Croydon, which was opened last week. Electricity is used not only for projection purposes, but also for warming and cleansing the air within the building, colour painting in light, operating colour fountains, and blowing the organ. A large electric kitchen is attached to the cinema, in order to cater for the needs of its patrons. A feature of the building is the general lighting, which has been designed in conformity with "architectural" principles. A special orchestral repeater system has been installed so that a true balance of sound is given throughout the hall, thus enabling the 3 000 odd patrons to hear with comfort, irrespective of seat position. It is stated that over 40 miles of wire were used for the lighting circuits, while some hundreds of spare points and power plugs have been fitted in anticipation of future needs.




Electric fires are the special feature of this window display. The background is an artistic representation of a winter scene, with snow piled up to the roof of a cottage. The colour scheme is black and white, relieved by sunset tints, and the words "Snowed Under" appear in white-tipped letters in the sky. The lighting of the window is controlled by a flasher.

This picture of the filming of a "talkie" shows the important part played by electrical equipment in recording the speech and lighting the set. The camera-operator is housed in a sound-proof box, in order that the clicking of his machine should not be picked up by the microphone, while in order that he may know what is going on, a separate amplifier circuit is provided.

The Engineer has reported to East Ham Electricity Committee that in order to meet the demand for electricity during the winter season 1929–30 it would be necessary to carry out extensions to the generation plant and distribution system as follows: power station extensions and alterations, £7 635; rotary sub-station at Church Road, £15 070; feeder cables, pilot and telphone cables from power station to Chirer Road, etc., £6 865. The Engineer is to obtain tenders for the plant and material.

Stretford Electricity Committee has agreed to supply current to the English Texilose Co., subject to a guaranteed consumption equivalent to £300 per annum for five years.—The Committee has approved the principle of an extra charge of ½d. per kWh being made on the ordinary charge of 4½d. in the case of slot meters.—Specifications are in hand for additional transformers at Ashburton Road and Trafford power station and plans are being prepared for a new sub-station in Trafford Park.

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# ELECTRIC TRACTION.

## Over 200 Tramway Undertakings in Great Britain—Report by Ministry of Transport.

A RETURN issued by the Ministry of Transport shows that during the year 1927 in the case of companies, and the year ended March 31st in the case of local authorities, there were 233 tramway undertakings in Great Britain, of which 167 were owned by local authorities and 66 by companies. The route mileage worked was 2 514, a decrease of 40 miles. Capital expenditure at the end of the period under review amounted to £99 913 760, increase £1 303 255. Gross receipts were £27 751 504, and working expenditure was £21 943 147, leaving net receipts £5 808 357. Passenger journeys were 4 705 842 932, increase 5·51 %, and car miles run 396 554 545, increase 4·70 %. At the end of the period under review trolley vehicle systems owned by local authorities and one owned by a company were in operation, the length of route operated being 111 miles, increase 24 miles. Passengers carried were 80 112 970, increase about 59 %.

The Rothesay Tramways Co. is applying for a Provisional Order to run a Sunday service over its system.

Manchester Tramways Committee is to reconstruct the lines and overhead equipment of the Heywood tramways, at a cost of £19 000.

Darlington General Purposes Committee recommends the substitution of pneumatic for solid tyres on the Corporation's trolley omnibuses.

### A Berlin Amalgamation.

The proposal to amalgamate the Berlin tramways, 'buses and underground railway into one company has, it is understood, been approved by the Budget Committee of the City Parliament.

In view of the satisfactory results of trackless trolley service on the Barming route, Maidstone Transport Committee recommends that trolley vehicles be substituted for electric tramcars on the Loose service.

The Transport Committee of Edinburgh T.C. recommends that 20 more tramcars be equipped with cross-seating accommodation. Already 50 cars have been completed, the cost amounting to £112 per car. The transport manager reports that the transverse seats in the lower saloons have been very popular with the public.

The work of installing twin escalators at Camden Town station on the Hampstead tube railway is progressing rapidly. It is expected that the escalators will be ready for traffic by April next. Camden Town will be the 29th station on the London underground railways to be equipped with escalators. At present there are 70 in service, and 87 more are to be installed at 34 stations.

In connection with the protest lodged by the Glasgow Corporation Tramways Committee against the appointment by the Electricity Commissioners of their chief engineering inspector to hold the inquiry into the application of the Corporation for consent to the installation of a new 18 750 kW alternator at the Pinkston generating station, the Commissioners state that they see no good reason for rescinding the appointment of their chief engineering inspector to hold the inquiry, and they propose to proceed with the inquiry by that official on a new date to be fixed.

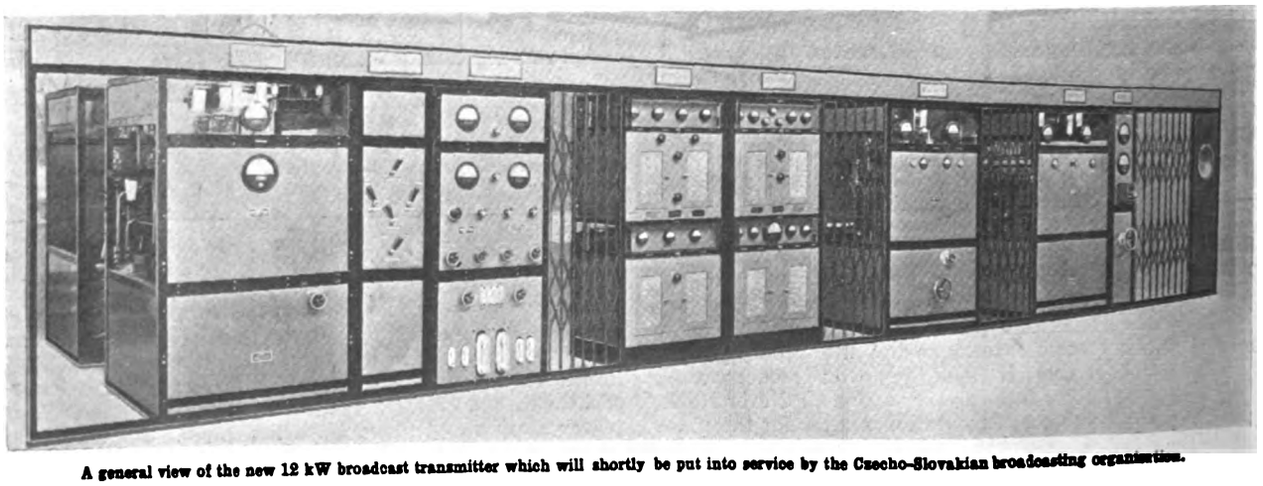
# WIRELESS NOTES.

## New Broadcasting Transmitter for Service in Czecho-Slovakia.

THE Czecho-Slovakian broadcasting organisation is building a chain of five stations to complete the service existing in that country. Of these stations the new high power station shortly to be erected by Marconi's Wireless Telegraph Co., Ltd., at Bratislava will be one of the largest and will be to Czecho-Slovakia what the B.B.C. new high power regional stations are to this country. The transmitter has been constructed on the unit system, in which each circuit is screened. The panels shown in the illustration on this page are, from left to right, rectifiers with the control switchboard; two totally enclosed panels containing the drive unit, isolator unit, the modulated amplifier unit, with modulator unit; the intermediate amplifier and the power amplifier. Access to the transmitter is obtained by means of the safety gates between the panels, power being cut off when the former are opened. In this type of transmitter every attention has been given to constancy of wavelengths; freedom from frequency change of the carrier wave due to modulation; deep modulation without distortion; a straight line frequency characteristic throughout the useful audio range; freedom from harmonic radiation and adjustability to wavelengths within the authorised broadcast band of 200 to 545 metres. The power of this transmitter to the aerial circuit is 12 kW, and it will be erected at Bratislava to replace the small transmitter at present serving the locality. Two rectifying panels are employed, each containing three water-cooled valves which are fed by three single-phase transformers, and the rectifier unit supplies the intermediate and power amplifiers with d.c. at between 8 500 and 10 000 V. The filaments of the valves are heated by step-down transformers from the three-phase supply. The drive unit uses two type D.E.T.1 valves, the anode voltage being provided by a h.t.d.c. motor generator taking current from an accumulator battery which is also used to light the filaments. The drive is inductively coupled to the isolator unit, which in turn is directly coupled to the modulated amplifier by means of a variable tapping on the anode tuning coil. The isolator circuit is neutralised, and the valve is provided with a negative bias which can be so adjusted that no grid current flows.

### The Modulator Amplifier.

The modulator amplifier unit consists of two shielded stages mounted in one framework, and is placed beside the drive circuit. One stage mounts the modulator amplifier with its high frequency circuit, and the other the modulator and sub-modulator together with the speech choke, etc. The high tension supply for the isolator and the modulator amplifier unit is taken from another h.t.d.c. motor generator, the voltage being reduced by resistances where necessary. The modulator is resistance-capacity coupled to the sub-modulator, and the sub-modulator is arranged for resistance capacity coupling to the output line amplifier. The design of this stage is such that full modulation of the modulator amplifier is obtainable before grid current occurs in the modulator valve. The intermediate amplifier unit consists of one water-cooled valve with its oscillatory circuits. The intermediate amplifier is inductively coupled to the power amplifier by means of a tuned circuit.



A general view of the new 12 kW broadcast transmitter which will shortly be put into service by the Czecho-Slovakian broadcasting organisation.

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# COMPANY NEWS.

## Extraordinary Meeting of the Marconi International Company—Other Company Meetings—Reports and Dividends—New Companies Registered.

GREENWOOD AND BATLEY, LTD.—Intm div., 2½% is announced.

QUEBEC POWER CO.—Div. on common shs. of $½ for qrtr. endg. Dec. 31 has been declared.

POWER CORPORATION OF CANADA.—Intm. div. of $1 p. sh. on no par value common stk. paid on Dec. 20.

LISBON ELECTRIC TRAMWAYS, LTD.—Intm. div. 3% net, on acct. of 1928 (same rate as last year), payable on Jan. 1.

PENNSYLVANIA WATER AND POWER CO.—Div. on common shs. of $⅝ p. sh. for qrtr. endg. Dec. 31 will be payable on Jan. 2.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Divs. of 1¾% on pref. stk. and 1% on common stk. will be payable Jan. 2.

MEXICAN ELECTRIC LIGHT CO., LTD.—Coupon No. 47 on 5% 1st mtge. gold bonds payable Jan. 1 at Bank of Montreal, 47, Threadneedle Street, London, E.C.2.

BUENOS AYRES LACROZE LIGHT AND POWER CO., LTD.—First unit at new power house in Buenos Ayres has been operatg. for commercial load since Nov. 30.

MEXICAN LIGHT AND POWER CO., LTD.—A half year's interest on the 5 p.c. 2nd mtge. 50 year bds. paid on Dec. 1 at the Bank of Scotland, 30, Bishopsgate, London, E.C.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Qrtrly. div. 1¾% ($1.75 p. sh.) has been declared in respect of fixed div. of 7% p. a. on non-cum. participatg. preference shs.

MANAOS TRAMWAYS AND LIGHT CO., LTD.—Int. at rate of 1¼% on 7% participatg. 1st debs. for year ended April 30, 1928, paid on Dec. 18 at offices of Glyn, Mills, and Co., 67, Lombard Street, London, E.C.3.

MEXICO ELECTRIC TRAMWAYS, LTD.—Coupon No. 61 on 5% 1st charge debs. to bearer payable Jan. 1 by Canadian and General Finance Co., Ltd., 3, London Wall Bldgs., London Wall, London, E.C.2.

COMPANÍA HISPANO-AMERICANA DE ELECTRICIDAD, S.A.—Paymt. made on Dec. 20 to shhldrs. of Ptas. 30 gold on shs. series A, B and C, Ptas. 6 gold on D shs., and Ptas. 3 gold on E shs. on acct. of div. for 1928.

ASSOCIATED GAS AND ELECTRIC CO.—Initial div. on $5 div. series pfd. stk. of $1.25 p. sh. or 2·72/100 of a sh. of class A stk. for each sh. held paid on Dec. 15. The stk. div. is equal to about $5.33 p. sh. p.a., compared with cash div. of $5 p.a

GENERAL COMPANY FOR THE FINANCING OF ELECTRICITY UNDERTAKINGS (AMSTERDAM).—This co. has appointed the following English directors: Messrs. Gerrard Louis d'Abo, Norman Edward Holden, James Henry Gannon and Harcourt Rose.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD.—At a further extraordinary mtg. of the co. and at separate mtgs. of the pref. and dfd. shhldrs. on Dec. 20, the resolutns. changing the name of the co. to "Associated Electrical Industries, Ltd.," and authorisg. the cap. rearrangemts. were confirmed.

BOGOTA TELEPHONE CO., LTD.—Gross rev. for year ended June 30, 1928, £45 944, pft. £20 776, plus £9 202 brt. in. To depreciatn. £5 000. Div. on old ord. shs. 10%, of which 5% was paid on Apl. 5, 1928; int. of 6%, p.a., on new cap., in accordance with terms of issue, absorbed £4 016. Fwd. £6 602.

LAURENTIDE POWER CO.—Two optnl. offers have been made by the Shawinigan Water and Power Co. to the minority shhldrs. of the Laurentide Co.: (*a*) to buy undertakg. and assets of Laurentide Co. for price sufficient to redeem all outstandg. obligatns. (funded debt is $8 157 500) and to pay to all shhldrs. $227.22 p. sh.; or (*b*) to give 1 1/10 sh. of Shawinigan Co.'s common stk., with $151.67½ cash, for each sh. of Laurentide Co.

### Company Meetings.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—At an extraordinary general meeting on December 14th a resolution to ensure that the company shall remain under British control was passed, and it will be submitted to a further meeting on December 31st, for approval. The resolution provides that at no time shall more than 25% of the issued shares be in the hands or under the control of persons not of British nationality.

JOHN SHAW AND SONS, WOLVERHAMPTON, LTD.—Mr. George Terrall, presiding at the meeting on December 11th, said their home trade in tools, particularly in the early part and also through the greater part of the past year, showed a heavy drop in sales. The electrical department, of which they were full of hope, failed to meet their expectations, and the year's trading resulted in a loss. During the five months of this year, the sales were greatly up on the sales for the similar period of the year under review. This was hopeful, and, if they went on as they had started, this department should show a profit. The profit for the year was £11 575, to which was added £35 735 brought forward. The dividend on the preference shares would absorb £6 720, leaving £40 590. The directors recommended a 3% dividend, leaving £34 268 to carry forward.

[*Photo by "Building."*

*AS from yesterday, Thursday, the London office of Johnson and Phillips, Ltd., is to be found at Columbia House, Aldwych, W.C.2, instead of at 12, Union Court, E.C.2.* *See page 744.*

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—Mr. W. Henderson-Cleland, presiding at the general meeting on December 18th, said the year ended August 4th, 1928, showed a profit of £160 937, against £146 900 for the previous year. Depreciation, directors' fees, bank interest and income tax amounted to £50 416, leaving a balance of £110 521, being the net profit for the year, to which was added £34 204 brought forward from the previous year. After providing for the dividend on the cumulative preference shares and the expense of issuing 100 000 preference shares, there was a balance of £111 679 to be dealt with. Dealing with the subsidiary companies, with regard to the Robinhood Engineering Works, Ltd., the sales of K.L.G. plugs continued satisfactory and there was a large increase in the sales of them in foreign countries, in spite of adverse tariffs. They were also recognised throughout the world as the premier plug for use in aircraft. The M.L. Magneto Syndicate, Ltd., had enjoyed an increased demand for its products during the year. These magnetos were fitted to the winning machines in the 24-hours' race at Le Mans, won by Bentleys, the English and French tourist trophy races and various other races at Brooklands and Montehery. Since the reorganisation of the company in 1923 there had been an annual increase in net profit from £23 500 in 1924 to £110 521 this year. Reserves had been built up in the business to the extent of nearly £250 000, including

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the carry forward of £43 000, and this year dividends on both classes of shares were being increased. The board had decided to offer to both the preferred ordinary and deferred ordinary shareholders new shares on such terms as would be beneficial to them. The directors intended to pay an interim dividend on the preferred ordinary shares during the current financial year. At a subsequent extraordinary meeting the shareholders approved the subdivision of 14 000 of the unissued £1 ordinary shares into 1s. deferred ordinary shares, and authorised that 50,000 of the unissued £1 ordinary shares henceforth be 7% non-cumulative preferred ordinary shares of £1 each.

## New Companies.

J. W. RUSSELL, LTD.—Cap., £10 000. To acquire business of electrician and contractor carried on by J. W. Russell at 8, Queen's Road, Watford and elsewhere.

GARDEN BROTHERS, LTD.—Cap., £1 200. Electricians, mechanical engineers, etc. Reg. office: 43, Clarence Drive, Hyndland, Glasgow.

SPOTESIE LUMINOUS SEAT INDICATORS, LTD.—Cap., £180. To acquire patents, brevets d'invention, licences, concessions, etc. Solicitors: McLean and Co., 21, West George Street, Glasgow.

NIVALIGHT (1928), LTD.—Cap., £5 000. Dealers in electric lamps, wireless valves and parts, etc. Reg. office: Poole's Buildings, Mount Pleasant, London, W.C.1.

E.G.W.T. SYNDICATE, LTD.—Cap., £100. To acquire and experiment upon patents; to carry on business of mechanical, electrical and motor engineers, etc. Reg. office: 211, Abbey House, Victoria Street, London, S.W.1.

STRAIGHT LITE REFLECTORS, LTD.—Cap., £1 000. To acquire business of electrical apparatus manufacturer carried on by W. L. Turpie at 65, Camden Road, London, N.W. Reg. office: 9-15, Oxford Street, London, W.1.

ANGLO-ORIENTAL CONCESSIONS, LTD.—Cap., £100. Manufacturers, importers and exporters of electric lamps, and other articles of an electrical nature, etc. Reg. office: Albion House, 59, New Oxford Street, London, W.C.1.

RAINE AND RENOUF, LTD. Cap., £250. To acquire the business carried on at 64, Moorgate, London, E.C., as Rex Supply Co., and to carry on business of electrical, wireless and general engineers, etc. Reg. office: 64, Moorgate, London, E.C.2.

ELTAX (BRITISH), LTD.—Cap., £1 000. Manufacturers of, and dealers in, dry and wet electric batteries, etc., and to acquire from present owners all their right and interest in the trade mark "Eltax." Reg. office: Haydens Place, Portobello Road, Notting-Hill, London, W.11.

WEST CAMBRIAN POWER CO., LTD.—Cap., £10 000. To adopt agreement between J. R. Parkington, M. Porn and T. A. Dunwoody and the company, and to carry on at Fishguard, Pembroke, and elsewhere in Wales the business of suppliers of electrical energy. Reg. office: 72-78, Fleet Street, London, E.C.

ASSOCIATED CONTRACTS, LTD.—Cap., £1 000. To provide clerical assistance and facilities or office accommodation for any company, to carry on the business of electrical and general engineers, etc. Amount borrowed by the directors and at any time outstanding shall not, without sanction of a general meeting, exceed £2 000 000. Reg. office: Astor House, Aldwych, Strand, London, W.C.2.

# COMMERCIAL INFORMATION.

## County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BONAS, Mr. L., 4, Randolph Court, Portsdown Road, W., wireless dealer. £10 2s. 10d. November 7th.

JACKSON, Mr., 21, Thorpe Street, Birmingham, wireless dealer. £18 4s. November 13th.

## Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—allowed by the date of the Summary, but such total may have been reduced.*]

HALCYON WIRELESS CO., LTD. (late HALCYON WIRELESS SUPPLY CO., LTD.), London, W.—Registered November 29th, £10,000 debenture, to Westminster Bank, Ltd.; general charge. *Nil. January 25th, 1927.

WAGNER ELECTRIC SUPPLIES, LTD., London, E.C.—Registered November 26th, £4 500 debentures; general charge, *——. September 28th, 1928.

### Satisfaction.

RADIO SERVICE (LONDON), LTD. Satisfaction registered December 5th, £125, part of amount registered July 27th, 1927.

## London Gazette, etc.

### Bankruptcy Petition.

STEIN (S.) AND SON (Samuel STEIN and Benjamin STEIN), electricians, 30, Warwick Street, Glasgow. A petition for sequestration has been presented at the instance of Lighting Trades, Ltd.

### Companies Winding-up Voluntarily

EASTNOR TRAMWAY TRACTION AND ELECTRICAL CO., LTD. By reason of its liabilities, December 10th. A. J. Adams, National Buildings, St. Mary's Parsonage, Manchester, chartered accountant, appointed as liquidator. Meeting of creditors at the offices of the liquidator at 11.30 a.m. on Friday, December 28th.

BELCO, LTD. By special resolution, November 28th, confirmed December 17th, S. Thompson, Chartered Accountant, 23, Bush Lane, Cannon Street, London, E.C.4, appointed as liquidator. Meeting of creditors at liquidator's office, on Friday, January 4th, at 2.30 p.m. All creditors have been, or will be, paid in full, on verification of their claims.

### Bankruptcy Information.

BROWNHILL, Harold James, 48, Whitehouse Street, Walsall, electrical engineer. Receiving order, December 18, debtor's petition.

PRICE, Frederick, and TARVER, Charles Reekes, 15, Working Street, Cardiff, electrical engineers, trading as FRED PRICE, TARVER AND CO. First meeting, December 31st, 11 a.m., 34, Park Place, Cardiff. Public examination, January 10th, 11.30 a.m., Law Courts, Cardiff.

### Notices of Dividends.

LACEY, Walter Thomas, 10, George Street, Bath, electrica engineer and contractor. First and final dividend, 2s. 4d. per £ payable December 31st, Official Receiver's Office, 26, Baldwin Street Bristol.

SPEKE, Herbert Henry, electrician, 12 to 17, Bilston Street, Wolverhampton. First and final dividend, 5s. 4d. per £, payable January 14, 3, Warwick Passage, Corporation Street, Birmingham.

### Notices of Intended Dividends.

HAMMOND, William Alexander, 31, Middle Street South, Great Driffield, Yorks, wireless dealer. Last day for receiving proofs, January 5th. Trustee, J. E. D. Stickney, 37, Scale Lane, Hull, Official Receiver.

HARTIGAN, James Aloysius, and HARTIGAN, George Joseph Dominick, trading as LONDON FAN AND MOTOR CO., 81, Charlotte Street, Tottenham Court Road, London, W.1, electrical engineers. Last day for receiving proofs, January 4th. Trustee, E. H. Hawkins, 4, Charterhouse Square, London, E.C.1.

HOLMES, Walter Godfrey, 43, Walcot Street, Bath, wireless and electrical engineer. Last day for receiving proofs, December 28th. Trustee, H. Ashton, Official Receiver, 26, Baldwin Street, Bristol.

### Partnership Dissolved.

LONDON AUTOMOBILE ELECTRIC SERVICE (Alexander Eugene NEWTON and Wilfred Ewart COLLINS), automobile electrical engineers, 383, City Road, E.C.1, by mutual consent as from December 3rd, 1928. Debts received and paid by W. E. Collins, who will continue the business.

## Bankruptcy Proceedings.

WISHAW, Bernard Henry, Bakewell Road, Matlock, Derbyshire, electrical wireless engineer. Liabilities of £400 were disclosed in the statement of affairs presented to the first meeting of creditors herein, held recently at the Official Receiver's Offices, 22, Regent Street, Park Row, Nottingham. The debtor attributed his failure to loss of money entrusted to an agent to pay liabilities unaccounted for, and loss of money received by an employee and not accounted for. It appeared that he commenced trading in January, 1926, but in June, 1927, creditors pressed him, and he arranged to pay through an agent liabilities amounting to £202 by monthly instalments. He had paid £179 10s. to the agent, who, he alleged, had failed to pass on the money to the extent of about £100. He also alleged that an employee had failed to account to him for about £50 taken for petrol. The matter was left in the hands of the Official Receiver as trustee.

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# PATENT RECORD.

***The following information is prepared from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent Specifications, when accepted, may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.***

## Specifications Accepted.

301 290 R. KAPP. Grid controls for thermionic electric valves. (29/8/27.)
294 206 GENERAL ELECTRIC CO., LTD. Wire spiralling machines. (20/7/27.)
293 839 H. J. J. M. DE REGNAULT DE BELLESCIZE. Heterodyne radio receiving systems and apparatus for use therein. (13/7/27.)
298 136 DR. S. LOEWE. Multiple thermionic valve for use with apparatus for connections to the mains. (19/7/26.)
271 896 BRITISH THOMSON-HOUSTON CO., LTD. Joint control of the speeds of generating-units in electric supply systems. (28/5/26.)
301 436 J. ROBINSON. Wireless communication. (27/5/27.)
301 437 A. F. SYKES. Electrodynamic loud-speakers. (27/5/27.)
301 364 J. L. BAIRD and BAIRD TELEVISION DEVELOPMENT CO., LTD. Sound transmitting or reproducing apparatus. (28/5/27.)
281 600 SIEMENS-SCHUCKERTWERKE GES. [in liq.]. Electric individual drive for spinning-machines with alternating-current or three-phase current machines. (6/12/26.)
301 438 BRITISH ELECTRIC TRANSFORMER CO., LTD., and A. C. WHISH. Means for regulating the voltage of electrical transformers. (30/6/27.)
301 338 W. ECCLES, J. F. PERRY, J. W. DAVISON, and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Braking of moving devices or apparatus, more particularly winding, hoisting, hauling, and like gear. (18/6/27.)
301 368 W. HOLMES and FERRANTI, LTD. Electric relays. (26/7/27.)
301 404 A. E. WHITE (DOVER MANUFACTURING CO.). Method of forming electric heating-units. (26/7/27.)
301 339 P. C. SACCAGGIO. Propulsion of railway trains or the like by electricity. (27/7/27.)
301 340 H. TINSLEY and D. C. GALL. Methods and means for balancing cables and land-lines. (27/7/27.)
301 525 D. M. SMITH and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Inertia governors. (3/8/27.)
301 408 E. PAROUSSI. Holders for thermionic valves. (26/8/27.)
301 352 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). High-frequency signalling systems. (27/8/27.)
301 353 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). Signalling arrangements, particularly for use in telephone systems. (27/8/27.)
301 354 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). Electrical spark-gap protective devices. (27/8/27.)
301 355 STANDARD TELEPHONES AND CABLES, LTD., and W. T. GIBSON. Electron-discharge devices. (27/8/27.)
301 356 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO., INC.). Means for reducing interference such as cross-talk in electric signal transmission systems. (27/8/27.)
301 411 A. REYROLLE AND CO., LTD., C. C. GALLOP, and G. H. GARDNER. Electric protective systems. (20/8/27.)
301 412 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Electric discharge tubes. (29/8/27.)
301 441 L. H. PADDLE. Microphones. (30/8/27.)
292 454 SIEMENS UND HALSKE AKT.-GES. Means for measuring electric tensions in electric transmission systems. (18/6/27.)
301 445 SIEMENS BROS. AND CO., LTD., and S. H. LONG. Electric signal receiving apparatus. (31/8/27.)
301 446 J. ANDERSON. Apparatus for coiling cables and the like. (31/8/27.)
301 535 BELLING AND LEE, LTD., and E. M. LEE. Electric terminals. (1/9/27.)
301 537 GENERAL ELECTRIC CO., LTD., and C. G. EDEN. Electric-lighting fittings. (1/9/27.)
301 557 BARR AND STROUD, LTD., and J. W. FRENCH. Apparatus for the electrical transmission of data over comparatively long distances. (6/9/27.)
301 558 BRITISH THOMSON-HOUSTON CO., LTD., J. G. WELLINGS, and C. G. MAYO. Electric transformers. (6/9/27.)
301 569 BRITISH THOMSON-HOUSTON CO., LTD., and J. C. READ. Transformer connection, particularly for rectifier service. (7/9/27.)
288 561 A. LEDERER. Manufacture of electron-emitting bodies. (12/4/27.)
301 576 GENERAL ELECTRIC CO., LTD., and J. STANLEY. Oscillating electric fans. (19/9/27.)
301 586 IGRANIC ELECTRIC CO., LTD., A. H. CURTIS, and W. M. HOLBEACH. Electrical condensers. (24/9/27.)
278 750 ARCTURUS RADIO CO. Vacuum tubes. (8/10/26.)
301 597 SIEMENS BROS. AND CO., LTD., and D. A. CHRISTIAN. Telephone and signalling systems. (12/10/27.)
301 600 W. AND T. AVERY, LTD., and J. W. TAYLOR. Dashpots employing liquid as a damping-medium. (15/8/27.)
301 601 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Contact plugs. (15/10/27.)
279 444 BRITISH THOMSON-HOUSTON CO., LTD. Electron-discharge devices. (20/10/26.)
301 606 C. R. MORTON, N. D. G. ROBERTSON, and L. SMITH (trading as WAYNE ELECTRICAL CO.). Spring reel for automatically winding-up electric conductors. (21/10/27.)
301 609 SIEMENS BROS. AND CO., LTD., and W. G. PATTERSON. Circuit arrangements for preselectors of automatic telephone systems. (24/10/27.)
301 617 E. NUTTALL. Means of heating liquids or fluids by electricity and electrical resistance heaters. (1/10/27.)
301 621 GENERAL ELECTRIC CO., LTD., and F. G. QUANCE. Electric coupling-elements. (3/11/27.)
301 638 S. G. BROWN. Loud speakers. (24/11/27.)
301 642 C. T. SCARP and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electrical control gear for the alternate forward and reverse operation of electric motors. (26/11/27.)
287 498 SIEMENS UND HALSKE AKT.-GES. Means for indicating the position of electric switches. (22/3/27.)
301 654 K. YOUNGHUSBAND and J. SUMMERS AND SONS, LTD. Controlling electro-magnets for lifting and transporting, and apparatus therefor. (19/12/27.)
301 656 SIEMENS BROS. AND CO., LTD., and G. F. DUTTON. Electrode for a microphone. (22/12/27.)
283 521 O. JACOBSON and A. O. GYLLING. Circuit-breakers and similar switch apparatus for electric power current lines. (1/12/27.)
301 658 W. AUS DEN RUTHEN. Suspension apparatus for electric lamps or the like flex-suspended electric devices. (29/12/27.)
301 660 ALLOY WELDING PROCESSES, LTD., E. H. JONES, and E. J. CLARKE. Electric arc welding, cutting, or soldering. (2/1/28.)
310 663 SIEMENS BROS. AND CO., LTD., and E. A. LAIDLAW. Impulse transmitters for telephone and like systems. (9/1/28.)
301 674 W. ELLIOTT. Electric heaters for radiators of motor-vehicle engines. (3/2/28.)
284 714 BRITISH THOMSON-HOUSTON CO., LTD. Electric arc-welding. (5/2/27.)
289 421 R. FRISTER AKT.-GES. Heating-elements for electric radiators. (27/4/27.)
287 922 LANDIS AND GYR SOC. ANON. Electric switch. (30/3/27.)
286 690 SOC. C. SCHNEIDER ET CIE. Electrical contacts. (9/3/27.)
288 296 INTERNATIONAL GENERAL ELECTRIC CO., INC. Polyphase electric transformers. (7/4/27.)
289 050 SIEMENS UND HALSKE AKT.-GES. Arrangement for the automatic control of the efficiency of transmitting systems, particularly for high-frequency transmitting systems. (21/4/27.)
298 463 SIEMENS UND HALSKE AKT.-GES. Arrangement for the automatic regulation of the efficiency of high frequency transmission systems. (8/10/27.)
289 775 G. MOMBUR. Electric watches or clocks. (30/4/27.)
289 440 GENERAL ELECTRIC CO., LTD. Protection from oxidation of caps consisting of brass or similar alloys such as bronze, for electric incandescent lamps and the like. (27/4/27.)
289 852 AKT.-GES. BROWN, BOVERI, ET CIE. Means for protecting the inducing winding of a synchronous machine against an earth connection. (4/5/27.)
291 092 BRITISH THOMSON-HOUSTON CO., LTD. Means for indicating at a distance electrically. (26/4/27.)
290 577 INTERNATIONAL GENERAL ELECTRIC CO., INC. Incandescent electric lamp holders. (14/5/27.)
290 589 KABELFABRIK AKT.-GES. Process and apparatus for the production of ropes and cable armourings. (14/5/27.)
301 709 J. A. KLOKS. Incandescent gas-filled lamps and the method of manufacturing same. (26/4/28.)
291 404 BRITISH THOMSON-HOUSTON CO., LTD. Systems of electric distribution. (1/6/27.)
292 163 BRITISH THOMSON-HOUSTON CO., LTD. Vapour-electric rectifiers. (16/6/27.)
292 173 INTERNATIONAL GENERAL ELECTRIC CO., INC. Measurement of alternating current voltages. (16/6/27.)
293 304 I. SILBERSTEIN. Manufacture of electric resistances. (2/7/27.)
293 459 BRITISH THOMSON-HOUSTON CO., LTD. Means for indicating at a distance electrically. (7/7/27.)
293 393 BRITISH THOMSON-HOUSTON CO., LTD. Electric switches. (5/7/27.)
297 036 BRITISH THOMSON-HOUSTON CO., LTD. Alternating-current rectifying systems. (12/9/27.)
301 719 H. E. POTTS (H. PLAUSON). Cathode ray tubes. (29/2/28.)
301 414 G. M. WRIGHT and S. B. SMITH. Picture and the like telegraphy. (27/7/27.)
301 447 A. REYROLLE AND CO., LTD., C. G. GALLOP, and G. H. GARDNER. Electric protective systems. (29/8/27.)
301 362 G. M. WRIGHT and S. B. SMITH. Picture and the like telegraphy. (27/7/27.)
301 847 J. L. BAIRD and BAIRD TELEVISION DEVELOPMENT CO., LTD. Means for driving television or other apparatus at a predetermined speed. (7/6/27.)
301 939 O. MUCK. System of selective remote control by superimposing alternating currents on linked light and power mains. (4/7/27.)
301 771 SIR C. A. PARSONS and J. ROSEN. Ventilation of dynamo-electric machinery, transformers and the like. (5/7/27.)
301 848 GENERAL ELECTRIC CO., LTD., and M. KAHN. Alternating-current dynamo-electric machines. (7/7/27.)
277 315 BRITISH THOMSON-HOUSTON CO., LTD. Governing-mechanism for elastic-fluid turbines. (13/9/26.)
301 763 S. G. S. DICKER (N. V. PHILIPS' GLOEILAMPENFABRIEKEN). Circuit arrangements for the operation of electric discharge tubes with direct current. (29/8/27.)
301 767 BRITISH THOMSON-HOUSTON CO., LTD., and J. C. READ, Transformer connections, for example, for rectifiers. (2/9/27.)
301 814 BIRMINGHAM ELECTRIC FURNACES, LTD., and A. G. LOBLEY. Control of the load factor in electrical current supply systems to factory and similar installations, including electrical resistance furnaces. (3/9/27.)
279 045 AKT.-GES. BROWN, BOVERI ET CIE. Metallic-vapour rectifiers for alternating currents. (18/10/26.)
301 784 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and P. N. ROSEBY. Magnet cores. (5/9/27.)
301 785 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and J. E. OSTLINE. Telephone systems. (5/9/27.)
301 948 BRITISH THOMSON-HOUSTON CO., LTD., H. TRENCHAM, and H. S. PETCH. Electric protective devices. (6/9/27.)
277 650 SIEMENS UND HALSKE AKT.-GES. Valve rectifying and amplifying arrangements. (17/9/26.)
277 347 C. H. F. MULLER AKT.-GES. Cathode-ray tubes. (7/9/26.)
277 350 SIEMENS-SCHUCKERTWERKE AKT.-GES. Arrangements for switching off an inductive resistance mounted in a direct-current circuit. (11/9/26.)
301 953 J. STONE AND CO., LTD., and A. E. HONEY. Automatic regulation of dynamo-electric machines. (8/9/27.)
301 954 E. F. NORTHRUP. Electric induction furnaces. (8/9/27.)
301 960 STERLING TELEPHONE AND ELECTRIC CO., LTD., N. BLADES and J. R. BEARD. Loud-speaking telephones and the like. (10/9/27.)
301 977 GENERAL ELECTRIC CO., LTD., and H. G. MCCLEAN. Electric motor control systems. (21/9/27.)
301 979 SIEMENS BROS. AND CO., LTD., and W. E. GOODWIN. Insulating panels. (21/9/27.)
301 980 DUBILIER CONDENSER CO. (1925), LTD. (W. DUBILIER). Electrical condenser units. (22/9/27.)

## Applications for Patents.

### November 17th.

33 750 J. E. GRANT and MORGAN CRUCIBLE CO., LTD. Brushes for dynamo-electric machines.
33 751 P. ST. J. HEATON. Controlling illumination of light sensitive bridges.
33 744 J. MCCALLUM. Insulation of electric cables, etc.
33 808 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Power plant.
33 810 METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and E. Y. ROBINSON. Vacuum electric tube devices.
33 764 M.P.A. WIRELESS, LTD., and H. C. H. SMYTH. Bobbin winding machines.
33 765 M.P.A. WIRELESS, LTD., and H. C. H. SMYTH. Reproduction of sound.
33 751 RADIOVISOR PARENT, LTD. Controlling illumination for light sensitive bridges.

### November 19th.

33 921 AKT.-GES. BROWN, BOVERI ET CIE. Indirect electric regulating devices. (3/3/28, Austria.)
33 866 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and H. H. HARRISON. Control of synchronous motors for telegraph systems.
33 908 H. H. BERRY. Signs.
33 899 BRITISH THOMSON-HOUSTON CO., LTD. Electrically-wound clocks. (18/11/27 U.S.)
33 888 D. A. CHRISTIAN and SIEMENS BROS. AND CO., LTD. Telephone systems.
33 845 S. O. COWPER-COLES. Electro-deposition of silver alloys.
33 905 H. B. DRESSER. Electric iron.
33 889 H. DUTILH. Electrical measuring means, etc.
33 924 FELTEN AND GUILLEAUME CARLSWERK AKT.-GES. Electric cables. (19/11/27, Germany.)
33 910 H. GEFFCKEN. Photo-electric cells.
33 935, 33,939 J. L. GOTTLIEB AND CO., LTD., and E. V. KAYLEY. Radio apparatus.
33 882 F. L. LUCAS. Electric switches.
33 909 E. J. MARRIOTT. Microphones, etc.
33 851 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electric circuit interrupters. (17/11/27, U.S.)
33 852 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Manufacture of insulated plates of magnetic material. (19/11/27, U.S.)
33 853 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Provision of insulated coatings on alloys. (19/11/27, U.S.)
33 854 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. (WESTINGHOUSE ELECTRIC AND MANUFACTURING CO.) Control systems for elevators, etc.
33 943 J. E. POLLAK (ASSOCIATED TELEPHONE AND TELEGRAPH CO.). Telephone systems.
33 911 FIRM OF O. PRESSLER. Photo-electric cells. (17/11/27, Germany.)
33 910 H. RICHTER. Photo-electric cells.
33 835 H. C. SANDERS and SANTON, LTD. Electric liquid heaters.
33 890 SIEMENS-SCHUCKERT A.G. Electric cables. (17/1/28, Germany.)
33 872 T. E. SLAUGHTER. Magnetic pick-up devices.
33 868 F. WOOD. Inductance coils, etc.
33 894 H. ZSCHOCKE. Apparatus for cleaning electrodes in electrical gas-purifying plants.

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### November 20th.

34 040 Allmanna Svenska Elektriska Aktiebolaget and L. A. Dreyfus. Damper windings for synchronous converters.
34 016 J. P. Annacker. Glands for metal-sheathed cables.
34 011 C. H. Archer and Automatic Telephone Manufacturing Co., Ltd. Electric heating apparatus.
33 970, 33 971 G. J. Blake and G. D. G. Leadbetter. Mercury vapour arc lamps.
34 017 W. A. Burns. Low frequency amplification for wireless signalling.
33 973 A. Chadwick and Veritys, Ltd. Dynamo-electric machines.
34 030 English Electric Co., Ltd., and F. Morris. Bow trolley for electric vehicles, etc.
34 028 E. D. Feldman. Electric motors.
33 959 Ferranti, Ltd., and V. Z. de Ferranti. Lightning absorbers, etc.
34 018 General Electric Co., Ltd., W. R. Pitkin, and C. J. Smithells. Manufacture of drawn wire from refractory metals.
34 093 P. L. Harlow and Metropolitan-Vickers Electrical Co., Ltd. Starting apparatus for induction motors.
34 057 O. Y. Imray (I.G. Farbenindustrie A.G.). Accumulator plates.
34 052 B. H. Peter and Westinghouse Brake and Saxby Signal Co., Ltd. Railway signalling apparatus.
34 063 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Electro-medical apparatus. (13/6/28, Germany.)
34 064 Siemens-Reiniger-Veifa Ges. fur Medizinische Technik. Apparatus for generating Röntgenr ays. (26/6/28, Germany.)
34 058 Siemens-Schuckertwerke A.G. Electric cables. (27/8/28, Germany).

### November 21st.

34 182 W. A. Burns. Controls for wireless receivers.
34 260 Car and General Patents Co., Ltd., and A. Wood. Electric heating apparatus.
34 261 Car and General Patents Co., Ltd., and A. Wood. Display signs.
34 118 A. Crawford, F. H. Reeves, and Reevo Electric Co. Ltd. Electric fuse.
34 190 C. E. Cruttwell. Containers containing electrically-fusible elements.
34 281 S. G. S. Dicker (N.V. Philips' Electriciteits Maatschappij Electrostoom). Means for joining electrical conductors.
34 272 Electroacustic Ges. Apparatus for emission, etc., of signals by acoustic frequency oscillations. (23/11/27, Germany.)
34 254 V. H. Gilbert and A. H. Johnson. Mercury switches.
34 273 L. L. de Kramolin. Radio receiving apparatus. (1/12/27, Germany.)
34 234 Longsign Corporation. Electric signs. (21/11/27, U.S.)
34 217 Metropolitan-Vickers Electrical Co., Ltd. Control system for elevators, etc. (23/11/27, U.S.)
34 218 Metropolitan-Vickers Electrical Co., Ltd. and E. Y. Robinson. Vacuum electric tube devices.
34 191 C. H. Nunn. Transformers.
34 283 J. E. Pollak (Associated Telephone and Telegraph Co.). Telephone systems.
34 254 Radiovisor Parent, Ltd. Mercury switches.
34 265 Siemens-Schuckertwerke A.G. Current collecting brushes. (25/11/27, Germany.)
34 280 Soc. Anon. des Etablissements Ducellier. Brush holders for dynamos, etc. (28/11/28, France.)
34 268 Wild-Barfield Electric Furnaces, Ltd. and L. W. Wild. Electric furnaces.
34 235 A. E. White (Abingdon Engineering Co., Inc.). Machines for wrapping bobbin electrodes.

### November 22nd.

34 452 Associated Telephone and Telegraph Co. Automatic switches for telephone systems. (12/12/27, U.S.)
34 295 B. Bell and W. H. Illingworth. Circuit breakers.
31 314 R. L. Brinton. Appliance for charging motor car batteries.
34 433 British Thomson-Houston Co., Ltd. and J. H. Warburton. Devices for protecting persons from radiations of an electric arc.
34 436 British Thomson-Houston Co., Ltd. Electron discharge apparatus. (14/12/27, U.S.)
34 346 G. H. and H. F. Collins. Electric connectors, etc.
34 385 F. Conrad. Electric clocks. (17/3/27, U.S.)
31 418 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Thermionic push-off amplifiers.
34 419 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Frequency multiplying means.
34 420 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Circuit arrangements for controlling temperature.
34 404 W. Fluchter. Protective apparatus for electric motors. (23/11/27, Germany.)
34 438, 34 439, 34 440 W. P. Grafton and W. Grafton and Son, Ltd. Adjustable arms for telephones, etc.
34 399 H. R. Hayden. Electric signalling systems.
34 380 O. Y. Imray (I.G. Farbenindustrie A.G.). Accumulators.
34 448 F. Matti. Electrical timepieces. (23/11/27, Switzerland).
34 437 Siemens-Schuckertwerke A.G. Gas-proof housing for electrical apparatus. (8/12/27, Germany.)
34 355 T. S. Skillman and Standard Telephones and Cables, etc. Circuit arrangements for a.c. relays.
34 353 C. H. and R. T. Smith. Wireless direction finding systems.
34 373 Telefunken Ges. fur Drahtlose Telegraphie. Thermionic valves, etc. (6/12/27, Germany.)

### November 23rd.

34 575 J. Anderson and G. Ellison. Electrical means for lowering loads.
34 535 H. H. Berry. Electric fires, etc.
34 546 British Electric Reproduction Co., Ltd. and A. J. Rowe. Thermionic valve amplifiers.
34 530, 34 531 British Thomson-Houston Co., Ltd. Wire feeding mechanism for welding machines. (23/11/27, U.S.)
34 532 British Thomson-Houston Co., Ltd. Control systems for arc welding machines. (23/11/27, U.S.)
34 587 Burovox, Ltd. Telephone receivers, etc.
34 553 F. Z. Chalmers. Control of electric lighting systems.
34 526 M. Charles. Adjustable sockets for electric lamps. (25/11/27, France.)
34 569 V. C. From, A. W. Larsky and C. D. Rowley. Electric lamps.
34 571 V. C. From, A. W. Larsky and C. D. Rowley. Illuminated signs, etc.
34 547 H. A. Gaydon. Means for mounting electrical pick-ups, etc.
34 533 K. A. Hawley. Electric insulators. (23/11/27, U.S.)
34 519 Metallges Akt. Ges. and J. Zagorski. High tension conductors.
34 573 Metropolitan Vickers Electrical Co., Ltd. Control system for electric motors. (30/11/27, U.S.)
34 562 S. Prisner and E. Wender. Electric discharge lamps.
34 536 S. Ruben. Electric condenser. (15/5/28, U.S.)
34 529 A. Wolf. Railway signalling systems.

### November 24th.

34 658 C. D. Barklie. Electrical resistances, etc.
34 621 J. J. Cannon. Electric signalling apparatus.
34 642 E. Dobson and Foster Engineering Co., Ltd. Electrical fuses, etc.
34 606 W. J. Elkins. Means for detachably coupling electrodes of batteries.
34 671 B. D. Field, T. C. Standbrook and Stanfield Radio Co., Ltd. Electric buzzers, etc.
34 675 V. C. From and C. J. M. Thornhill. Apparatus for reception of signals, etc.
34 676 V. C. From and C. J. M. Thornhill. Apparatus for transmission of signals, etc.
34 677 J. F. Macfarlane and Rotax (Motor Accessories), Ltd. Dynamos.
34 622 G. H. Neep and Switchgear and Cowans, Ltd. Load-equalising devices for electric generators, etc.

### November 26th.

34 807 C. E. G. Bailey and Gramophone Co., Ltd. Thermionic valve rectifiers.
34 800 British Thomson-Houston Co., Ltd. Vibration recording apparatus. (28/11/27, U.S.)
34 850 British Thomson-Houston Co., Ltd. Regulating systems. (26/11/27, U.S.)
34 810 C. O. Browne. Apparatus embodying electric discharge lamps.
34 719 O. Caron. Burglar alarms. (24/11/27, France.)
34 793 D. R. Davies. Electrical switchgear.
34 779 De Forest Phonofilms, Ltd. Photographically recording sound pictures. (3/12/27, U.S.)
34 758 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Aerials for transmitting wireless signals. (3/12/27, U.S.)
34 759 S. G. S. Dicker (N. V. Philips' Gloeilampenfabrieken). Transformers.
34 811 F. Ehrenhaft. Electrical discharge tubes.
34 789 B. B. Fenn. Incandescent lamps.
34 742 General Electric Co., Ltd. Manufacture of incandescent lamps, etc. (28/11/27, Germany.)
34 808 Gramophone Co., Ltd., and A. Whitaker. Electric glow discharge devices.
34 810 Gramophone Co., Ltd. Apparatus embodying glow discharge lamps.
34 720 S. Hermont. Bayonet cap for filament lamps. (26/11/27, France.)
34 801 A. Just. Cathodes for electron discharge devices. (30/7/28, Austria.)
34 750 J. T. Lucas. Electric switch indicators.
34 783 Marconi's Wireless Telegraph Co., Ltd. Picture, etc., telegraph apparatus. (25/11/27, U.S.)
34 790, 34 791, 34 792 Metropolitan-Vickers Electrical Co., Ltd. Vacuum electric tube devices.
34 793 Metropolitan-Vickers Electrical Co., Ltd. Electric switchgear.
34 708 E. B. Moullin. Electric condensers and inductances.
34 726, 34 727 F. J. Pearce, G. H. Scholes and G. H. Scholes and Co., Ltd. Electrical plug and socket couplings, etc.
34 849 L. Poulsen and Co. Reflection arrangements for incandescent lamps. (24/11/27, Denmark.)
34 698 Rees Roturbo Manufacturing Co., Ltd., and W. A. Stevens. Means for control for engines and electric power transmission.
34 723 A. J. Rhodes. Electrically-heated bakers' ovens.
34 724 A. J. Rhodes. Electric heating elements.
34 841 T. A. W. Robinson. Tuning devices for radio apparatus.
34 770 Soc. Anon. Le Carbone. Connections for electric resistances. (20/1/28, France.)
34 736 Telefunken Ges. fur Drahtlose Telegraphie. High frequency telephone systems. (26/11/27, Germany.)
34 782 Telefunken Ges. fur Drahtlose Telegraphie. Radio transmitters. (24/11/27, Germany.)
34 844 Tilling-Stevens Motors, Ltd., and H. K. Whitehorn. Electric braking and control of vehicles.

### November 27th.

34 920 A. Allen and A. Reyrolle and Co., Ltd. Electric switches.
34 954 R. Brooks. Motor control systems.
34 984 H. C. Channon, H. J. Garnett and W. S. Smith. Electric cables. (5/6/28.)
34 852 H. E. Dicks. Electric welding and burning apparatus, etc.
34 928 Dictograph Telephones, Ltd., and G. A. V. Swettenham. Telephone apparatus.
34 925 J. Dorn. Magnetic reproducing instruments.
34 988 Electrical Research Products, Inc. Apparatus for electrical transmission of sound. (14/2/27, U.S.)
34 974 Felten und Guilleaume Carlswerk A.G. Electric cables. (12/1/28, Germany.)
34 953 C. Filmer. Motor control systems.
34 929 J. Harden. Electric furnaces. (14/12/27, Sweden.)
34 918 H. W. and L. A. Hubbard. Remote control of wireless sets.
34 939 International General Electric Co., Inc. Centrifugal compressors. (30/11/27, Germany.)
34 998 L. Lipson. Cable stripping machine.
34 904 Lodge-Cottrell, Ltd. (Metallges A.G.). Cleaning electrodes of electrical gas cleaning apparatus.
34 895 J. C. and W. A. Macfarlane. Dynamo electric machines.
34 905 Sir G. C. Marks (Radio Frequency Laboratories, Inc.). Demodulator, and method of demodulation.
34 953, 34 954 Metropolitan-Vickers Electrical Co., Ltd., and L. Miller. Motor control systems.
34 931 N. V. Philips' Gloeilampenfabrieken. Vapour pumps. (9/12/27, Holland).
34 911 D. Roberts. Protection for electric terminals.
34 976 A. and L. Seguin. Plug and socket couplings. (2/12/27, France.)
34 928 G. A. V. Swettenham. Telephone apparatus.
34 944 Telefonaktiebolaget L. M. Ericsson. Impulse senders. (29/11/27, Sweden.)
34 989 V. Vologden. Electric rectifying arrangements.
34 971 Waygood-Otis, Ltd. Motor control system. (3/12/27, U.S.)

### November 28th.

35 109 Associated Telephone and Telegraph Co. Electric signalling system. (28/11/27, U.S.)
35 010 W. L. Ball. Electric switch and fuse.
35 044 Benjamin Electric, Ltd., and G. Campbell. Shade holders, etc.
35 070 British-Thomson Houston Co., Ltd. Thermo-responsive devices. (29/11/27, U.S.)
35 081 R. E. H. Carpenter. Electron discharge amplifying apparatus.
35 114 A. E. Chapman and J. Vielle. Photoelectric recording and reproduction of sound.
35 094 Cie Pour la Fabrication des Compteurs et Material d'Usines a Gaz A. Iliovici. Electric meters, etc. (28/11/27, France.)
35 060 Constant Potential Transformer Syndicate. Means of power production.
35 054 H. Hastings. Apparatus for controlling electrical circuits.
35 055 R. T. Medcalfe. Electric switches.
35 089 Metropolitan-Vickers Electrical Co., Ltd., and H. K. Ramsden. Electric circuit interruptors.
35 065 M. P. Otto. Electric water sterilising apparatus.
35 111 R. S. Portham. Thermostatic control devices for cooling systems of internal combustion engines.
35 040 A. R. A. Rendall, E. K. Sanderman, and Standard Telephones and Cables, Ltd. Phase compensation for electric wave transmission.
35 078 Siemens and Halske A.G. Circuit arrangements for signalling systems, etc. (6/12/27, Germany.)
35 085 Telefunken Ges. fur Drahtlose Telegraphie. High frequency arrangements, etc. (29/12/27, Germany.)
35 015 Telefunken Ges. fur Drahtlose Telegraphie. Television apparatus. (12/12/27, Germany.)
35 041 E. P. G. Wright. Automatic telephone exchange systems.

### November 29th.

35 137 Albion Clay Co., Ltd., and R. Lawton. Electrical conduits, and manufacture of same.
35 257 British Thomson-Houston Co., Ltd. Electric switch face plates. (29/11/27, U.S.)
35 259 British Thomson-Houston Co., Ltd. Wire feeding mechanism for arc welding machines. (29/11/27, U.S.)
35 216 Sir A. W. Brown. Protection of aerial conductors.
35 242 Elin Akt.-Ges. fur Elektrische Industrie. Electric welding burner. (30/11/27, Austria.)

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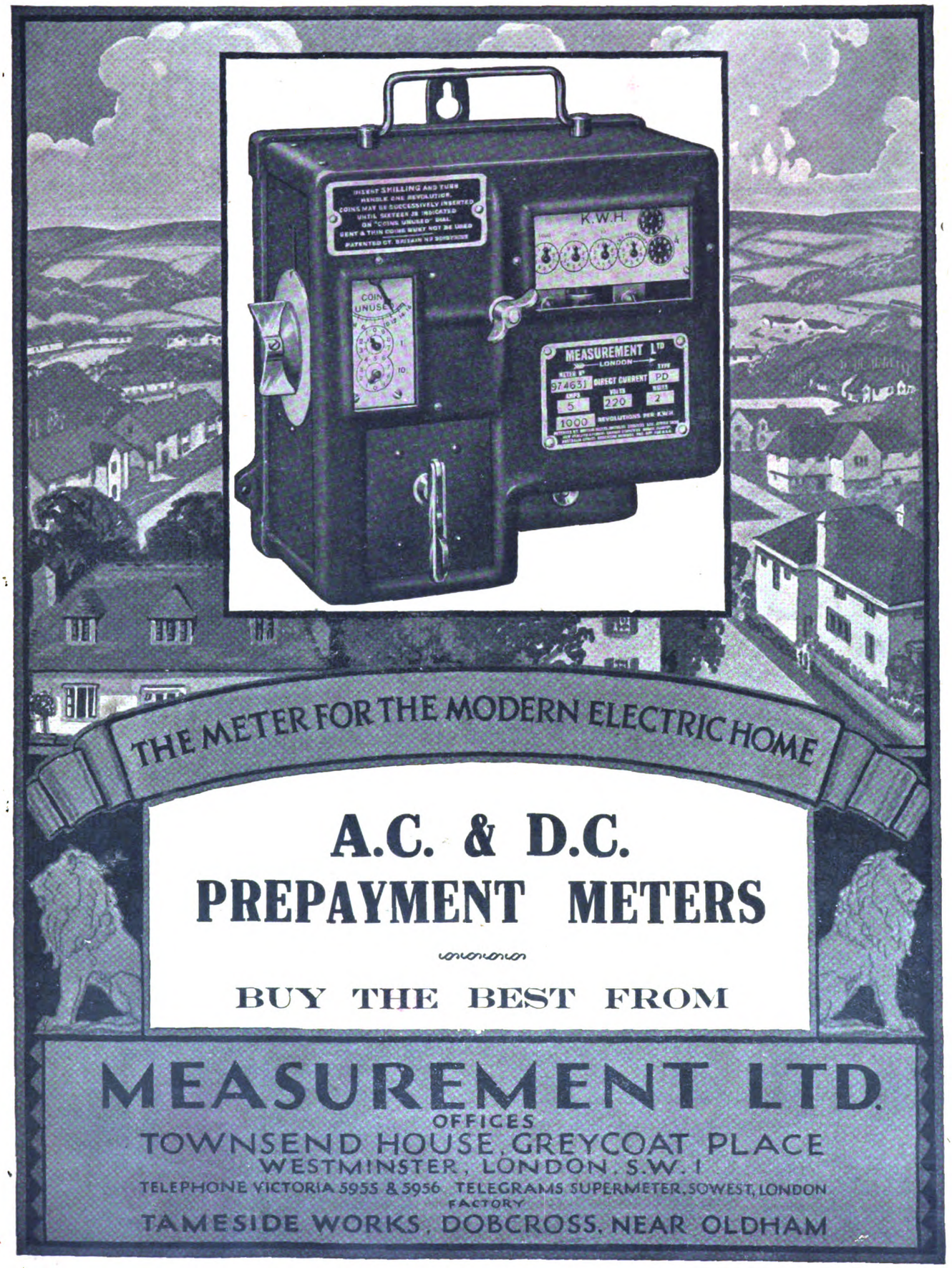
# THE ELECTRICIAN

Vol. CI.—No. 2639. Friday, December 28, 1928. [Registered at the General Post Office.] Sixpence







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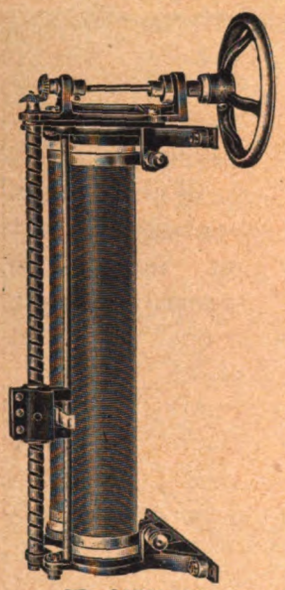

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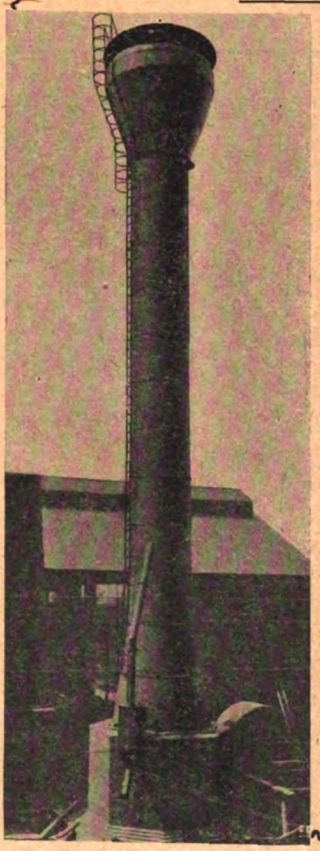

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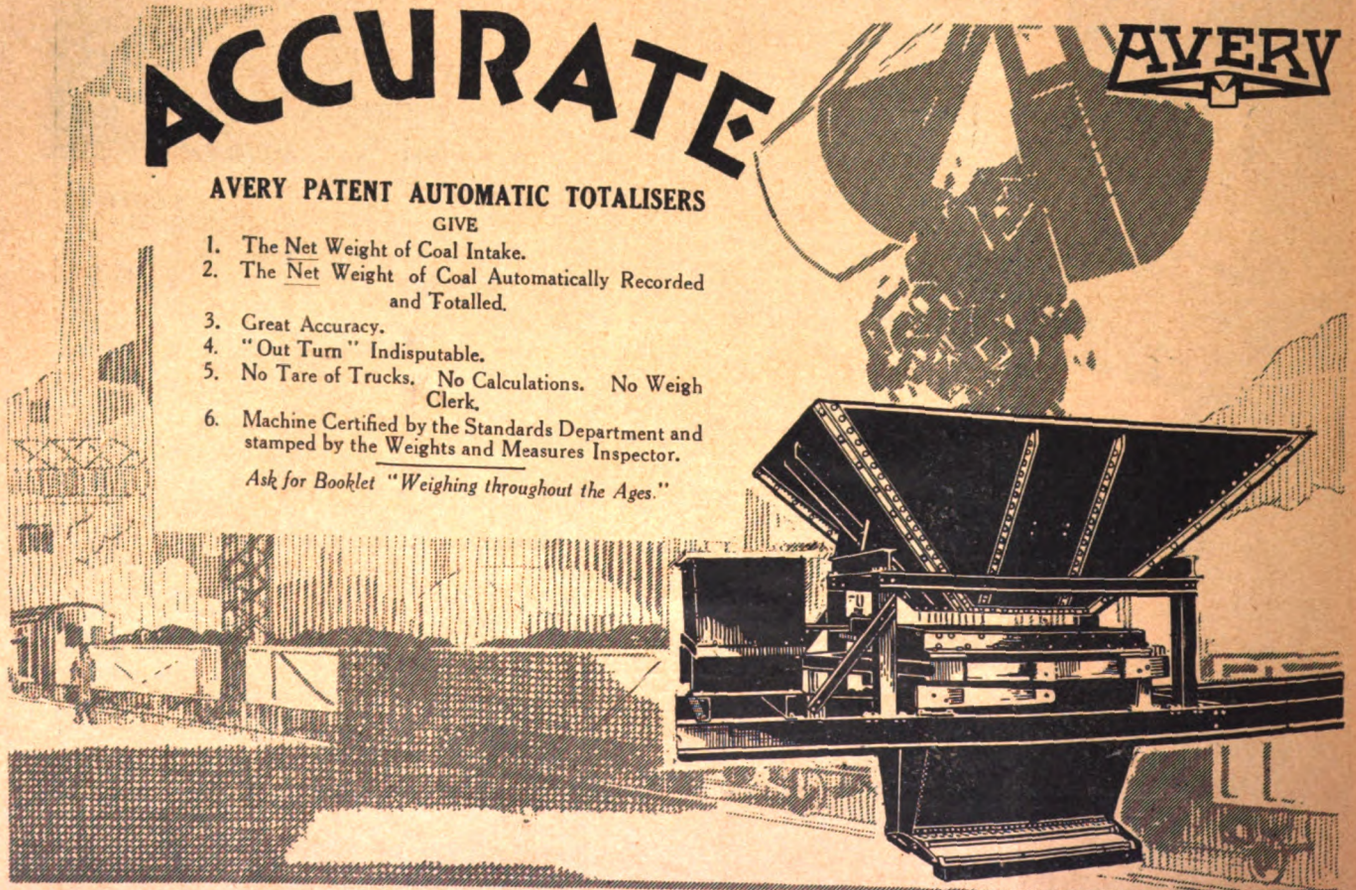

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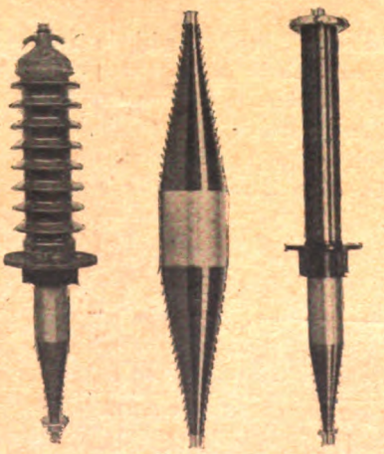

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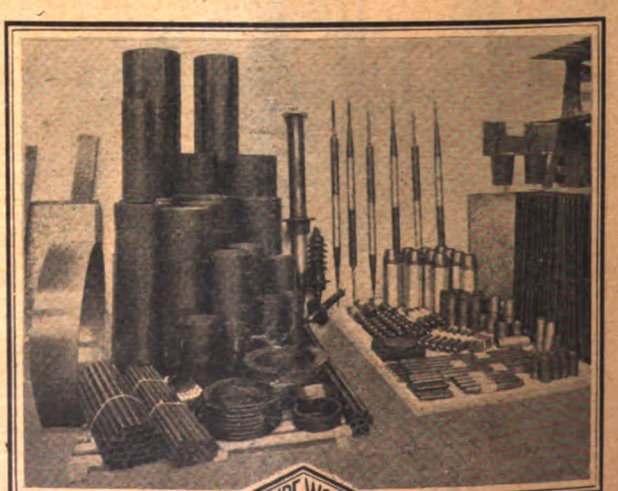

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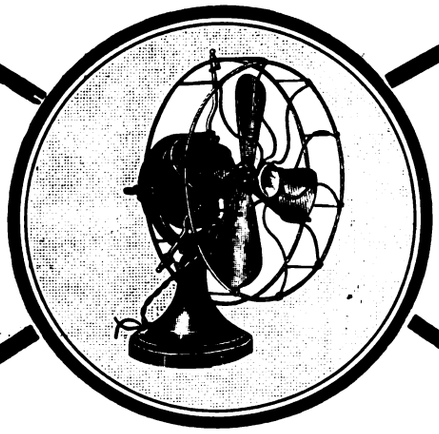

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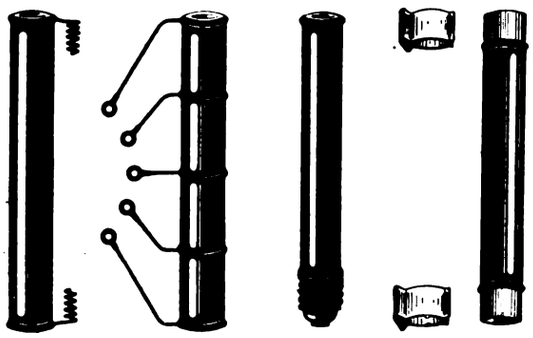

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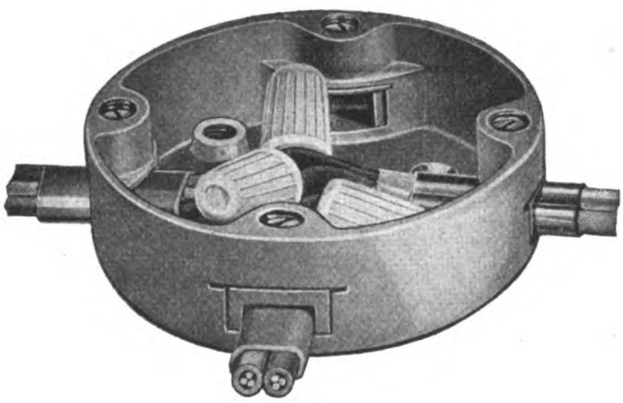

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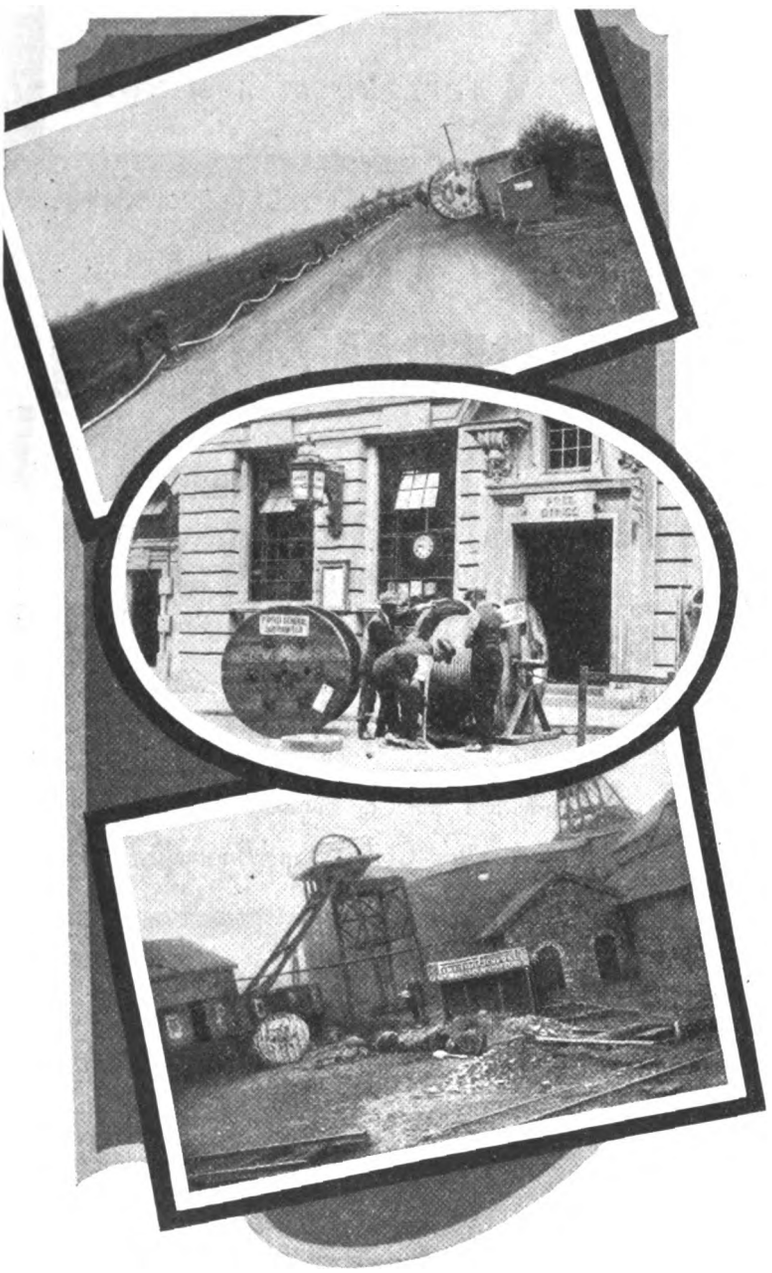

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IN THE MATTER of LETTERS PATENT granted to GOTTHILF ANSGARIUS BETULANDER dated respectively the 24th December 1912 Nod. 29615 of 1913, the 24th May 1913 Nod. 6210 of 1914 and 23rd April 1913 Nod. 9840 of 1914 for inventions of "Improvements in or relating to Automatic or Semi-Automatic Telephone Exchange Systems."

NOTICE IS HEREBY GIVEN that on TUESDAY the 22nd January 1929 an Originating Summons (1928 B. 2403) issued out of the High Court of Justice (Chancery Division) on behalf of the Relay Automatic Telephone Company Limited the Transferees of the above Patents asking that the term of the Patents may be extended for a further term of five years will come before Mr. Justice Tomlin for directions as to the hearing and any person desirous of being heard in Opposition must at least seven days before that date lodge Notice of Opposition (giving an address for service within the United Kingdom) at Room 175 Royal Courts of Justice Strand, and serve a copy thereof upon the under-mentioned Solicitors and upon the Solicitor to the Board of Trade.

Dated 17th December 1928.

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(*a*) Modern Developments in Protective Apparatus at 6.30 p.m.

(*b*) Automatic Control Gear at 8.10 p.m.

For particulars apply to the Principal at the Institute.

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## NOTICE.

THE Eastern Extension Australasia and China Telegraph Co., Ltd. The Share Register of this company will be closed from the 31st instant to the 7th January, 1929, both days inclusive. By Order R. T. WOLFE, Secretary, Electra House, Moorgate, London, E.C.2. 13th December, 1928.

## APPOINTMENTS VACANT.

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W. H. OSTLER,
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## COUNTY BOROUGH OF STOCKPORT.

ELECTRICITY DEPARTMENT.

MAINS SUPERINTENDENT.

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Applicants must have received a sound technical education and practical training, and must have had practical experience in similar work

Salary in accordance with the National Joint Board Schedule for the Electricity Supply Industry, Class G, Grade 4.

Applications, giving full particulars of age, training and experience, present and previous appointments, accompanied by copies of three recent testimonials, to be addressed to the Chairman of the Electricity Committee, Town Hall, Stockport, endorsed "Mains Superintendent," to be received not later than first post Wednesday, January 9th, 1929.

R. LOMAX,
Borough Electrical Engineer.

Electricity Offices,
23, Tiviot Dale,
Stockport.

## METROPOLITAN BOROUGH OF STOKE NEWINGTON.

ELECTRICITY DEPARTMENT.

MAINS ASSISTANT.

APPLICATIONS are invited for this post at a salary of £200 per annum, rising by annual increments of £25 to £300 per annum.

Candidates must have had practical experience with L.T. 3-wire D.C. and 4-wire A.C. networks, including the laying of services.

The person appointed will be required to act under the Technical Assistant and his duties will include the keeping of mains sketch books. Ability to make neat and accurate sketches is essential.

Experience with E.H.T. cables and transformer substations will be an advantage.

The position will not be wholly supervisory.

The successful candidate will be required to reside within the Borough, pass a medical examination and contribute to the Council's Superannuation Scheme.

Applications, with particulars of age, training, experience and enclosing copies of three recent testimonials, should be delivered to the undersigned not later than the first post on January 3rd, 1929.

HEDLEY LARGE,
Borough Electrica Engineer.

Electricity Offices,
Edwards Lane, Church Street, N.16.

"ENGINEERING OPPORTUNITIES."—This is a book you must not miss. It contains brilliant articles by Professor A. M. Low, our Employment Superintendent, etc., shows how to pass A.M.I.Mech.E., A.M.I.C.E., A.M.I.A.E., A.M.I.E.E., Matric., C. and G., G.P.O. Exams., and outlines over 60 home study Courses in all branches of Engineering. Send for free copy to-day (state subject or exam.). We alone guarantee "NO PASS, NO FEE."—BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 43, Shakespeare House, Leicester Square, London.

ENGINEERS—an increase of £100 in 12 months was Wilson's return from T.I.G.B. training. On enrolment Wilson was a power house attendant and had not looked at a study book since leaving council school. Therefore, however bad you *think* your position is, be sure that you can get out of the rut and secure a better job through T.I.G.B. postal training and employment service. Specialised coaching for A.M.I.E.E., A.M.I.Mech.E., etc. Moderate Fees. Free text books. Easy instalments. Write for advice *now*, and get the 64-page Book, "The Engineer's Guide to Success" FREE.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN,
(*Established* 1917),
164, TEMPLE BAR HOUSE, LONDON, E.C.4.

## FOR SALE.

15 H.P. Motor, 220 Volts D.C., 800 Revs., with Starter Spare Armature.
7 H.P. Motor, 410 Volt D.C., 1 000 revs.
2½ H.P. Motor, 530 Volt D.C., 625 revs.
3 ft. 6 in. Blackman Fan and Motor, 220 Volt D.C., 420 revs. and Starter.
W. MOSSOP, 52, Queen Victoria Street, E.C.4.

## THE SALISBURY ELECTRIC LIGHT AND SUPPLY COMPANY, LIMITED.

THE above Company has the following plant for Disposal —One 95 H.P. electric lighting type Crossley Gas Engine with Compressor and Sundries.
Suction Gas Plant and Accessories to suit above engine.
Dynamo, 550 Volts, 91 amps.
Motor Generator, 500 Volts, 100 Amps to 100/160 Volts 250 amps.
Switchboards and sundries.
All plant modern make and in very good condition.
Can be seen by appointment if desired.
Communications and offers to be addressed to the MANAGER, 27, Market Place, Salisbury.

## CORPORATION OF EALING.

PLANT FOR SALE.

THE Corporation of Ealing have the following Plant for Sale :—

One Water Tube Boiler and Superheater by Sinclair, Leith (now taken over by Thompson's, Wolverhampton). Guaranteed evaporation from and at 212 deg. F., excluding Superheater 27 500 lbs. per hour. Insured for 165 lbs. Hand-fired, Crosthwaite Furnace, Steel Chimney 4 ft. 8 in. diameter, 100 ft. from ground level. Duplicate Feed valves and Steel Feed Pipes. All necessary mountings by Hopkinson. A number of spare tubes, all necessary sizes.

One Water Tube Boiler and Superheater by The Stirling Boiler Co., Motherwell. Guaranteed evaporation from and at 212 deg. F., excluding Separator 25 000 lbs. per hour. Insured for 165 lbs. Hand-fired Crosthwaite Furnace. Steel Chimney 4 ft. 4 in. diameter 100 ft. from ground level. Duplicate Feed Valves and Steel Feed Pipes. All necessary mountings by Hopkinson. A number of spare tubes, all necessary sizes.

One Galloway Boiler and Superheater; evaporation 3,000 lbs. per hour. Insured for 135 lbs. Length 27 ft., diameter 7 ft. 6 in. Hand-fired Crosthwaite Furnaces. Duplicate Feed Valves and Steel Feed Pipes. Fitted with all necessary mountings.

Three Lancashire Boilers by Jas. Watt and Co., Birmingham; evaporation 2 300 lbs. each. Insured for 130 lbs. Length, 26 ft., diameter 6 ft. Hand-fired Crosthwaite Furnaces. Duplicate Feed Valves and Steel Feed Pipes. Fitted with all necessary mountings.

One Weir Feed Pump, 13½ in. by 10½ in. by 21 in. Capacity 70 000 lbs. per hour.

One Wooden Cooling Tower.

One Tudor Battery, consisting of 37 cells, capacity 4 300 ampere hours, at 68 volts.

One Brush-Ljungstrum Turbo Alternator, output 2 222 kVA, speed 2 400 r.p.m., single-phase, frequency 40; exciter attached. The turbo is bolted on top of condenser which has centrifugal pump (circulating) and 3-Crank air pumps. Spare impeller and shaft

One 3-Crank Triple Expansion Engine by Howden, Glasgow, direct coupled to Siemens Alternator. Engine, enclosed type forced lubrication. Alternator, rotating field 750 kW, speed 240 r.p.m. Single-phase 2 000/2 100 volts, 750 kVA.

One 3-Crank Triple Expansion Engine by Davey Paxman, Colchester, direct coupled to Siemens Alternator. Engine, enclosed type, forced lubrication. Alternator rotating armature, 750 kW, speed 240 r.p.m., single-phase, 2 000/2 1000 volts.

Two 3-Crank Tandem Compound Engines by Bellis and Morcom, direct coupled to Siemens Alternators. Engines, enclosed type, forced lubrication. Alternator, rotating armature 300 kVA. Speed 300 r.p.m., single-phase, 2000 /2 100 volts.

Two 2-Crank Compound Engines by Browett Lindley and Co., direct coupled to Siemens Alternators. Engines, open type. Alternators rotating armature 65 amps. 2 000 volts, 40 periods, single phase, 200 r.p.m.

One Bellis and Morcom Compound Engine, direct coupled to Siemens Alternator and Dynamo. Engine 2-Crank Compound, enclosed type, forced lubrication; speed 480 r.p.m. Alternator 20 amps., 2 000 volts at terminals; dynamo 710 amps., 66/97 volts at terminals.

Two Browett-Lindley Single Cylinder Engines, coupled direct to two Siemens Exciters on same bedplate as engines. 300 r.p.m., 145 amps., 66 volts at terminals. One spare armature for dynamo.

One Condenser by Haslam, Derby, capable of dealing with 5 000 lbs. of steam per hour, plus the exhaust from the engine connected to it for driving the circulating pump and air pump attached to the condenser.

One Condenser by Schwartz, mild steel body; Centrifugal Pump by Drysdale and Browett-Lindley Compactum in place of Air Pumps. Capable of dealing with 35 000 lbs. of steam per hour (plus the steam used by its own engine) and maintaining 25-26 in. vacuum.

One Condenser by Willans and Robinson, cast iron body; Centrifugal Pump, Edwards Air Pumps (three) driven by steam engine by Browett Lindley and Co., capable of dealing with 180 000 lbs. of circulating water per hour, 37 000 lbs. of steam per hour (plus the steam used by its own engine) and maintaining 27½ in. of vacuum. Browett Lindley Engine, as above—2-Crank Compound, enclosed type, forced lubrication, speed 480 r.p.m.

Mild Steel Steam Piping, 7 in., 8 in., and 9 in., insured for 165 lbs. Cast Iron Exhaust Piping, 15 in., 18 in., and 30 in.

One Automatic Exhaust Valve, 30 in. diameter, by Spencer-Bonecourt.

Conditions of Sale, Orders to View the plant and date for completion of removal, will only be issued to firms or persons who undertake to tender.

Tenders, which must be sealed and endorsed "Tender for Plant," are to be addressed to the Borough Electrical Engineer and Manager, Town Hall, Ealing, and be delivered not later than 12 noon, on January 15th, 1929.

The Council does not bind itself to accept the highest or any Tender, and reserves the right to accept any Tender in whole or in part.

By Order,

Town Hall,
Ealing, W.5.
December, 1928.

J. DOUGLAS KNIGHT,
Borough Electrical Engineer and Manager.

## AGENCIES.

BRITISH Manufacturers of full range of wireless cords will give sole area agencies to factors who can introduce business. Prices highly competitive and commission good.—Apply Box A.P.B., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

## MISCELLANEOUS.

IRONCLAD Ceiling Roses, 2/- dozen. Cash with order.—Apply A.P.E., ELECTRICIAN Offices, Bouverie House, 154, Fleet Street, London, E.C.4.

DUTCH Electric Lamps and Valves. Absolutely finest value. Every one guaranteed. Importers write. Keenest prices.—BRITISH REPRESENTATIVE, 107, Hinde House Lane, Sheffield. Mention Paper.

SCRAP FOR CASH.—Copper, brass, lead, cable, accumulator plates, sediment, etc. All descriptions old plant and machinery for dismantling purposes bought. Any distance. Any quantities. 'Phone, Bishopsgate 7288-9, or wire "Irometamer Edo London."—W. & H. COOPER, LTD., Brady Street, Bethnal Green, E.1.

*YOU* WANT SCREWS!—*WE* HAVE THEM!—TRUE SCREWS, LTD., "The Screw House," 107, Clerkenwell Road, E.C.1. Phone: Holborn 2618

## ELECTRIC LAMPS.

FINEST quality Non-Ring Electric Lamps.
Metal Filaments, Half-Watt Type, Opals, Tractions, Carbons, Motor Bulbs. etc., at Competitive Prices.

IMPORTERS AND DISTRIBUTORS, LTD.,
173-5, Gt. Portland Street, London, W.1.
Telephone: Welbeck 3801.

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# "Nineteen Twenty-Nine"

WITH sighs—of thankfulness or otherwise—the old year passes, and before us stretches the wide vista of opportunities yet to come. May they far exceed our expectations, and lend further impetus to the growing progress of our industry.

**J. H. Tucker & Co. Ltd.**
KINGS Rd TYSELEY BIRMINGHAM

N.E.H.

# As the Chairman said

"We are told that £1,000,000 is wasted annually in Great Britain alone through breakdown due to faulty insulation. I submit that the best 'Loss of Profits Insurance' is to use the best possible insulating varnish."

This is made by Sterling, who resolutely refuse to meet price-cutting competition by lowering the quality or quantity of the expensive constituents of really dependable insulating varnish.

Put your trust in the "Sterling" qualities of the pioneer insulating varnish, perfected by thirty-seven years of constant research and practical use throughout the world.

*Write to:—*
**The Sterling Varnish Co.**
**196, Deansgate, Manchester**

**Sterling**
INSULATING VARNISH

*"Insure your dividends with STERLING."*


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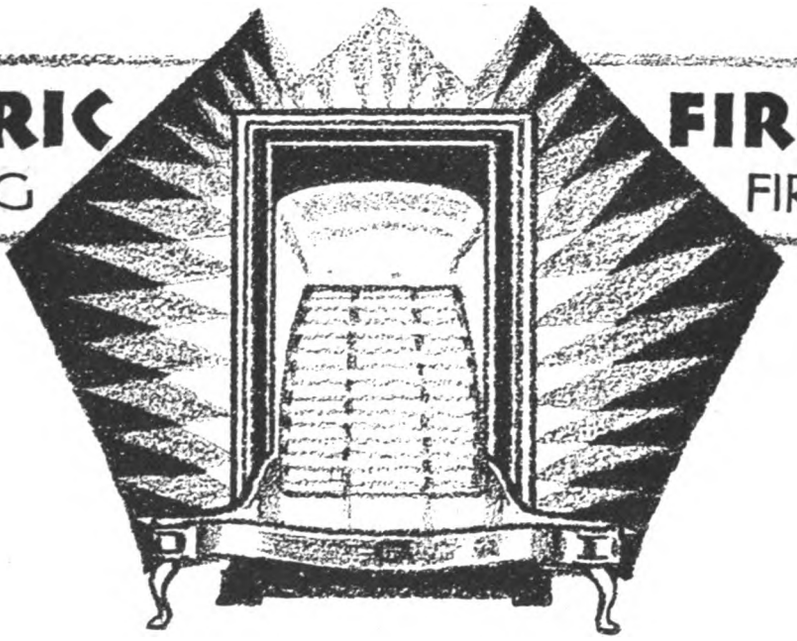
# ELECTRIC FIRES FOR EXISTING FIREPLACES



## THE "TOWNSEND" HIGH CLASS ORNAMENTAL ELECTRIC FIRE

This very attractive model has many unique and exclusive features. Specially designed to replace ordinary coal or Gas Fires in existing fireplaces, it is fitted with a Chromium Plated Reflector and Fender Top—two switches, two yards of best quality flexible leads and three firebars of 1,000 Watts each—and has a current consumption of 1, 2 or 3 units per hour. Height 27½ inches. It can be supplied in ten different finishes.

May we send you details of this and other models?

◆◆◆

## DOMESTIC ELECTRIFICATION LIMITED

TOWNSEND HOUSE, GREYCOAT PLACE,
WESTMINSTER . . . LONDON, S.W.1

Telephone: Victoria 5956.

DE

Telegrams: "Domuselect, (Sowest) London."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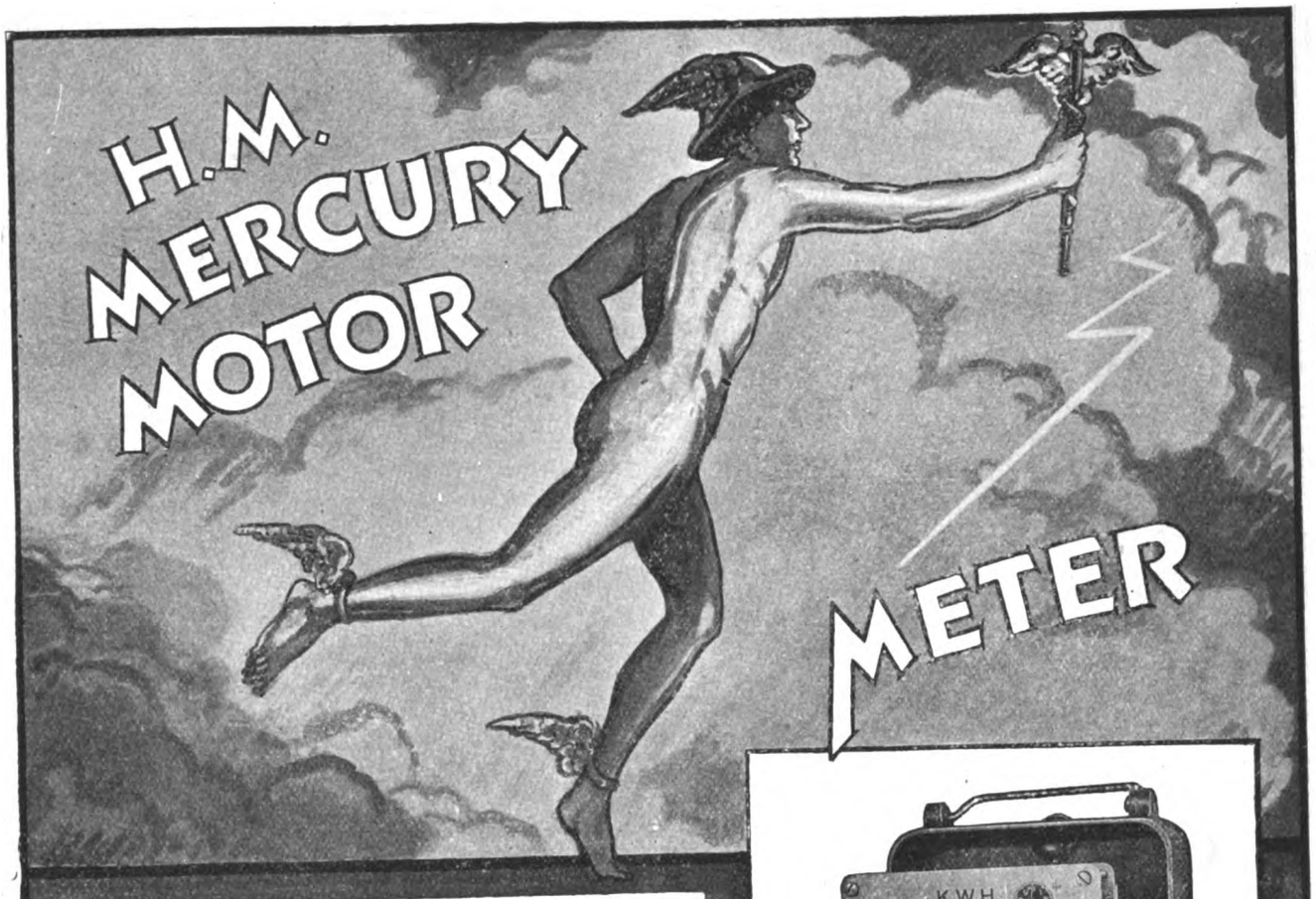
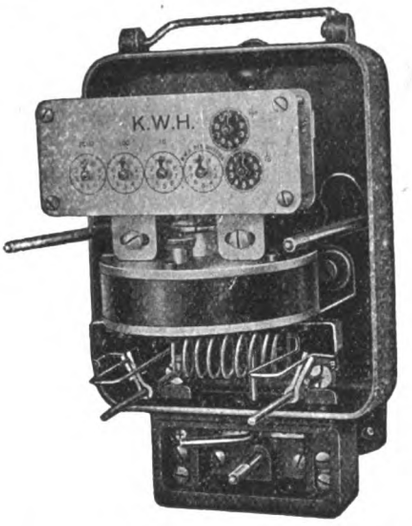



**OUR "H.M." MERCURY MOTOR METER FOR DIRECT CURRENT IS IN A CLASS BY ITSELF**

*IT IS*
*SCIENTIFICALLY SOUND,*
*MECHANICALLY PERFECT*
*AND*
*HAS STOOD UP TO EVERY TEST*




Type H.M. Meter with cover removed.

**MEASUREMENT LTD.**

*Offices:—*

Townsend House, Greycoat Place,
Westminster, - London, S.W.1

*Factory:—*

Tameside Works, Dobcross, near Oldham.

Telephone No.:
Victoria 5955 & 5956

Telegrams:
"Supermeter, Sowest, London."

**BRITISH HOUSE SERVICE METERS**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STRONG · SILENT · POWER

The "POPULAR POWER" H.T. BATTERIES
in Brown Containers

LARGE CAPACITY

| E.M.F. VOLTS. | Price |
|---|---|
| Popular Power 60 - - - | 13/6 |
| Popular Power 64 - - - | 14/6 |
| Popular Power 99 - - - | 22/- |
| Popular Power 105 - - - | 24/- |
| Popular Power 120 - - - | 27/- |

Power Valves need Power Batteries

# EVER READY Reg'd

## BRITAIN'S BEST BATTERIES — *LAST LONGEST*

Illustrated catalogue with trade terms sent post free from the manufacturers:

**The Ever Ready Co. (G.B.), Ltd. - Hercules Place, London, N.7**


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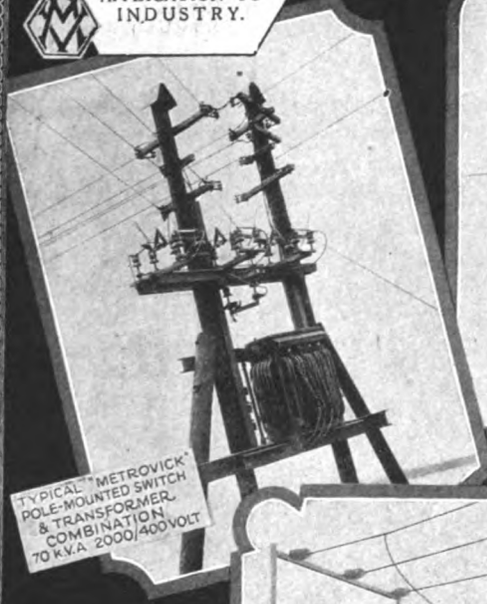
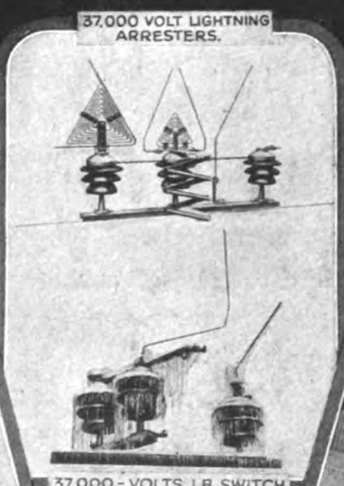
*From Source to Service:-*

# The Network

A SERIES OF ADVERTISEMENTS TO ILLUSTRATE "METROVICK" APPARATUS COVERING EVERY SIDE OF ELECTRICITY SUPPLY FROM ITS GENERATION TO ITS APPLICATION TO INDUSTRY.



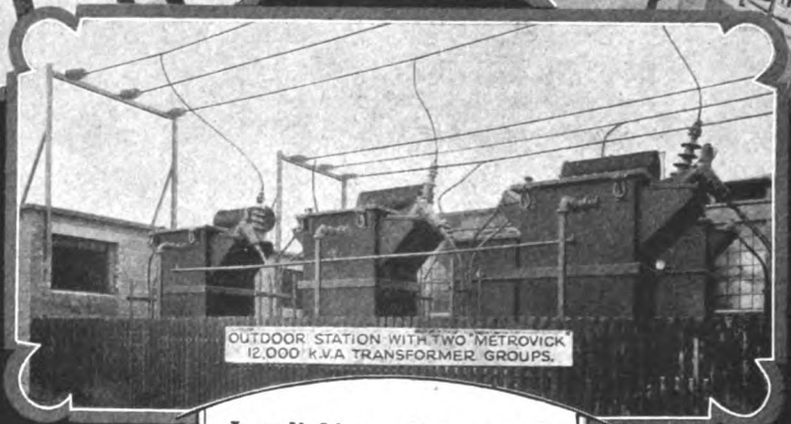
TYPICAL "METROVICK" POLE-MOUNTED SWITCH & TRANSFORMER COMBINATION 70 K.V.A 2000/400 VOLT



37,000 VOLT LIGHTNING ARRESTERS.

37,000-VOLTS I.B. SWITCH OPENED AFTER HAVING BEEN FROZEN UP.

"METROVICK" 37,000 VOLT CIRCUIT BREAKERS AT AN OUT-DOOR SUBSTATION.



OUTDOOR STATION WITH TWO "METROVICK" 12,000 K.V.A TRANSFORMER GROUPS.

PART OF A "METROVICK" FREQUENCY CHANGER; 50/60 PERIODS, 600 R.P.M., WITH OUTPUT EQUAL TO 16,000 K.V.A.

**Interlinking schemes and the network of modern electric supply are provided for by "Metrovick" Outdoor Switchgear and Transformer Stations, Pole Mounted Stations, Air-break Switches, Lightning Arresters, Farm-line equipments, Frequency Changers, Relays and Feeder protection apparatus.**

These pictures show typical examples.

*Send us your enquiries.*

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TRAFFORD PARK

METROPOLITAN Vickers ELECTRICAL CO., LTD.

MANCHESTER


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# street lighting

No application of electricity plays a more vital part in the life of the community than street lighting; nowhere is reliability more essential. Particularly in overhead systems experts have proved LECITE (Regd.) Insulated Cables the solution of all their distribution problems.
Insulated with LECITE (Regd.) Rubber Compound they defy atmospheric effects. Corrosion tests show remarkable resistance to acids and alkalis and polluted waters. Specify LECITE (Regd.) Insulated Cables for street lighting schemes.

REG.D TRADE MARK

"LECITE" REG.D INSULATED CABLES

The LIVERPOOL ELECTRIC CABLE COMPANY LIMITED.

Phone, Bootle, 1660. Linacre Lane, Bootle, Liverpool. Grams, Concentric, Liverpool.

Associated with
THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LTD.
FREDERICK SMITH & CO.
Incorporated in the London Electric Wire Company and Smiths Limited


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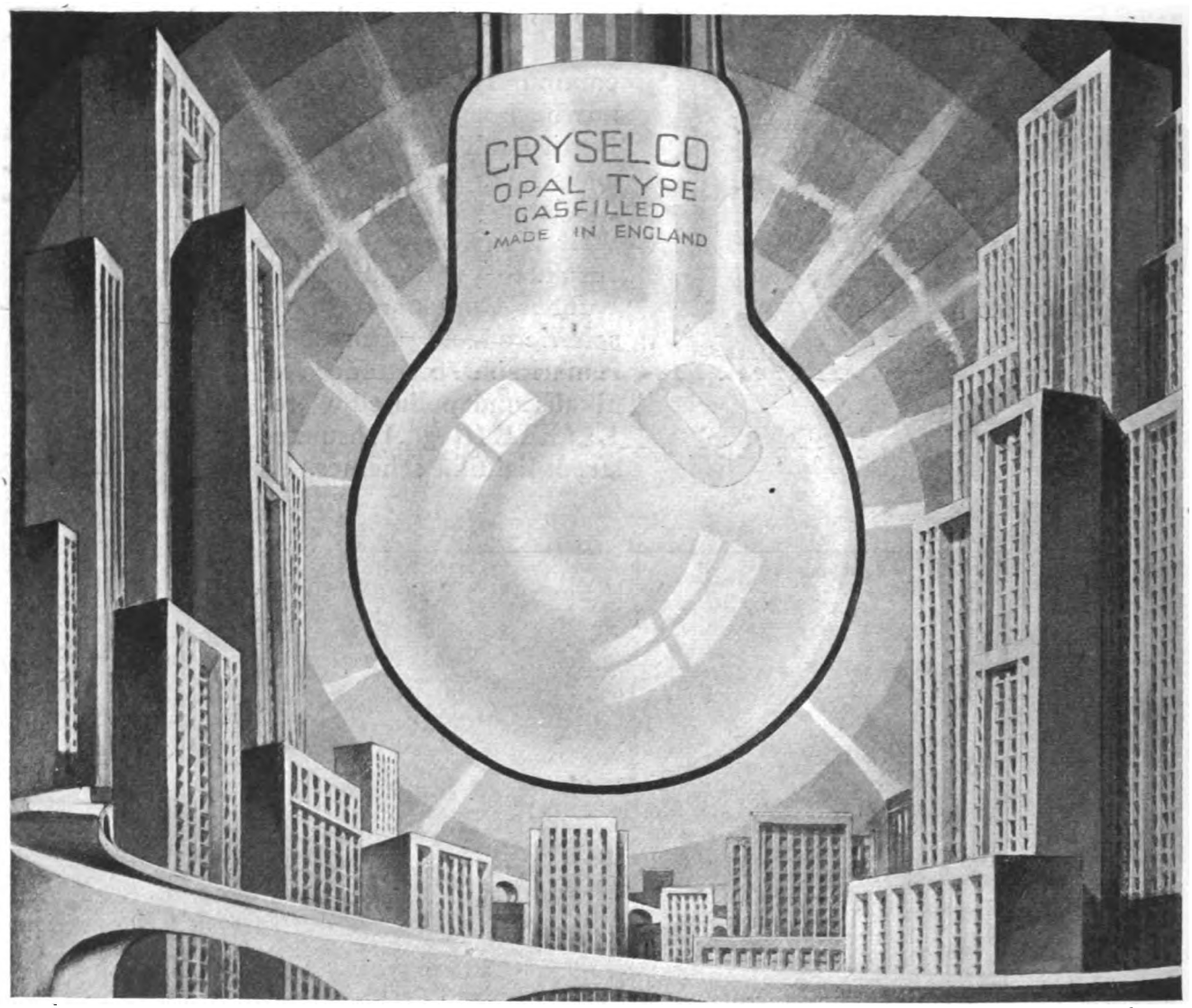
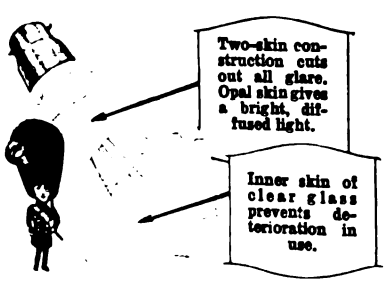



# The Lamp that has stolen a march on time—

THE cities of to-morrow are but conjectures; we picture titanic buildings like granite cliffs which will obscure the daylight and render perpetual artificial light imperative—but to-day—years in advance of time—we have discovered the perfect lamp; a white brilliant luminosity in the inner bulb with an outer opal skin to give perfect diffusion and cut out glare.

**CRYSELCO, LTD.**
**Kempston Works**
**BEDFORD**




# CRYSELCO
## *Gasfilled* OPAL LAMPS
## *The Ultimate in Glareless Lighting*

***HOME BRANCHES:***

BRIGHTON: 35, Duke Street. ('Phone: Brighton 5512.)
BIRMINGHAM: 40 & 41, Clarence Chambers, 39, Corporation Street. ('Phone: Central 2296.)
NEWCASTLE-ON-TYNE: 27, Grey St. (Telegrams: "Cryselco, Newcastle-on-Tyne." 'Phone: Central 3295.)
GLASGOW: 23, Douglas St. (Telegrams: "Starter, Glasgow." 'Phone: Central 1253).
LONDON: Thanet House, 231/2, Strand, W.C.2. (Telegrams: "Cryselco, Estrand, London." Phones: Central 3016/7/8.)
BRISTOL: All Saints' Chambers, 41, High Street. ('Phone: Bristol 5069.)
LEEDS: 11, New Station St. (Telegrams: "Cryselco, Leeds." 'Phone: Leeds 27866.)
MANCHESTER: Douglas Chambers, 63 Corporation St. (Telegrams: "Cryselco, Manchester. 'Phone: Blackfriars 4871/2.)
CARDIFF: 30, Charles St. ('Phone: Cardiff 7466.)

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# Recommend these *UTILITY* lines

**IRON.**
Nickel plated finished. Guaranteed perfect construction for 3 years.
4 lb. 5 lb. 6 lb.
Price: 14/- 15/- 16/4

**KETTLE.**
Gives wonderful service. Guaranteed perfect construction for 1 year.
1-pt. 2-pt. 3-pt.
Price: 22/- 29/- 40/- (copper)
Nickel-plated extra.

**"RAYMOND" FIRE.**
Weight approx. 9 lbs. Solid brass framework, artistically finished in either Oxidised Brass, Copper or Silver.
Price: £3 : 10 : 0
including 2 yards flex.

**TOASTER.**
Costs fraction of a penny per meal, and can be connected to the ordinary lamp socket.
Price: 24/-

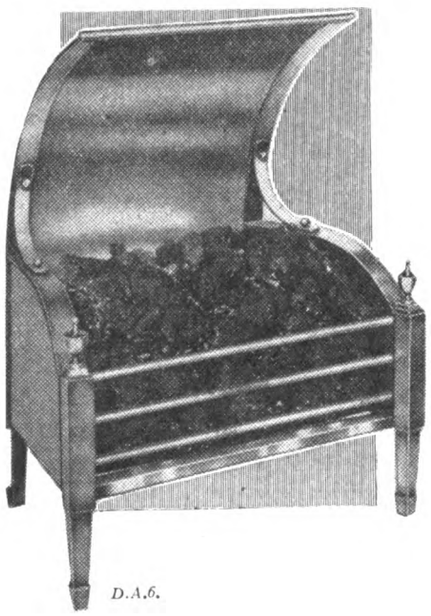
**PEDESTAL FIRE.**
Convenient and extremely portable.
Price: 500 watts 22/-
750 watts 24/-

## The "VERA" ELECTRIC COAL FIRE

A special feature of this fire is the solid fuel block. Soundly constructed in sheet metal and cast-brass, the "VERA" Fire can be supplied in three finishes:—

Oxidised Brass, Oxidised Copper or Oxidised Silver.

PRICE:
2 k.w., 2-Bar **£5 : 15 : 0**
including lamp and 2 yards of flex.



*D.A.6.*

*Sell*
ROYAL
"EDISWAN"
ELECTRIC LAMPS
in the
MODEL VILLA CARTON

They make a most attractive window display. Write us for full details if you are not already stocking.

# EDISWAN

## *Electric Domestic Appliances*

**THE EDISON SWAN ELECTRIC CO., LTD., 123/5, QUEEN VICTORIA STREET, LONDON, E.C.4**

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# DI-ELECTRIC STRENGTH

**3352 VOLTS PER MIL**

and after 48 hours' immersion in water

**2784 VOLTS PER MIL**

# SPECIFIC RESISTANCE

**$5{\cdot}9 \times 10^{14}$ ω/cm³**

**ARE OFFICIAL TEST READINGS OF**

# 213 "ARMACELL"

Heat and Humidity dangerously lower the di-electric strength of most insulating varnishes.

# 213 "ARMACELL"

**ENSURES SAFETY**

**AT ALL WORKING TEMPERATURES AND UNDER VERY EXACTING CONDITIONS**

When heated from 15° to 90° C. its di-electric strength **falls only 18·5%**

When immersed 48 hours in water its di-electric strength **falls only 17%**

## The Insulation Resistance of

# 213 "ARMACELL"

## EQUALS THAT OF GOOD RUBY MICA

*Full particulars on application to Sole Manufacturers:—*

# GRIFFITHS BROS. & CO.

**LONDON, LTD.**

*Paint, Enamel and Insulating Varnish Specialists,*

**MACKS ROAD, BERMONDSEY, S.E.16**

*Agents all over the world.*

# "Ideal" Switch & Fuse Gear

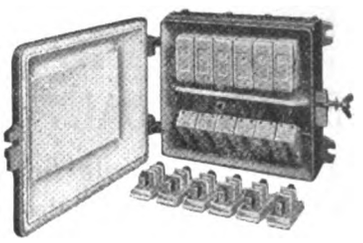
***—Sound in Design and Practice, too!***

## "IDEAL" IRONCLAD SWITCH AND FUSE BOARDS.

These are standard Switchboards combined with Switchboxes which are fitted with 10/15-amp. Quick-make and Break switches or 5-amp. tumbler switches. Fitted with "Ideal" Fuses on copper bars mounted on tilting battens—making for easy wiring. The holes in each end of the cases are fitted with removable discs, obviating drilling on the site. Switch and fuseboards can be supplied in Teak cases if desired.

## "IDEAL" IRONCLAD FUSE BOARDS.

A new design fitted with "Ideal" Fuses on Copper Bars mounted on steel tilting battens—thus easy wiring is assured. Each end of the cases is fitted with holes for conduit with removable discs. Finished inside white insulating enamel, outside naval grey.



15 Amps. 250 Volts.

Prices are competitive.

Compare SANDERS quality.

**Take advantage of the SANDERS SERVICE**

Sanders do more than merely supply standard lines of Switch and Fuse Gear. They give a Switchgear Service that can supply every out-of-the-ordinary need. Special designs for special jobs submitted by their own engineers or any piece made promptly to customers' specifications.

# Wm. Sanders

## & COMPANY

**(Wm. Preston—Sole Proprietor).**

***Makers of "Superior" Switchgear since 1892***

***Falcon Electrical Works:* WEDNESBURY.**

*Telephone: Wednesbury 65* *Telegrams: "Sanders: Wednesbury."*

**London: 128, SHAFTESBURY AVENUE.**

*Telephone: Gerrard 8984.* *Telegrams: "Sandecco, Westcent, London."*

Norrington & Landon, Ltd., 33, Brazennose Street, MANCHESTER. T. M. Johns & Co., Ltd., Athenæum Arcade, PLYMOUTH. R. & H. Barkes, 7-13, Clavering Place, NEWCASTLE-ON-TYNE. Wm. C. Yuille & Co., Ltd., 155a St. Vincent Street, GLASGOW. The Walsall Hardware Manufacturing Co., Ltd., College Square North, BELFAST. V. G. Burkitt, 105, Redcliffe Street, BRISTOL.

REGD. TRADE (S) MARK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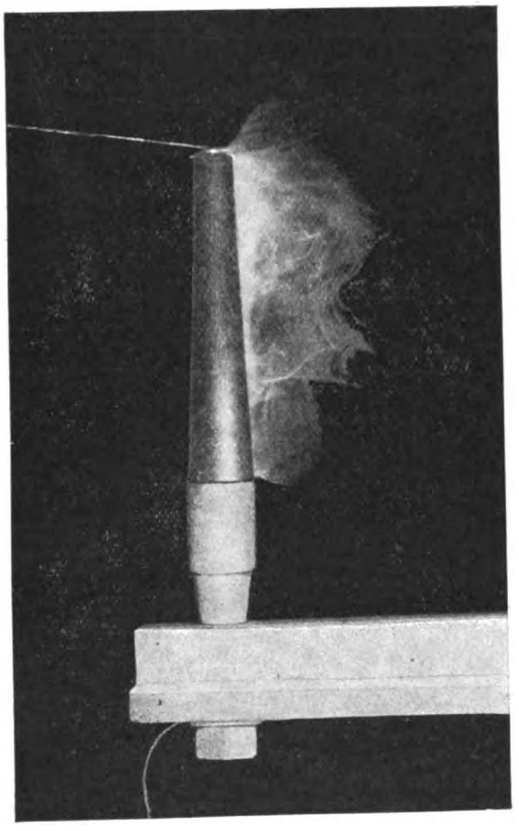
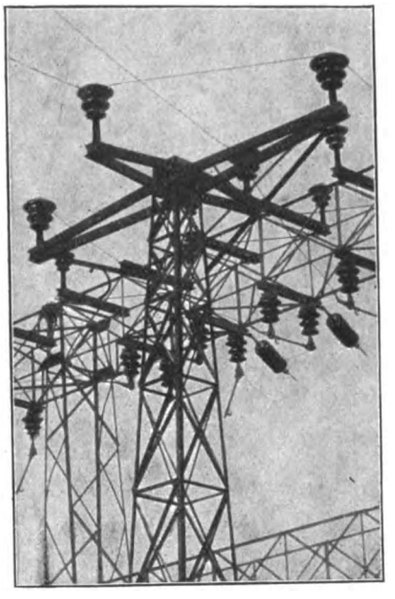
# BAKELISED WOOD
## THE MODERN INSULATOR



Flash Over Test in Air of 65,000 volt Bakelised Wooden Insulator Pin. Flash Over did not take place until 145,000 volts was reached.



65,000 volt Transmission Line in Lorraine. The Insulator Pins are made of *Bakelised Wood*, thus increasing enormously the factor of safety on the line and decreasing leakage to a minimum.

## *Some other uses for Bakelised Wood*

Transmission Pole Crossarms.
Indoor Type H.T. & E.H.T. Insulators.
Isolating Switch Operating Poles.
Packing Pieces for Transformer and Alternator Windings.
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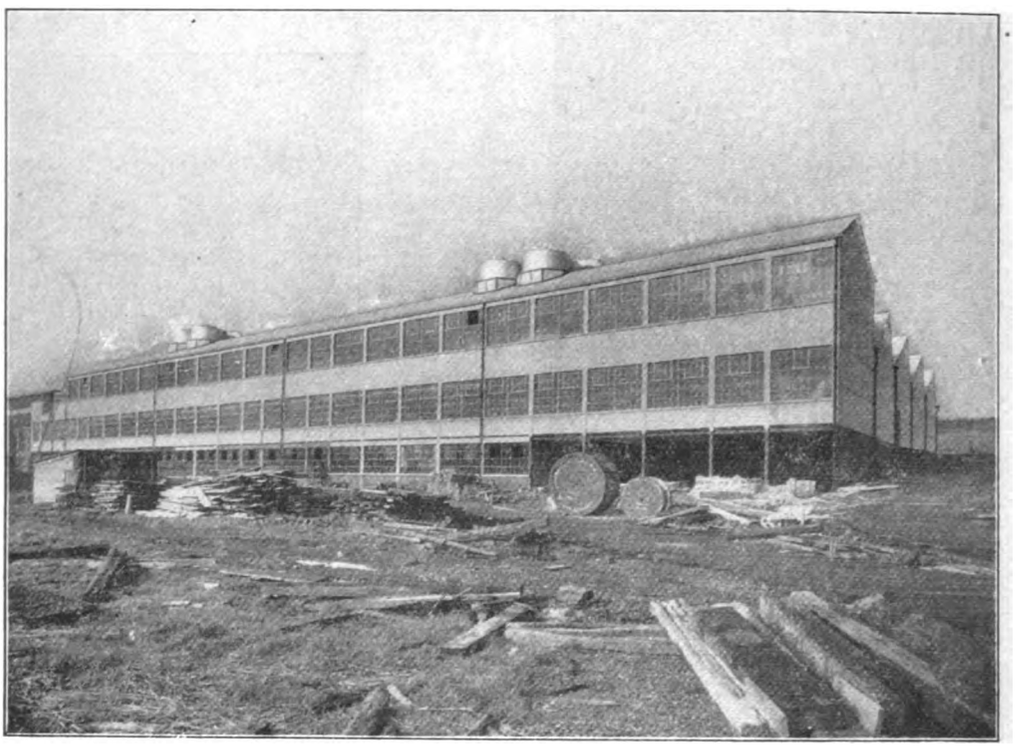

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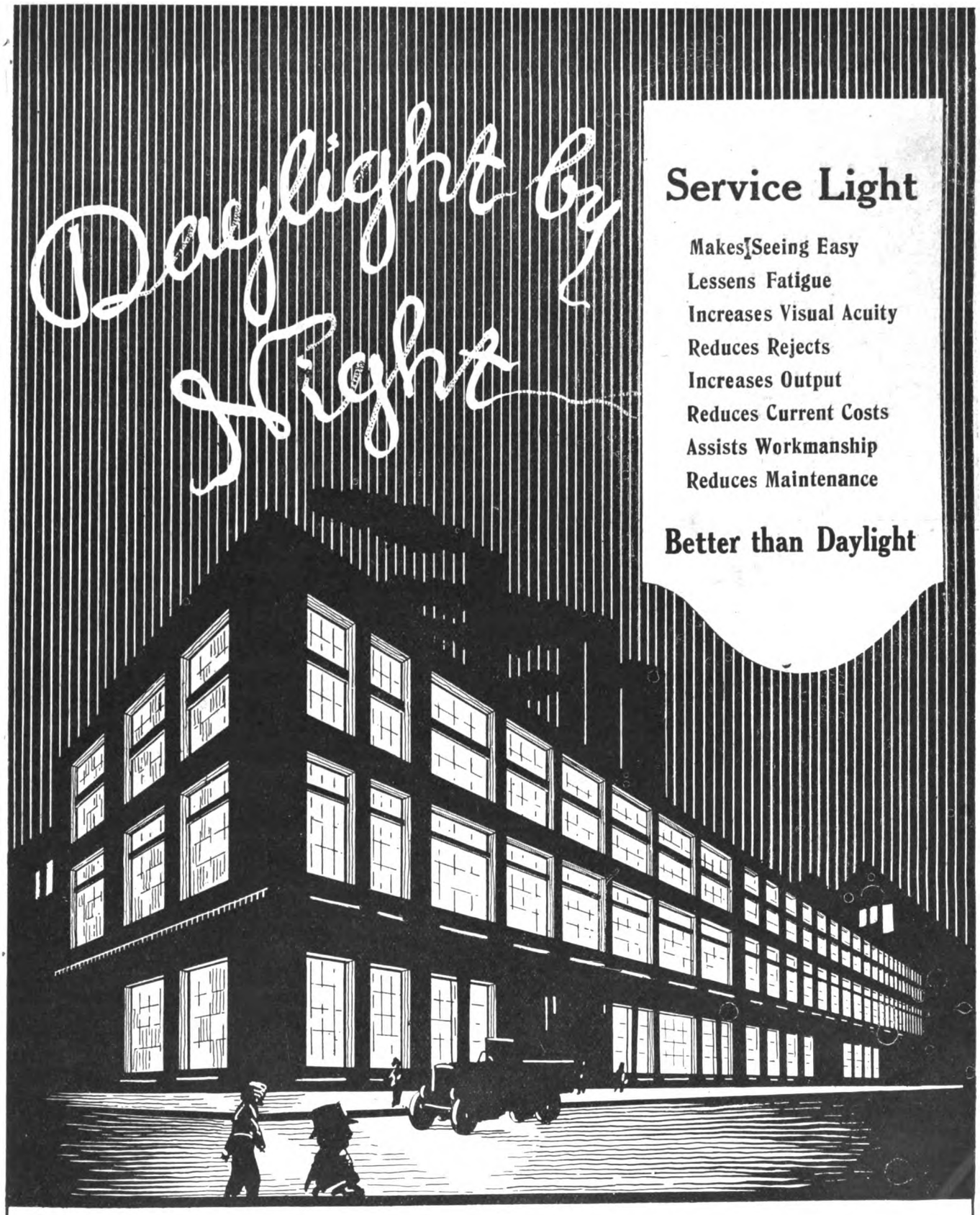


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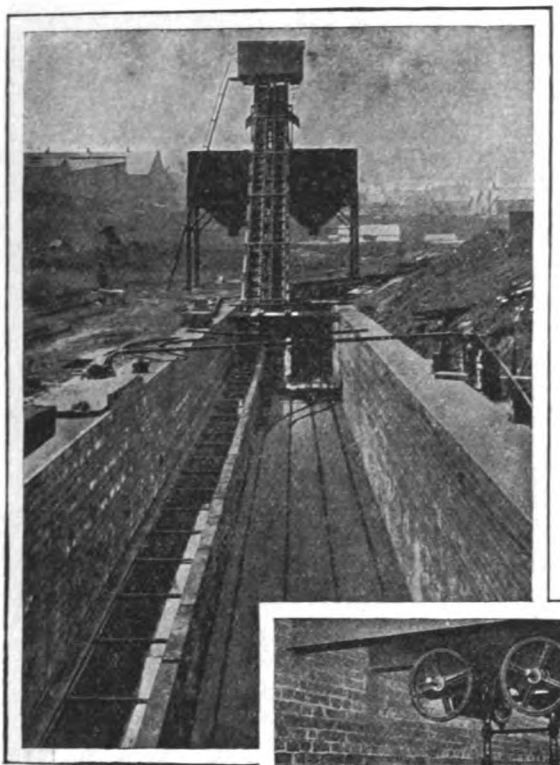

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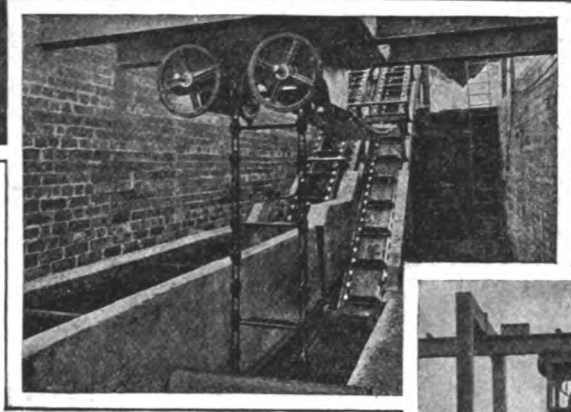

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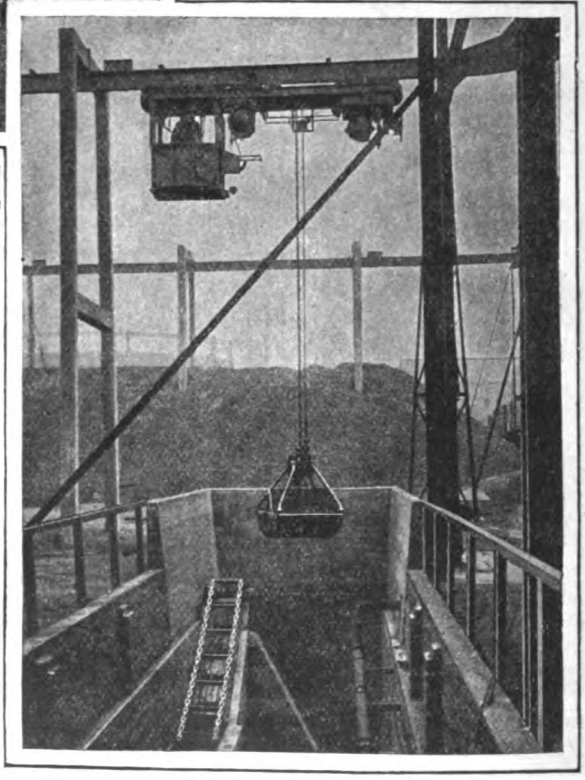

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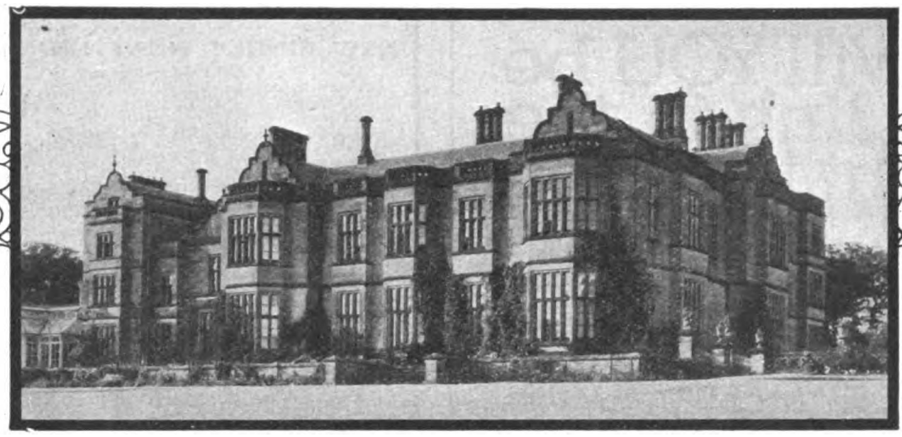

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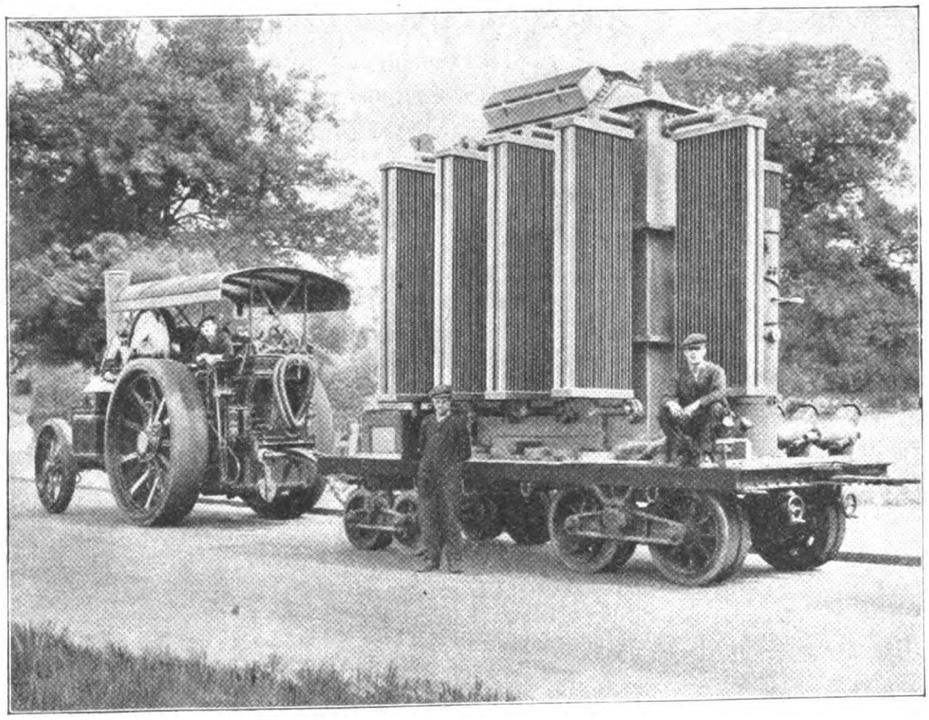

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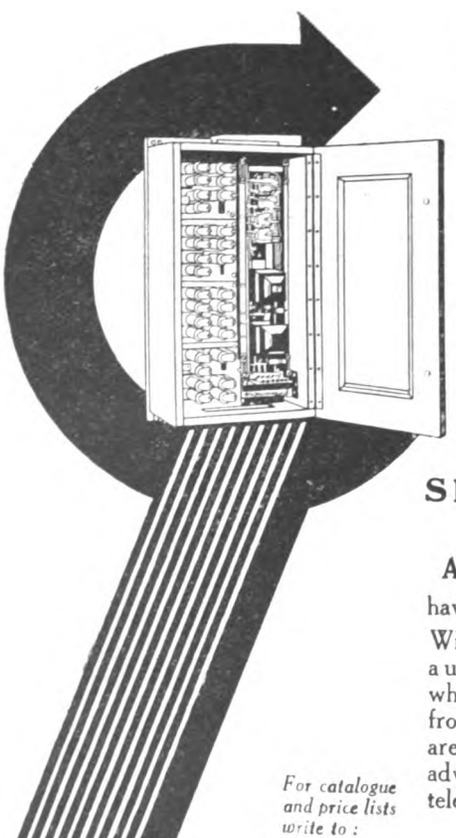

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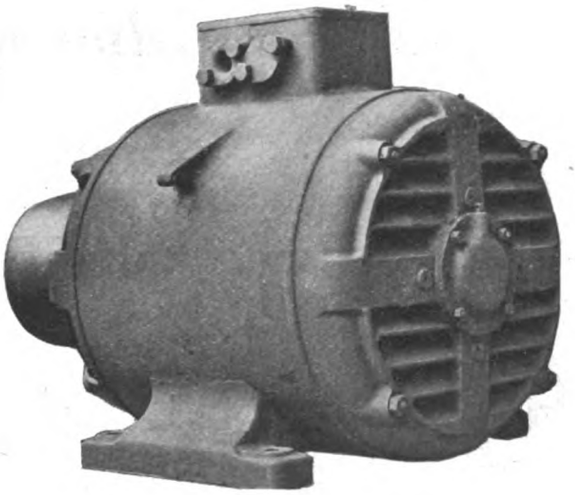

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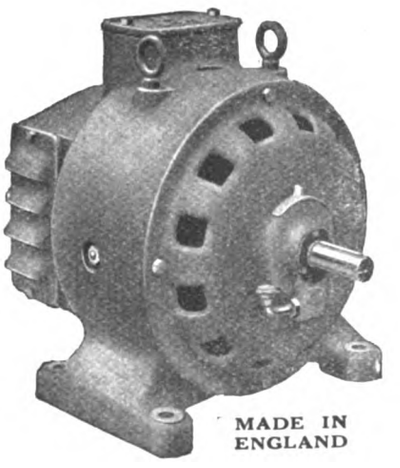

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An excerpt from the I.E.E. Regulations for the Electrical Equipment of Buildings (Rule No. 106, B) reads

*"Portable fittings . . . the only metal parts of which are the guards surrounding the lamp or lamps, need not be earthed . . . provided that these guards are not, and cannot come, in metallic contact with the lampholder or lampholders. Such fittings shall be made of treated hardwood, or of some suitable non-ignitable composite material capable of withstanding rough usage. . . ."*

Possibly "treated" hardwood in a hand-lamp is that kind of wood meant to be treated with respect when in use in damp places. However, there's no ambiguity about

# HAND LAMPS

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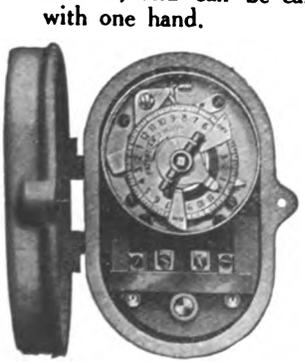

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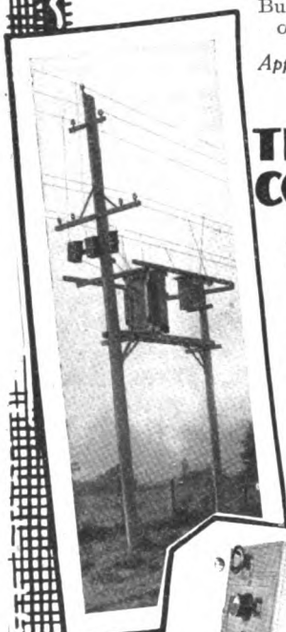

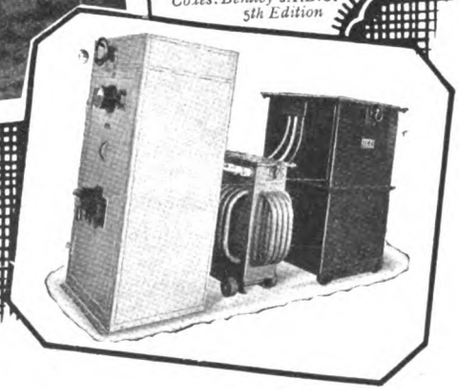

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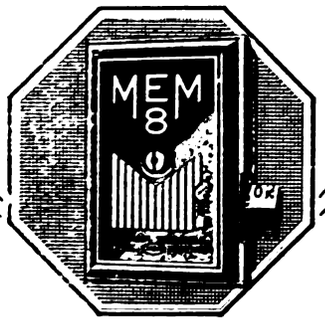


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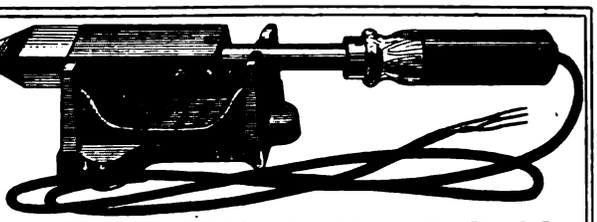

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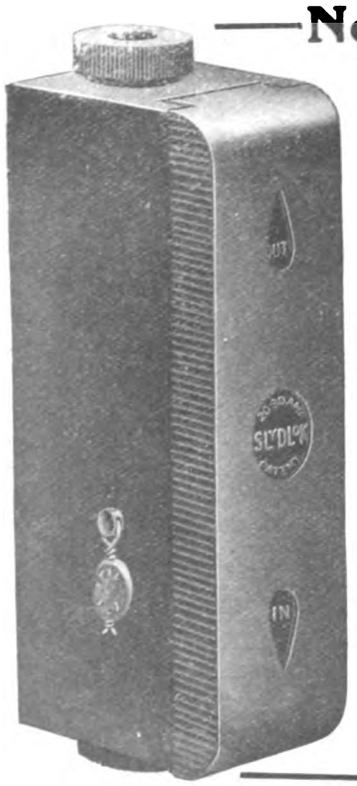


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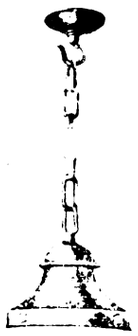

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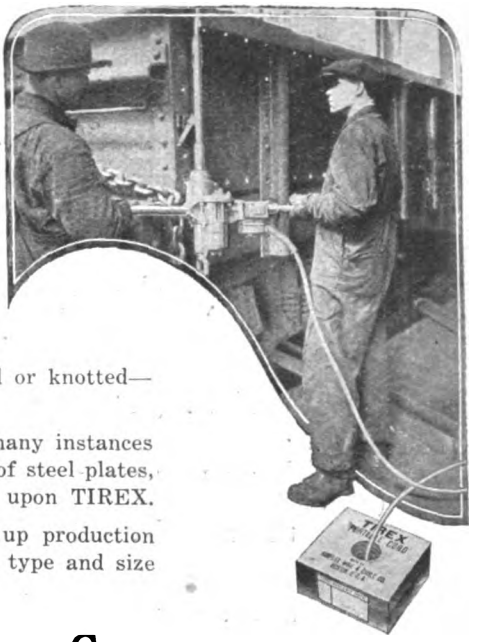

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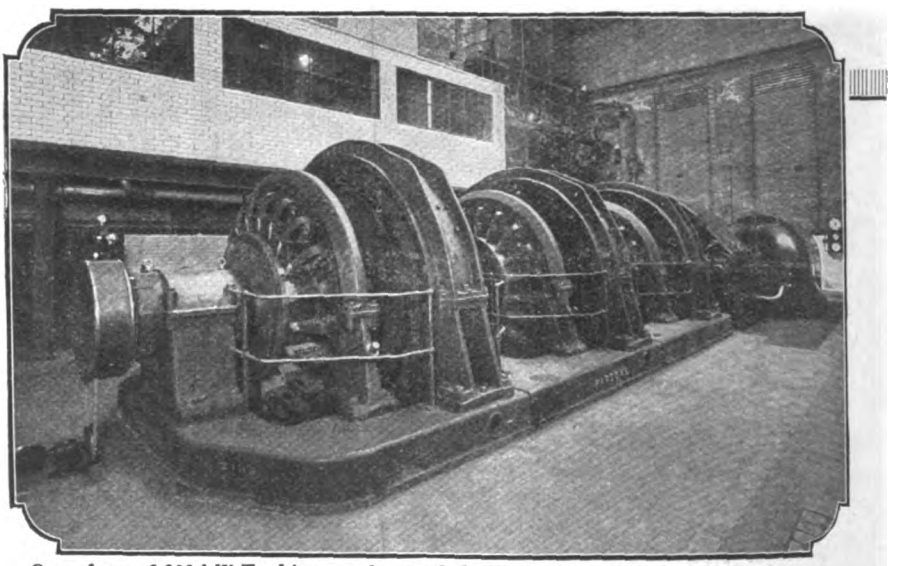

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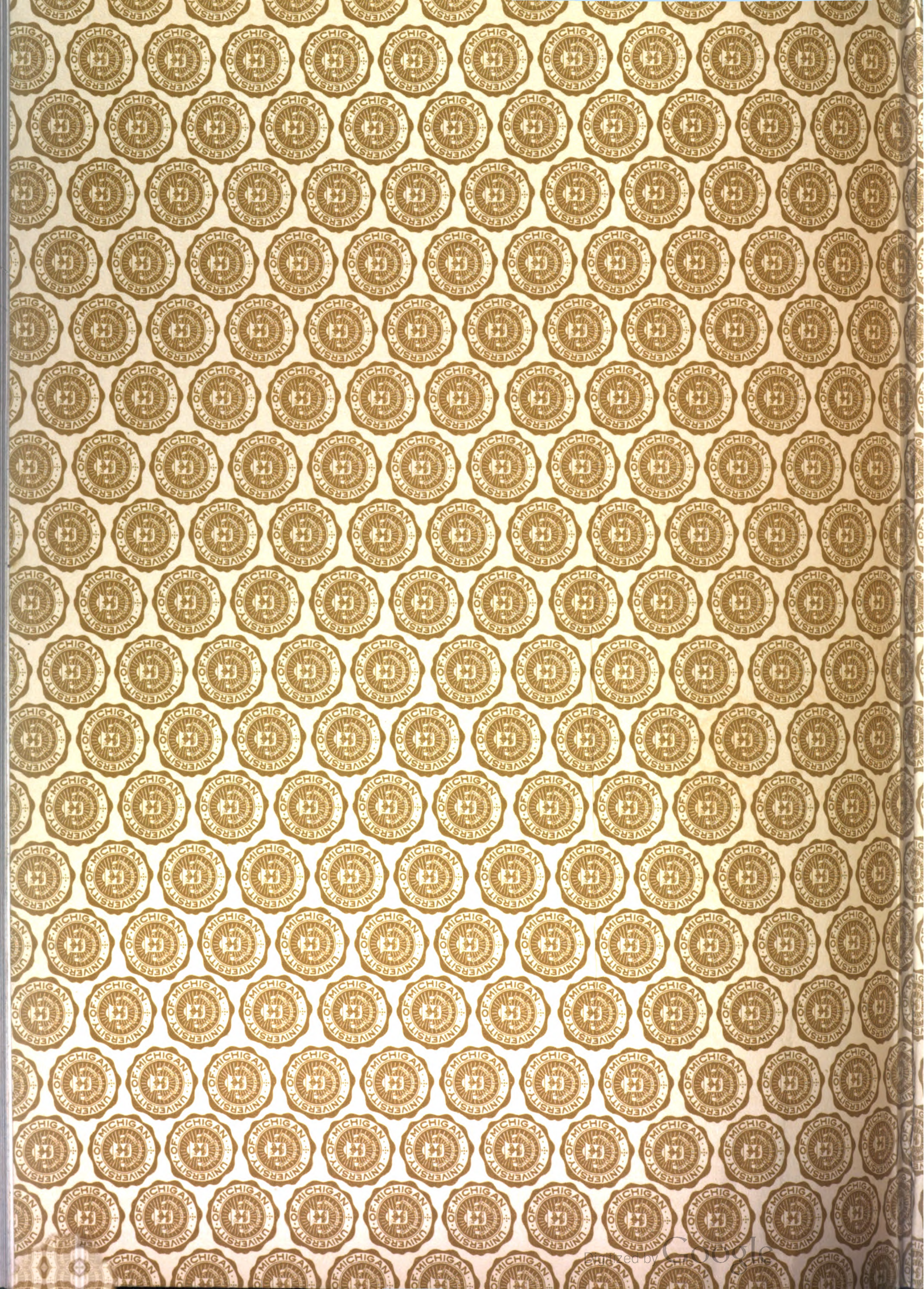
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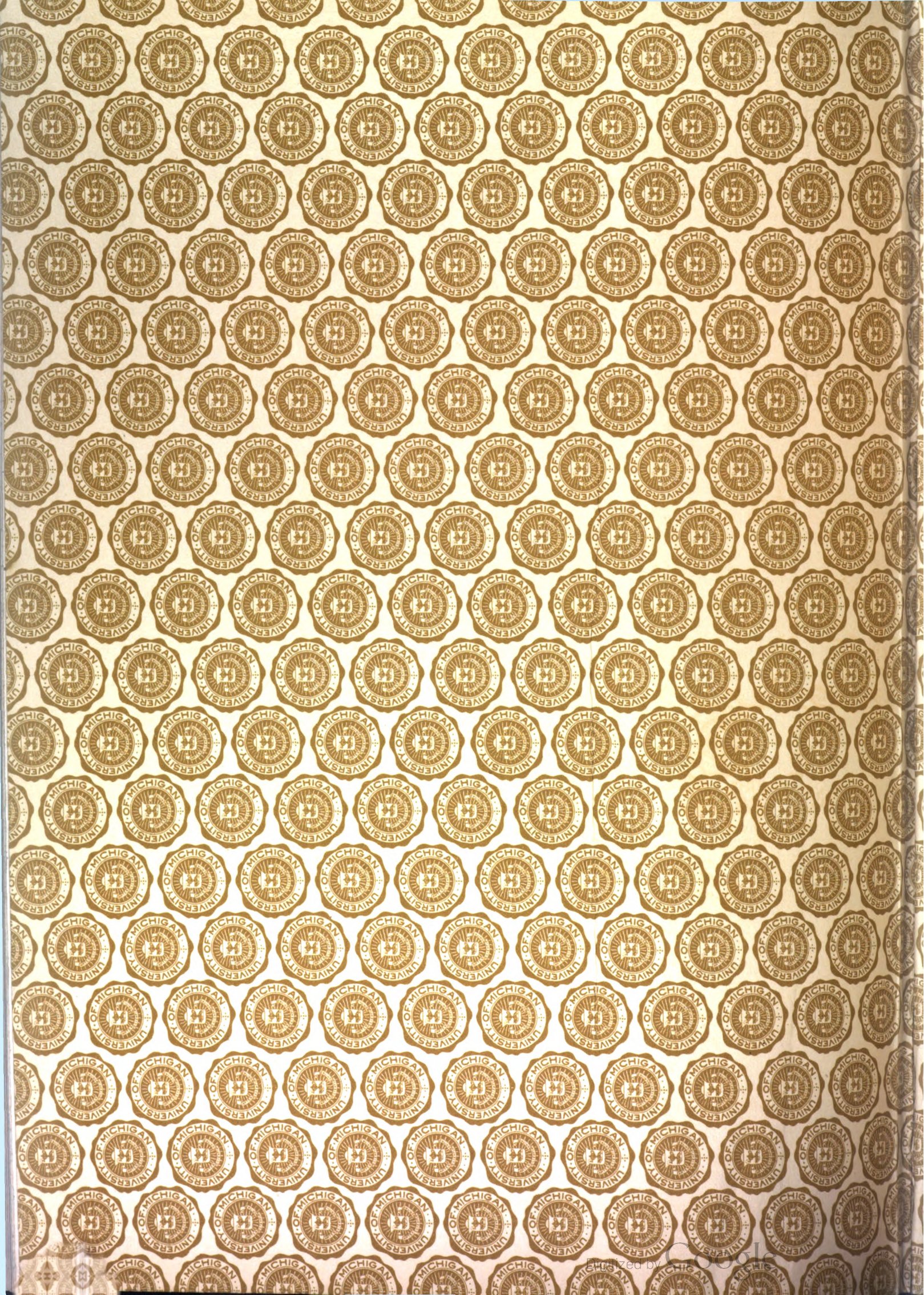
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